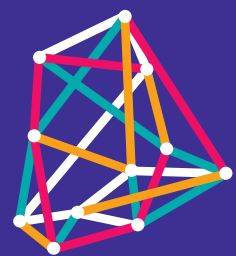
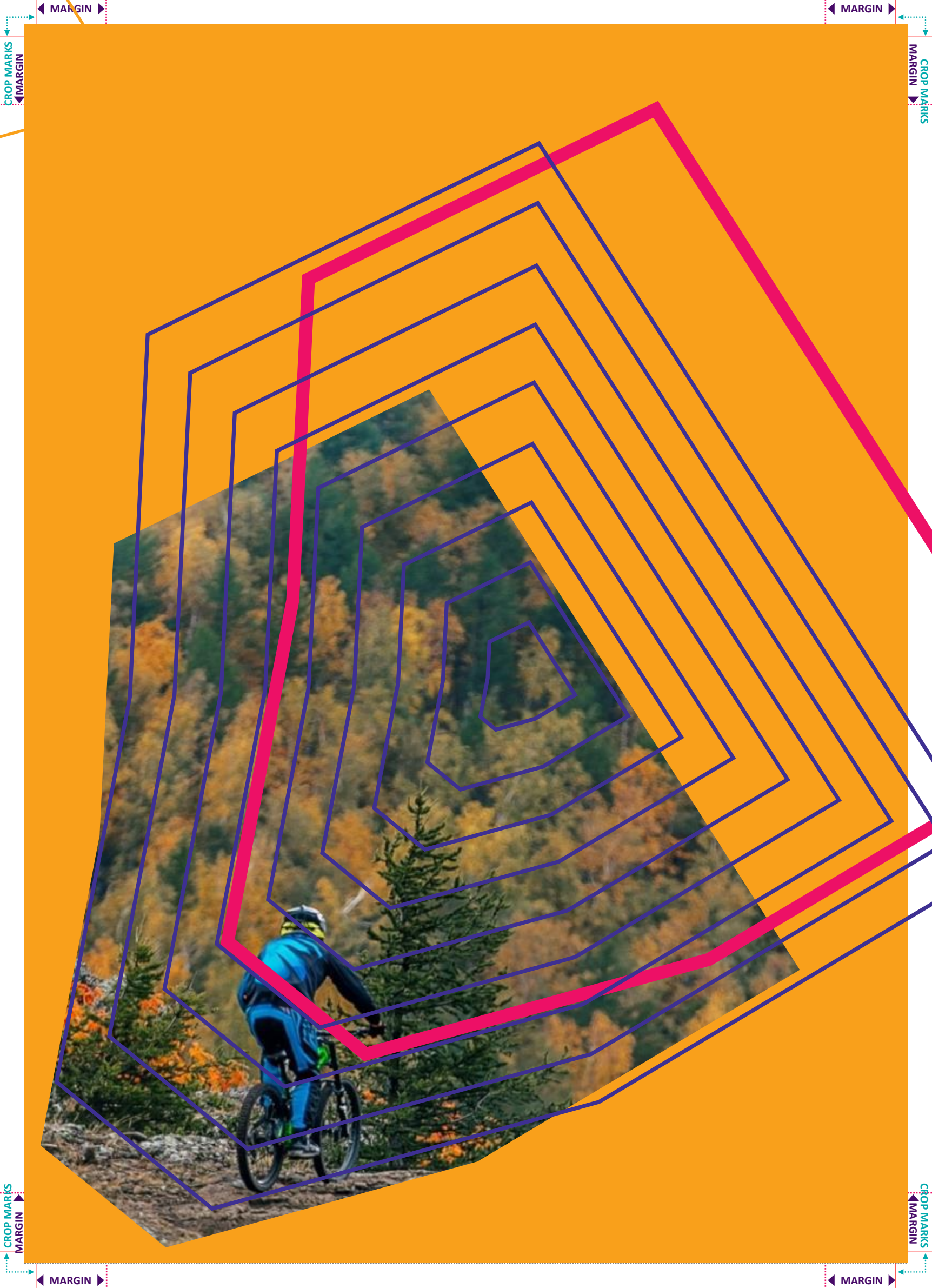


# Net Zero North Prospectus

March 2022

NP11







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# Foreword

The NP11 group of Northern Local Enterprise Partnerships is pleased to present this Prospectus, which showcases the ways in which the North is bringing its distinctive strengths to facilitate the transition to net zero and ensure the UK can ‘build back better’ after COVID-19. The Prospectus identifies areas where collaboration between different parts of the North and with Government around the UK’s 10 Point Plan for a Green Industrial Revolution can deliver better outcomes in terms of decarbonisation and economic value.

Clean growth is a vital part of securing the future of the North’s most valuable industries. COP26 and the increasing ramping up of global commitments demonstrate this is about creating new markets rather than just safeguarding what we have. The scale of the opportunity is huge, but it needs coordinated, systematic action across the North, between public and private sectors, and with Government.

Economic benefits for the North and the UK from clean growth are substantial. Collaboration across infrastructure provision, skills and supply chain, and trade and investment can ensure the region’s low carbon offer is greater than sum of its parts. This is not just about the industrial clusters: right across the North, our innovative businesses and outstanding research institutions are driving forward on 10 Point Plan Priorities.

Regions of the North are already collaborating to bring exciting low-carbon projects forward- from cluster decarbonisation through to major environmental projects such as the Great North Forest.

This Prospectus is the first step on a journey to establish collaborative strategy and interventions around future prosperity through clean growth, starting with the North, playing its part nationally, and competing globally.



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# Executive summary

# 01



# Driving clean growth in the North

**The North is the UK's Powerhouse: it generates over 40% of the UK's electricity, and almost a fifth of the electricity produced is exported to the rest of the UK. However, the North generates over 90m tonnes of CO<sub>2</sub> per annum - a quarter of the total. This reflects the significance of manufacturing and energy to the Northern economy.**

The North will be key to driving clean growth and ensuring the UK meets its environmental targets. Building off current activities, scaling up and collaborating can unlock significant benefits in the coming decades:



## Jobs figures

Create around 100,000 new green jobs by 2050.\*



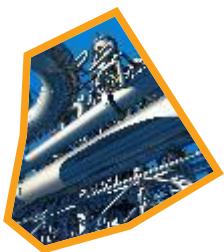
## GVA figures

£2.3 billion increase in GVA growth in the Northern Powerhouse by 2050.\*



## Inward investment

Add more than £2 billion per year to the energy economy in the region by 2050.\*



## Carbon reduction

Reduce the carbon emissions by 50% by 2032 against 2005 levels.\*

Successfully capitalising on the Northern Powerhouse's clean growth opportunity will mean that the UK will have a great chance to achieve Net Zero, and offers substantial economic and environmental benefits. Exploiting this opportunity will cement and extend the North's nationally and internationally competitive position in the field – fuelling industries of the future where the North is already a leader, such as digital and advanced manufacturing, unlocking economic regeneration by facilitating a just industrial transition, and harnessing the region's innovation capabilities to generate huge export opportunities for clean energy generation and efficiency technology.

Three of the six largest industrial clusters by emissions are in the Northern Powerhouse and supporting these clusters to transition to a net zero position whilst maintaining competitiveness is a significant challenge. Coordinated, systematic action across the North, between public and private sectors and with Government, is needed to take advantage of the opportunities it offers. There are many other clean growth opportunities outside the clusters, including nature based solutions to remove carbon from the atmosphere. By taking a collaborative, joined up approach, and viewing these major projects as complementary elements contributing to a larger ambition across boundaries, the North can maximise impact and ensure that the region delivers more than the sum of its parts. This will in turn have wider economic impacts that will help address the Government's levelling-up agenda.

*\*Figures are from: Northern Powerhouse: Energy and Clean Growth, NP11 Report, 2019*

## Local Enterprise Partnerships play a key role in driving future growth

LEPs play a central role in deciding local economic priorities and undertaking activities to drive economic growth and create local jobs. They are overseen by a Board which is led by a business Chair and its board members are local leaders of industry (including SMEs), educational institutions and the public sector. LEPs represent a shift of power to the right levels, increase democratic accountability and transparency, and ensure that public expenditure is more responsive to the needs of local business and people. In the context of the decades-long investment that will be needed to meet 2050 targets, they provide a strategic, non-partisan voice with a longer-term perspective, and can help join the dots between the component parts of future low-carbon systems and supply chains.

LEPs drive the clean growth agenda in the following ways:

- leadership and coordination - using their community leadership role and planning powers to set out a clear framework for local development, helping to provide certainty for business and investment, overcoming coordination failures and managing externalities and competing interests. This includes helping local authorities to coordinate climate action;
- supporting growth and development through ensuring a responsive supply of land that supports business growth and increases housing supply;
- using their significant land assets to leverage private funding to support growth. In many places, opportunities to include other parts of the public estate in asset-based vehicles exist;
- supporting high growth businesses, through involvement in bringing together and supporting consortia to run new growth hubs and coordinating approaches to leverage funding from the private sector;
- supporting local infrastructure - transport investment, in particular, is a key enabler of growth. The 2021 Spending Review prioritised economically significant local transport projects.

## How the North is already collaborating on projects

There is already a strong pipeline of projects where different parts of the North are coming together to deliver clean growth, developing innovative technologies and safeguarding the future of existing high-value sectors. Examples include:

**The East Coast Cluster:** A collaboration between the Northern Endurance Partnership (NEP), Net Zero Teesside and Zero Carbon Humber, the East Coast Cluster is delivering decarbonisation efforts in some of Britain's key manufacturing and industrial regions: Teesside and the Humber. The Cluster is actively bringing together communities, business, industry and academia to deliver the Carbon Capture and Storage (CCS) infrastructure needed to decarbonise this key industrial area. The NEP is developing the common infrastructure needed to transport CO<sub>2</sub> from emitters across the Humber and Teesside to secure offshore storage in the Endurance aquifer in the

Southern North Sea.

**Net Zero North West:** Net Zero North West is an industry-led cluster acting as a public and private sector investment accelerator for industrial decarbonisation and clean growth projects in the North West. Uniting business, regional leaders and academia, the project is committed to deliver a coordinated net zero vision for the region, including planning for the decarbonisation of the Mersey industrial cluster.

**Transport for the North:** A collaboration across local and National Government, LEPs and the private sector to make the case for strategic transport improvements across the whole of the North, which are needed to drive inclusive and sustainable transformational economic growth and rebalance the UK economy. They are looking at potential infrastructure improvements, like increased rail network connectivity between economic centres in the North, bringing together transport authorities across the North to manage the two rail franchises in the North to guide strategic industry investment, and identifying priorities for road investment and Strategic Development Corridors.

**Nature North:** The Nature North partnership is taking forward crucial initiatives that need Government support such as the Northern Forest, Great North Bog, and Eden North. The partnership is committed to adding value to the Nature North programme through its proposals for cross-partner investment in place, particularly in drawing out the complementarity of the North's urban, rural and coastal landscapes. There are significant circular economy opportunities relating to land use, agriculture, and biomass, and Nature North is developing these 'investable concepts' to attract capital.

**Pan-Regional Hydrogen Network:** Several concepts like East Coast Hydrogen and HyNet have been launched by Cadent, Northern Gas Networks (NGN) and National Grid among others with the aim of repurposing and building new hydrogen pipelines across North England. In the East pipelines will connect the Humberside and Teesside industrial clusters initially and spread across the wider region thereafter, while in the West HyNet will provide hydrogen connections initially around the Merseyside area.

**Energi Coast:** Energi Coast is the North East England's Offshore Wind Cluster. Made up of more than 30 key regional businesses and stakeholder organisations involved in offshore wind, the industry group works to showcase the vast supply chain capabilities in this sector within North East England, promote the region as a key hub for servicing both UK and international offshore wind markets and address the themes arising from the sector deal announced in early 2019.

**BioYorkshire:** BioYorkshire is a collaborative, cross-sectoral project to develop sustainable solutions for some of the UK's most pressing environmental challenges. Led by the University of York, Askham Bryan College and Fera Science, the project will harness scientific expertise to develop bio-based supplies of fuel, chemicals and materials. It will also work with the region's farmers and agricultural industries to drive innovation while enabling more productive and sustainable crop production and land use.

# Driving clean growth in the North (cont.)

## The projects in this prospectus show how the region can deliver the Government's 10 point plan priorities.

Across the North, we are already delivering on the Government's major policy aims. This encompasses all aspects of clean growth, from large infrastructure projects such as low-carbon industrial clusters to holistic approaches for more sustainable growth that protects the region's natural resources:

**Energy and Supply**

**1. Advancing offshore wind**

- Hornsea Two Offshore Wind Farm
- Dogger Bank Wind Farm
- Sofia Wind Farm
- Morecambe and Walney Wind Farms\*
- Able Marine Energy Park - SeAH Wind

**2. Driving the growth of low-carbon hydrogen**

- HyNet
- H2Teesside, H2North East
- H2H Saltend
- InTEGReL site, Gateshead & Winlaton – HyDeploy Hydrogen Homes
- DNV – Spadeadam hydrogen houses
- MMU 'Hydrogen & Fuel Cell Centre' & Trafford Energy Park

**3. Delivering new and advanced nuclear power**

- Nuclear Advanced Manufacturing Research Centre (AMRC) projects
- Cumbria Clean Energy Park (concept)\*
- SMR developments by Urenco, Birchwood
- Springfields Clean Energy Technology Park, Lancashire

**8. Investing in CCUS**

- BECCS project by Drax
- Net Zero North West
- Ince Biomass Plant, BECCS by Protos
- Storage facilities in the Liverpool and Morecambe bay areas\*
- CCUS by Tata Chemicals

**Supporting Factors**

**10. Green finance and innovation**

- Northern Powerhouse Investment Fund, pan-regional
- UK infrastructure Bank, Leeds
- The University of Sheffield Advanced Manufacturing Research Centre
- CCUS Research Centre, Sheffield University
- New and Renewable Energy Centre (NaREC), Blyth
- Advanced Machinery and Productivity Institute, Rochdale
- TIGGOR programme
- North East Energy Catalyst
- Net Zero Industry Innovation Centre
- RedCAT, the Lancashire Centre for Alternative Technologies
- GM Energy Innovation Agency & Highview Cryobattery

\*projects currently under development

**Transport**

**4. Accelerating the shift to zero emissions vehicles**

- Project Vanguard
- Nissan - EV36Zero Hub
- Britishvolt Gigaplant
- DER Centres - Newcastle University
- Hydrogen fuel research – Durham University

**5. Green public transport, cycling and walking**

- Tees Valley Multi-Modal Hydrogen Transport Hub\*
- Athena project
- Hitachi Rail & Hyperdrive Innovation\*
- GM Bee Active Cycle Network

**6. Jet Zero, green ships**

- Altalto plant - Velocys\*
- Port of Tyne
- Fulcrum Northpoint
- Bibby Marine Services Ltd

**Natural and Built Environment**

**7. Greener buildings**

- Newcastle University Merz Court - Energy Centre
- Customer Energy Village – InTEGReL\*
- Energy Hubs across the region
- E-ON / Newcastle CC heat pump trial
- AMRC NW low carbon demonstrator project, Lancashire
- Salford University 'Energy House 2.0'

**9. Protecting our natural environments**

- REnescience Northwich Project
- Doncaster peatlands management
- Eden Project North, Morecambe
- Peatland restoration – Pennine Peat LIFE
- Peatland restoration in North Yorkshire - Yorkshire Peat Partnership
- The Great Northern Forest reforestation
- Cumbrian Coastal Community Forest
- Greater Manchester Environment Trust

# Driving clean growth in the North (cont.)

## The Net Zero transition offers the opportunity for the regions of the North to work together, maximising environmental and economic opportunities and driving levelling up.

Systems-based, cross-cutting approaches offer an opportunity for the regions to work together to achieve more. By collaborating in areas such as infrastructure, skills provision and supply chains, and with a joined up approach to promoting investment, the North can drive down costs, stimulate innovation and exploit synergies. Collaboration can also ensure that some of the pressing challenges in delivering the low-carbon agenda can be met, in particular to ensure that skills and training shortages do not create labour bottlenecks. This means the region will enjoy more of the benefits and opportunities from the low-carbon transition and help it deliver Government’s priorities.

We have identified the following key sectors, based on current projects and scale of pipeline together with supporting factors: offshore technologies, nuclear, hydrogen & CCUS and maximising the region’s natural assets. These sectors represent significant economic and environmental opportunities for the region, and the collaboration approaches outlined below will help ensure that the North cements its world leading position in these sectors.

Collaboration opportunities	What this looks like in the North	How this maximises benefits
Infrastructure	<ul style="list-style-type: none"> <li>Hydrogen transmission network</li> <li>Whole systems solutions</li> <li>CCUS, heat, transport and industry infrastructure shared between clusters</li> <li>Shared offshore wind networks</li> </ul>	<ul style="list-style-type: none"> <li>Reduced costs from shared networks</li> <li>Economies of scale</li> <li>Synergies e.g. using excess green power</li> <li>More liquid markets</li> </ul>
Skills	<ul style="list-style-type: none"> <li>Address challenges faced in delivering low-carbon projects in the North (workforce capacity issues, large pipeline of infrastructure projects competing for resource, including from outside region)</li> <li>Mobile, skilled workforce, with upskilling and reskilling as needed</li> <li>Skill &amp; knowledge-share projects</li> <li>Partnerships between skills providers and industry across the North to ensure provision meets need</li> <li>Close links between industry and research institutes across the North</li> </ul>	<ul style="list-style-type: none"> <li>Industry-led, commercially focused innovation</li> <li>Filling labour market gaps and avoidance of bottlenecks</li> <li>High value work for local labour force</li> </ul>
Supply chains	<ul style="list-style-type: none"> <li>Ensure supply chain companies can access the local skills and knowledge they need (given skills challenge outlined above).</li> <li>Projects can source from local firms e.g. Offshore wind supply chain clusters around new manufacturing hubs</li> <li>Developments for better awareness of supply chains across the wider region</li> <li>Supplier associations such as NOF Energy, to provide easy access to supply base</li> </ul>	<ul style="list-style-type: none"> <li>Resilient and diverse supply chains</li> <li>High level of local content</li> <li>High value work for local labour force</li> <li>Greater efficiency project delivery</li> </ul>
Trade and Investment/ Internationalisation	<ul style="list-style-type: none"> <li>One Northern voice in promoting investment opportunities and regional excellence</li> <li>A shared approach to attracting overseas investors</li> <li>Freeports enabling innovative low-carbon businesses the chance to take advantage of opportunities</li> <li>Delivering a more effective, place-based approach in partnership with private banks, ensuring private as well as public funds are leveraged</li> <li>Creating “investable propositions” in new sectors e.g. natural capital, by creating scale and responding to investor needs</li> </ul>	<ul style="list-style-type: none"> <li>Higher level of inward investment</li> <li>Innovative, dynamic businesses cluster in freeports</li> <li>Lower finance costs, more and easier access to investment</li> <li>Unlock investment in new sectors, bring in new investors</li> </ul>

## This prospectus showcases current activities and states the case for future collaboration.

It aims to show the breadth of activity going on across the region in support of the Government's 10 Point Plan agenda. This is structured in terms of:

- **Projects:** these are the investments that drive environmental benefits and meet the infrastructure needs of consumers and citizens in the region.
- **Supporting activities:** in order to drive clean growth projects in the region and ensure that maximum value is derived from these, other initiatives are required to allow the region to deliver scale, drive local content and value and position the region to benefit from export opportunities.

We then highlight opportunities for future collaboration which can help the North seize the clean growth opportunity. The work is structured around the Government's 10 Point Plan, with priorities grouped as follows:

- **Energy and supply:** this section covers the priority sectors and technologies which will deliver the low-carbon energy required for Net Zero.
- **Transport:** this section covers the investments needed to drive modal shift and develop the clean fuel technologies of the future.
- **Natural and built environment:** this section covers the activities needed to decarbonise the built sector and safeguard the region's natural assets.

In terms of maximising the potential across the world leading sectors of the North – **principally, offshore technologies; new nuclear; hydrogen & CCUS; and the region's natural assets** - we have highlighted the immediate priorities for collaboration that need to be addressed to unlock future opportunities:

- **Infrastructure:** whole system solutions, funding for the hydrogen transmission network, working business models for shared CCUS infrastructure;
- **Skills:** ensuring that training programs meet technical needs, enabling workforce mobility & public transport;
- **Supply chains:** strengthening supply chain relationships, increasing the capacities of Growth Hubs;
- **Trade & Investment / Internationalisation:** delivery of Freeports, widening the evidence base in novel investment categories, developing a shared approach to marketing the region; and
- **Innovation:** identifying ways of increasing flow of innovation funding.

The most important steps need to be taken in the next phases will be the following:

- promoting **collaboration** at scale;
- assessing **funding** requirements;
- assessment of the opportunities created by **Freeports**; and
- identifying **blockers**.

# Energy and supply priorities

This section covers the priority sectors and technologies which will deliver the low-carbon energy required for Net Zero, in high priority areas like offshore wind, nuclear, hydrogen and CCUS. These sectors will drive not just the way to Net Zero, but collaboration and economic prosperity in the North.



# 02

# Advancing Offshore Generation

## Why this is important

Offshore Wind (OSW) will play a major role in delivering green electricity as the economy decarbonises. Volumes will continue to increase as demand for electricity increases across the economy e.g. for electric vehicles and heat pumps. In the 10 Point Plan, the Government sets out its ambitions for 40GW by 2030. The Committee on Climate Change projects the need for 75GW by 2050. This will require rapid deployment over the coming decades. Other marine technologies, in particular tidal, offer an opportunity to add further low-carbon capacity and diversity to the energy mix.

## What we are doing in the North

The North has a mature offshore wind supply chain, and strong R&D activities, while hosting the O&M activities of the huge offshore wind projects. A supply chain mapping exercise by Energi Coast revealed that there is a potential for 4,500 new green jobs for North East England's offshore wind supply chain, with the turnover of companies doubling to £2.2 billion in the same period. In terms of specific developments, SeAH Wind is planning to set up a £117m factory to build offshore wind turbine foundations at the Able Marine Energy Park, and LM Wind Power will make blades for Haliade-X turbines at the planned Dogger Bank project at their Teesside facility.

The North is also a known international R&D centre for offshore renewables, not least due to OREC's world leading facilities in Blyth, where they tested the GE Haliade X, which will be used on Dogger Bank Wind Farm.

With its wealth of marine resources in both the Irish and North Seas, the North of England is already leading the way in terms of offshore wind development with several projects at different stages of development. These include Hornsea 2, the largest project currently under development anywhere in the world, as well as the Dogger Bank and Sofia projects which are at an earlier development stage. In the Irish Sea a consortium between EnBW and BP and a joint venture between Cobra Instalaciones y Servicios and Flotation Energy are building wind farms in a total capacity around 3.5 GW. Various tidal projects are being explored in the region (e.g. Merseyside): high tidal ranges provide a unique opportunity to reliably generate abundant and predictable long-term renewable energy.

When complete these projects will provide:

- More than **10 GW** of potential capacity, enough to power at least **10 million households**
- At least **4,000** construction jobs and **4,500** additional jobs in the supply chain
- More than **£10bn** of investment

## Future opportunities

The Net Zero target and Government support create significant growth potential for offshore wind. Given the scale of action needed to reach UK climate targets, offshore wind deployment is likely to be scaled up significantly. This will include the development of deeper water projects based on innovative new technologies e.g. floating turbines.

The Government has estimated that reaching 30GW by 2030 would require around **£40 billion** in infrastructure spending. The North is well placed to contribute significantly to this economic activity, and should engage with Crown Estates to put in place future bidding rounds to expand offshore across the region. As deeper water projects become feasible, this will allow projects further offshore in the Irish and North Sea. The North is already leading the way in developing the supply chains to support this scale up, as demonstrated by new manufacturing hubs at Able Marine Park and Teesport.

## Future collaboration

Shared offshore wind transmission networks can drive cost reduction benefits, and ease future investments and developments of offshore wind projects in the area. This will require a wider view of requirements (both within the North and across the UK as a whole) to ensure efficient design.

The surplus, off-peak power generated by windfarms can be utilized efficiently by collaborating with green hydrogen plants, that can convert this energy into clean hydrogen which can be stored in facilities developed for this purpose.

# Advancing Offshore Generation (cont.)

## How we are supporting this growth in the North

<b>Skills</b> 	<b>Infrastructure</b> 	<b>Supply chains</b> 	<b>Trade and Investment</b> 
<p><b>Energi Coast Skills Group – North East LEP</b> A skills sub-group facilitated by the North East LEP leads the reviewing of future skills needed in the sector, and is coordinating skills pathways with institutions and training providers. The program is developing an action plan for demand-led skills provision, bringing educators together with industry to map current provision, and defining what is needed.</p>	<p><b>First Subsea</b> First Subsea, a Lancashire-based subsea connector specialist, has patented connector systems which aim to streamline the process of connecting power cables to wind turbines – the most labour-intensive and time-consuming element of power cable installation.</p>	<p><b>Smulders Projects UK</b> A £70 million investment in new equipment and infrastructure to enable the manufacture of offshore wind turbine transition pieces at an already existing site in Wallsend, Newcastle.</p>	<p><b>North of Tyne</b> A call for proposals on offshore wind infrastructure projects, with a fund allocation of £25 million up to 2028.</p>
<p><b>Newcastle College &amp; Port of Blyth</b> In a skills-first approach, Newcastle College and Port Training Services (PTS), the Port's award winning training arm, are joining forces to develop and deliver training programmes with direct pathways into the offshore energy sector, the North East's fastest growing industry.</p>	<p><b>Ports of Barrow and Workington (Irish Sea)</b> Both of these ports have a long association with the wind energy sector, and are well placed to service the expansion of offshore wind in the Irish Sea. The locations of the ports are ideal for windfarm construction phases, through to commissioning, operating and maintenance of these facilities.</p>	<p><b>LM Wind Power - GE Renewable Energy</b> The plant in Teesside, which is scheduled to open in 2023, will make blades for Haliade-X turbines at the planned Dogger Bank offshore wind farm located 125 kilometres off the coast.</p>	<p><b>Global Underwater Hub (GUH)</b> The GUH is the successor to Subsea UK and will harness opportunities in a rapidly-growing global market, create a step-change in the growth and internationalisation of UK underwater expertise, technologies, services and skills and drive innovation to accelerate the energy transition.</p>
<p><b>Vocational training centre at Port of Blyth</b> Investment of £1.08m will deliver a technical vocational training centre in the Port of Blyth industrial area which will focus on training school leavers, adults and sector employees in welding and fabrication disciplines, management of sector related apprenticeships and delivery of mandatory professional industry certifications.</p>	<p><b>Port of Tyne (North Sea)</b> SSE and Equinor have announced that they will be constructing the O&amp;M base for the Dogger Bank project. This will serve as the main hub once it is operational. The design includes the development of a new quay for Service Operations vessels which will provide transport to and from the wind farm.</p>	<p><b>JDR Cable Systems</b> JDR Cable Systems is planning to open a new GBP 130 million manufacturing facility in Cambois, near Blyth, Northumberland for high voltage subsea cable manufacture, plugging a major UK supply chain gap.</p>	
<p><b>CATCH</b> CATCH is an industry led partnership supporting the process, energy, engineering and renewable industries in Yorkshire and Humber, and is actively involved in developing and delivering skills and qualifications programmes.</p>	<p><b>Able Marine Energy Park</b> This is a fully consented project that will provide port facilities for renewables projects, offshore wind in particular. It offers 1,350m of deep water quays suitable for heavy loads and has 217 hectares of developable land, offering the potential for a multi-user facility for offshore wind turbines and their supply chains.</p>	<p><b>SeAH Wind</b> SeAH Wind is planning to set up a £117m factory to build offshore wind turbine foundations at the Able marine energy park.</p>	

# Driving the Growth of Low Carbon Hydrogen

## Why this is important

Hydrogen will be critical to decarbonising challenging sectors such as heavy industry and safeguarding the future of high-value industrial clusters in the UK. It can also play a role in decarbonising transport and domestic heat, complementing electricity-based technologies. Initial hydrogen deployment will be in the form of blue hydrogen (produced from natural gas with the resulting CO<sub>2</sub> stored using CCUS technologies). As costs reduce, green hydrogen will play an increasingly prominent role, utilising the UK's native renewable electricity production.

## What we are doing in the North

The North of England is already at the forefront of low-carbon hydrogen production in the UK through plans based around the region's industrial clusters. One of the largest projects is HyNet, which alone would provide 50% of the total hydrogen needed to meet the UK's net zero targets by 2050, in large part enabled by the CCUS infrastructure of the North West, and the storage sites at Liverpool Bay and Morecambe Bay. Net Zero Teesside and Zero Carbon Humber are large scale projects aimed at decarbonising two of England's largest industrial sectors on the East Coast using CCUS and hydrogen production.

In terms of individual production facilities, the H2H Saltend plant in the Humber will be able to produce 3 GW of blue hydrogen when fully operational.

The combined 1.5 GW capacity of HyGreen Teesside and H2 Teesside could deliver 30% of the UK Government's target of developing 5 GW of hydrogen production by 2030.

East Coast Hydrogen, a concept by Cadent, Northern Gas Networks (NGN) and National Grid is aimed at repurposing and building new hydrogen pipelines across the North East of England. These pipelines will connect the Humberside and Teesside industrial clusters initially and spread across the wider region thereafter.

The various activities at the InTEGREL site like the Hydrogen homes and the Winlaton HyDeploy trial, as well as the DNV Spadeadam testing facility, demonstrate the North is taking a leading role in proving the safety case for hydrogen, encouraging consumer acceptance, and accelerating deployment in scale.

Encirc, a glass furnace from Cheshire, is one of the first glass furnaces in the world to use hydrogen and green electricity for their melting processes, while Peel Environmental and Waste2Tricity are planning the UK's first waste plastic to hydrogen facility at the 54-hectare Protos site near Ellesmere Port.

When complete these projects will provide:

- **7.8GW** of hydrogen production, enough to meet the forecasted demand for hydrogen in 2030
- **10 million tonnes of CO<sub>2</sub> reduction per year**, equivalent to around **4%** of the UK's total emissions
- **10,000 jobs** and more than **£5bn in investment**

## Future opportunities

As outlined above, blue hydrogen production is an important part of the decarbonisation plans for the industrial clusters in the region (Tees, Humber and Merseyside). Going forward, green hydrogen production will become increasingly prevalent as costs reduce. A key factor here will be the continued deployment of zero carbon electricity, especially offshore wind: if wind output is high during periods of low demand, excess power can be supplied to electrolysis plants at a low price. Demand for green hydrogen will depend on sectors such as heat and transport. As of now the North is ideally positioned for the various demonstrators that need to be delivered (village/town heating near H<sub>2</sub> supplies, offshore wind & electrolysis, transport), and also has the opportunity to build on hugely complementary supply chains to deliver the hydrogen supply chain as needed (storage, transmission, appliances etc). A great example for future opportunities is the development of the Cumbria hydrogen cluster, which could span blue hydrogen using the gas and CCUS capabilities from Morecambe Bay, green hydrogen from offshore & onshore wind and ultimately from nuclear new build. The Trafford Energy Park (TEP) has also submitted its planning application for a Hydrogen Electrolyser, which will be the UK's largest green hydrogen production facility.

## Future collaboration

In order to provide a secure supply of hydrogen to the industrial clusters, a national hydrogen transmission system is being proposed by National Grid (Project Union). As well as providing security of supply, this can promote more liquid hydrogen markets by joining up more sources of supply and demand. A joined up approach will be needed to identify the optimal pipeline routes, and how these coexist with the 'legacy' natural gas transmission system.

Green hydrogen production will need to be located to meet local demands from heat and transport. Again, a joined up approach to planning will allow for resources to be shared between areas and avoid shortages or over-provision.





# Driving the Growth of Low Carbon Hydrogen (cont.)

## How we are supporting this growth in the North

 Skills	 Infrastructure	 Supply chains	 Trade and Investment
<p><b>North West Energy &amp; Hydrogen Cluster skills roadmap</b> The North West Energy &amp; Hydrogen Cluster sets out a roadmap for low carbon skills in the region. Working with businesses, universities, colleges and training providers it will highlight where skills gaps exist and where investment is needed. Led by the University of Chester and Manchester Metropolitan University, the roadmap will seek to understand skills requirements of industry in the region as businesses seek to respond to the Government's target of net zero emissions by 2050.</p>	<p><b>Protium electrolyser</b> Protium will build a 40MW flagship green hydrogen project at Wilton Universal Group's site in Teesside. Current plans are for the site to include up to 40MW of electrolysis capability, developed in two phases, including hydrogen storage. The building of a hydrogen production facility will provide Protium with the infrastructure necessary to generate renewable green hydrogen energy, with plans to supply local manufacturers once built.</p>	<p><b>Athena project</b> In this project, the development of hydrogen refuelling corridors for Heavy Goods Vehicles (HGVs) within the geographic area of the NP11 will be analysed in collaboration with the associated stakeholders. Data analysis and simulation modelling techniques will be utilised to gain an understanding of the current road freight movement on strategic corridors within the North in an attempt to determine the optimal location and capacity of hydrogen infrastructures required in serving the hydrogen needs of the given corridors.</p>	<p><b>Network Innovation Competition (NIC) projects</b> NIC is an annual competition that funds flagship innovative projects to deliver financial and environmental benefits for gas customers. With an annual fund of £20m each year, NIC is accelerating the development of low carbon energy sector projects with significant environmental benefits.</p>
<p><b>Customer Energy Village – InTEGREL</b> The customer energy village will feature a number of residential properties enabling the research, testing, de-risking and demonstration of energy technologies within the home environment. It is envisaged that researching the safe limits of mixed hydrogen operation will be undertaken within the customer energy village, amongst other energy system interactions across all vectors. This will build expertise and skills in understanding and developing the hydrogen heating systems of the future.</p>	<p><b>HySecure</b> With an investment opportunity of £25m, HySecure is a bespoke mined hydrogen storage salt cavern, capable of storing 50GWh of energy (1100 tonnes of hydrogen working gas volume) from 2026. The cavern can be used to demonstrate flexible hydrogen storage at scale. Equally the cavern can provide back-up hydrogen supply services to other hydrogen projects in the North West region increasing the overall resilience of the nascent hydrogen supply industry.</p>	<p><b>Trafford Low Carbon Energy Park</b> For the first time, sustainable hydrogen fuel will be produced at scale in the region through a 200MW plant, creating opportunities for businesses in the area to make Net Zero plans with hydrogen in mind. This new hub will be an addition to Trafford Low Carbon Energy Park – a green energy storage facility, which already consists of a number of Net Zero industrial projects in support of UK Government objectives. The facility aims to help integrate renewable energy on a regional scale through the storage of solar and wind energy using the world's first commercial cryobattery, and now through the production and storage of hydrogen.</p>	<p><b>NZN: Sustainable Hydrogen Economy</b> With the research expertise of the N8 Research Partnership and its wider partners this program is centered around exploring and identifying opportunities to maximise the use of green energy to support hydrogen production, storage and utilisation using excess green energy. Maximising economic growth opportunities, environmental benefits and knowledge exchange, the program will look to prioritise and accelerate projects that can find novel uses for hydrogen in the local, regional and national context – delivering hydrogen solutions faster than anticipated, in areas where hydrogen has not been prioritised in the past.</p>
<p><b>North of England Hydrogen Forum</b> This is a group launched in 2021 that brings together energy networks, universities, local government and consultancies to share ideas and build collaborative developments. Areas of focus include skills development within the hydrogen economy supply chain, building on strengths at Chester and Durham Universities.</p>	<p><b>Hydrogen for Heat – Durham University</b> Hydrogen for Heat is centred around a hydrogen powered combined heat and power (CHP) system and will create a laboratory in the North East. The project will establish a facility at Durham University to demonstrate hydrogen fuelled heating, storage and power generation with potential commercial applications.</p>	<p><b>Future Grid by National Grid</b> NG has been awarded funding through the Network Innovation Competition to look at the possibility of converting the NTS to transport hydrogen. A facility will be built from a range of decommissioned transmission assets, to create a representative whole-network which will be used to trial hydrogen and will allow for accurate results to be analysed. Blends of hydrogen up to 100% will be tested at transmission pressures to assess performance.</p>	<p><b>Hydrogen and Fuel Cell Centre at Manchester Metropolitan University</b> The Hydrogen and Fuel Cell Centre at Manchester Metropolitan University is the UK's first Fuel Cell Centre of Excellence. The Centre is exploring the pure science of the fuel cell itself, driving engagement with industry on a local, national and international scale, and developing the technology talent of tomorrow.</p>

# Driving the Growth of Low Carbon Hydrogen (cont.)

## How we are supporting this growth in the North

Skills 	Infrastructure 	Supply chains 	Trade and Investment 
<p><b>Highview Cryobattery</b> Enabling works have already been completed to establish the development platform for the world-first commercial CryoBattery and Battery Energy Storage System (BESS) projects. This £80million project will provide 50MWh peak of transmission grid scale flexibility collocated with the potential local Green Hydrogen production.</p>			

# Delivering New and Advanced Nuclear Power

## Why this is important

Nuclear power has been a low-carbon component of the UK's electricity system for decades, providing large volumes of baseload power and enhancing system diversity. Much of the UK's nuclear power fleet is reaching the end of its operational life, with only Hinckley Point C currently under construction to replace what is due to close. New nuclear technologies such as Small Nuclear Reactors (SMRs) are currently under development, and could replace retiring capacity. Fusion technology also offers the prospect of abundant energy with further development and innovation. As well as power production, the UK (and the North of England in particular) has a leading nuclear Decommissioning and Waste Management sector.

## What we are doing in the North

The North is hosting numerous advances in new nuclear, in the form of new power plants and innovation projects. Cumbria is building on existing nuclear heritage and current decommissioning expertise as well as available NDA owned development land, to put in place new nuclear capability and integrate with clean energy uses, like STEP, SMR, AMR or EDF gigawatt capability. The Cumbria Clean Energy Park (currently in pre-planning phase) can host most of these developments. Cumbria is working with the Government and developers to secure a long term clean nuclear power plant in the vicinity of the existing Sellafield site. These nuclear developments could:

- Provide a major boost to employment in the region, with an estimated **14-21,000 jobs** supported
- Add generation capacity of more than 3GW, enough to power around **6.2 million homes**
- Reduce emissions by around **10 million tonnes CO<sub>2</sub>e per year**, equivalent to approximately **3% of UK emissions**

## Future opportunities

The 10 Point Plan and the Government's Energy White Paper set out ambitions to develop new large scale sites as well as next generation technologies such as small and advanced modular reactors.

LEPs with successful nuclear industries have an ambition to increase their access to international markets for nuclear sector materials, engineering capabilities and decommissioning services. Cumbria LEP aims to build its reputation as a global centre for nuclear technology, particularly in spent fuel management and decommissioning, while also looking to develop Small Modular Reactors (SMRs) at Sellafield. Cumbria is also in the shortlist for the potential site of a STEP fusion reactor, and West Cumbria (Copeland and Allerdale) is being considered as a potential site for a national Geological Disposal Facility for Nuclear Waste.

Cheshire and Warrington LEP aims to become a local hub for advanced modular reactor development (e.g. SMR developments by Urenco near Birchwood).





Nuclear fusion also offers an opportunity for the North to use its capabilities to drive innovation in the sector. The Government has recently published a list of five sites which could host a prototype fusion power plant: these include two sites in the North (Goole and Moorside).

## Future collaboration

The North is already home to supply chains and umbrella groups which go beyond local boundaries. The North West Nuclear Arc is a sector cluster spanning the North of England and North Wales which covers the whole nuclear value chain, and works with industry stakeholders and local and national Governments. Ongoing collaboration will allow local economies to continue to support the region's thriving nuclear sector.

# Delivering New and Advanced Nuclear Power

## How we are supporting this growth in the North

<b>Skills</b> 	<b>Infrastructure</b> 	<b>Supply chains</b> 	<b>Trade and Investment</b> 
<p><b>The Advanced Nuclear Skills and Innovation Campus</b> A £2m centre to unlock advances in nuclear power is set to open in Preston. An eight-month pilot for The Advanced Nuclear Skills and Innovation Campus will be based at a laboratory on the Springfields site in Salwick, where leaders from industry and academia - including the UCLan, the University of Manchester and the University of Sheffield - will collaborate.</p>	<p><b>Sellafield Product and Residue Retreatment Plant</b> One of the biggest construction projects at the Sellafield site, the plant will treat and store historic nuclear waste for 100 years.</p>	<p><b>North West Nuclear Arc</b> The North West Nuclear Arc is a unique nuclear sector cluster. Spanning the North of England and North Wales, it incorporates all the facilities and capabilities across the whole nuclear lifecycle from fuels, to energy production, management of waste and decommissioning. NWNA is unique in the UK and widely recognised as a world class, self-contained, end-to-end nuclear system all within a very compact geography.</p>	<p><b>Nuclear Advanced Manufacturing Research Centre (AMRC) projects</b> The Nuclear AMRC is a partner in a host of collaborative research and development projects, supported by UK and international funding programmes. The Nuclear AMRC works with companies to overcome their manufacturing problems, and help them develop the technical capability to compete on cost, quality and delivery. With an annual funding of ~£10m+ it plays an important role in innovation for new nuclear projects. It has five core R&amp;D groups offering a host of capabilities in:</p> <ul style="list-style-type: none"> <li>• Machining technologies</li> <li>• Welding &amp; materials</li> <li>• Simulation &amp; verification</li> <li>• Modularisation</li> <li>• Controls &amp; instrumentation</li> </ul>
	<p><b>Springfields Clean Energy Technology Park</b> The Clean Energy Technology Park at Springfields provides a collaborative hub for demonstrating and accelerating the commercialisation of a broad range of nuclear-related technologies.</p>	<p><b>Westinghouse fuel manufacturing plant – Springfields, Lancashire</b> The Westinghouse plant at Springfields near Salwick is the UK’s only nuclear fuels production site, and recently received a funding of £75m, helping to save at least a 1,000 jobs.</p>	



# Investing in Carbon Capture Usage and Storage

## Why this is important

Carbon Capture Usage and Storage (CCUS) will be a key facilitator of several of the most important abatement technologies. It will allow the production of blue hydrogen to input into key industrial processes and make flexible low-carbon power generation using natural gas possible.

Developing CCUS will be a significant undertaking in terms of infrastructure, both onshore and offshore. Industrial clusters in the region are well-advanced with their plans, and have been selected as the first sites in the UK for development, with plans to begin capturing and storing CO<sub>2</sub> by 2027. This will be crucial to ensuring cluster competitiveness in the face of international competition and rising carbon prices.

## Future opportunities

Once carbon transport and storage infrastructure is operational, this offers the opportunity for more emitters to connect. Providing CCUS infrastructure to emitters outside the major industrial clusters is another potential area of growth.

In addition, when first of a kind projects such as those in the North of England prove successful, it could offer the region the chance to export its knowhow to other countries looking to develop the sector. The region can also offer its storage facilities to other clusters in the UK that do not have access to offshore sites e.g. South Wales, Southampton clusters. This could involve a solution where CO<sub>2</sub> is shipped for storage in the North Sea. There is also a potential for Morecambe Bay Carbon Storage with a link to hydrogen production at the North Morecambe Gas Terminal at Barrow.

## Future collaboration

The North is already joining up on CCUS, for example with the collaboration between the Tees and Humber clusters to create a plan for shared onshore and offshore infrastructure to create efficiencies and drive down costs. Allowing the connection of sites outside industrial clusters, and facilitating CO<sub>2</sub> 'imports' from other parts of the country, will require a joined up approach to network planning and safety. Marketing the region as the country's 'CO<sub>2</sub> centre of excellence' will attract interest from other countries with a large industrial base and early plans for CCUS.

## What we are doing in the North

CCUS is one of the largest areas of investment in the North, as the industrial clusters aim to reduce their carbon emissions, to reach net zero goals. The region is well-placed in terms of CCUS assets, as depleted North Sea and Liverpool & Morecambe Bay oil and gas fields offer storage of waste CO<sub>2</sub> at scale. Activity is centred around the three main industrial clusters in the North as follows:

- **Hynet:** as part of the North West's wider plans for low-carbon hydrogen production and direct capture of industrial emissions, the Hynet project will run a CO<sub>2</sub> pipeline from Merseyside into North Wales and out to a storage site in the Irish Sea. When complete this has the potential to capture 10m tonnes of CO<sub>2</sub> per year.
- **East Coast Cluster:** covering the Teesside and Humber clusters, this project will develop the common infrastructure to transport CO<sub>2</sub> to offshore storage in the Endurance aquifer in the North Sea. Across the Teesside and Humber clusters there is the aim to capture more than 25 million tones of CO<sub>2</sub> per year.
- An example for the work done in the Humber cluster is the **Humber Zero** project which is a large scale decarbonisation project backed by world scale partners to remove up to 8 million tonnes per annum of CO<sub>2</sub> from the Immingham industrial site by 2030, and will integrate CCS technology into some of the industrial processes at combined heat and power plant VPI Immingham and the Phillips 66 Humber Refinery. Post combustion, CO<sub>2</sub> is captured at source and then transported via the Northern Endurance pipeline to CO<sub>2</sub> storage fields in the North Sea.

When complete, these projects will provide:





- **500 million tonnes of CO<sub>2</sub> storage capacity**
- **£20 billion in GVA and 50,000 jobs** in the region

CCUS will allow flexible generators in the region like the Drax power station, which provides low-carbon power as well as providing (in the case of Drax, MGT Teesside or Protos) negative emissions energy through the use of biomass.

Already generating heat and electricity from one of the most efficient combined heat and power plants in the UK, the carbon footprint of Tata's operations in Northwich is set to be significantly reduced through the completion of the UK's largest carbon capture and utilization plant. This plant will enable a considerable proportion of the CO<sub>2</sub> produced by the CHP to be recycled and used as a raw material to produce sodium bicarbonate.

# Investing in Carbon Capture Usage and Storage (cont.)

## How we are supporting this growth in the North

<b>Skills</b> 	<b>Infrastructure</b> 	<b>Supply chains</b> 	<b>Trade and Investment</b> 
<p><b>Drax &amp; Selby College</b> Drax have a five year partnership in place with Selby College, to 2025, to deliver community education programmes, as well as support for retraining and to ensure students are developing the skills needed in innovative clean technologies which will help to drive a zero carbon economy.</p>	<p><b>Offshore CO<sub>2</sub> networks and storage</b> Old oil and gas fields in the North and Irish Seas offer ideal storage facilities for waste CO<sub>2</sub> from carbon capture projects. The East Coast cluster will use the Endurance Aquifer in the North Sea.</p>	<p><b>Industrial Decarbonisation Fund</b> A government funding provided in two complementary streams and as two phases, with funding of up to £131m for deployment projects – which will either deliver or support delivery of significant emissions reductions in a UK industrial cluster by 2030 – and £8 million for decarbonisation roadmaps, or cluster plans, for major UK industrial clusters.</p>	<p><b>Cluster Sequencing</b> The UK government is aiming to have at least two CCUS schemes up and running by the mid-2020s and four operational by 2030 at the latest. The clusters identified will receive funding from the government. BP-led East Coast cluster and Eni-led HyNet have been chosen as first recipients of government funding.</p>
<p><b>CATCH</b> CATCH is an industry led partnership supporting the process, energy, engineering and renewable industries in Yorkshire and Humber, and is actively involved in developing and delivering skills and qualifications programmes.</p>	<p><b>Carbon Capture and Storage Association (CCSA)</b> The CCSA has published a report, outlining how a national supply chain can be created to deliver a successful CCUS rollout that contributes to the UK's wider net-zero goals.</p>		



# Benefits of pan-Northern collaboration

Large low-carbon energy and supply projects across the North offer significant opportunities for collaboration, unlocking greater benefits for the region and for the UK's net zero transition. This table identifies potential areas of collaboration, how these maximise environmental and economic benefits from clean growth and some initial actions to realise these benefits.

Collaboration opportunities	What this looks like in the North	How this maximises benefits	What needs to be done
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>Shared CO<sub>2</sub> storage infrastructure (pipes and fields) between clusters</li> <li>Shared offshore wind transmission networks</li> <li>Hydrogen network connecting industrial clusters</li> <li>Renewables/nuclear agreements with green/pink hydrogen production for low carbon power</li> <li>Cross-vector hydrogen infrastructure e.g. shared with transport</li> </ul>	<ul style="list-style-type: none"> <li>Project efficiencies</li> <li>Efficient use of energy/ market balancing</li> <li>Development/cost reduction for key technologies e.g. green hydrogen</li> <li>Liquid hydrogen markets</li> </ul>	<ul style="list-style-type: none"> <li>Regulatory frameworks for shared networks</li> <li>Clear project pipeline to facilitate optimal design of shared infrastructure (e.g. shared space for CCUS and wind projects)</li> <li>Clarity around funding and timing of hydrogen transmission network</li> <li>Clarity around business models for nuclear (including SMR)</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>Skills needs of emerging offshore wind manufacturing base e.g. Smulders, SeAH factories met</li> <li>Understanding of the skills needs of CCUS clusters (emitters and Storage/Transportation owners) and ensure skills provision is in place to meet these needs</li> <li>Skills provision to meet needs of hydrogen production in clusters</li> <li>Continued development of skills through existing technical and academic providers building off existing clusters e.g. North West Nuclear Arc</li> </ul>	<ul style="list-style-type: none"> <li>Local labour upskilled to develop CCUS clusters</li> <li>Avoid bottlenecks and shortages</li> <li>Drive local value and high value jobs</li> </ul>	<ul style="list-style-type: none"> <li>Work with offshore wind manufacturers to understand needs</li> <li>As CCUS clusters develop on similar timeframes, work with other LEPs to understand pipeline and likely pinch points</li> <li>Understand skills needs of hydrogen producers (green and blue) and plan to meet these</li> <li>Build off existing relationships with nuclear clusters to understand future needs</li> <li>Industrial clusters continue to develop mapping of skills and supply chain needs</li> </ul>
<b>Supply chains</b>	<ul style="list-style-type: none"> <li>Local supply chains able to meet production and network needs</li> <li>Idea and knowledge sharing between cluster 'centres of excellence'</li> <li>Developers aware of supply chain capabilities across region</li> <li>Continued innovation in universities and research centres</li> <li>Knowledge sharing within existing clusters e.g. North West Nuclear Arc</li> </ul>	<ul style="list-style-type: none"> <li>Drive local value</li> <li>Innovation driving lower technology costs</li> <li>Innovation spillovers from offshore wind manufacturing hubs</li> <li>Project efficiencies from UK sourcing</li> <li>Wider availability for users</li> </ul>	<ul style="list-style-type: none"> <li>Liaise with developers to ensure awareness of local firms' capabilities</li> <li>Support for further offshore wind manufacturing plants e.g. in North West</li> <li>Requirements for local content and sourcing in cluster plans</li> <li>Industrial clusters continue to develop mapping of skills and supply chain needs</li> </ul>
<b>Trade and Investment/ Internationalisation</b>	<ul style="list-style-type: none"> <li>Pan-Northern campaigns to sell the region's expertise in emerging CCUS markets</li> </ul>	<ul style="list-style-type: none"> <li>Region-wide expertise in CCUS</li> </ul>	<ul style="list-style-type: none"> <li>Develop materials to showcase full range of regional experience and capacity in the sector</li> </ul>

# Transport priorities

The section covers the investments needed to drive modal shift and develop the clean fuel technologies of the future. As the demand for low carbon alternatives in transport increases over time, the electrification of transport will also increase demand for low carbon power (especially offshore wind and CCUS), hydrogen, and other alternative sustainable solutions.



# 03

# Accelerating the Shift to Zero Emission Vehicles

## Why this is important

Emissions from cars, vans and buses (the modes of transport most suitable for electrification) account for around 17% of total UK emissions. Emissions from surface transport have been largely flat since the 1990s, reflecting the growth in vehicle numbers even as vehicle efficiency has improved. The shift to electric vehicles is therefore an important component of the shift to Net Zero.

The North is well-placed to take advantage of this shift. Car manufacturing is a major employer in the North, in particular through the Nissan Sunderland plant, which has recently announced plans to expand its electric vehicle production.

## Future opportunities

Given the need for the UK's light vehicle fleet to electrify over the coming decades, there will be significant sales of vehicles. As the costs of green hydrogen reduce, production will increase, allowing greater penetration for hydrogen refuelling infrastructure to make this a feasible option for heavier vehicles.

Increasing numbers of electric and hydrogen vehicles will require a recharging and refuelling infrastructure that is convenient for travellers. This will include both local provision e.g. on street charging as well as facilities aimed at longer distance travel.

Existing and increased inward investment in battery technology and EV supply chains in the region could deliver a first mover advantage in a growing global market and represents a huge opportunity for the North. These sectors could create 78,000 new jobs in the UK by 2040.

## Future collaboration

Charging and refuelling infrastructure will need to be planned and delivered to ensure travellers' needs are met in an efficient way. Long distance EV and hydrogen infrastructure must therefore be planned and created at regional level to account for transport flows/demand and distribution of green hydrogen across the region.

## What we are doing in the North

The North can play a leading role in the development of zero emission vehicles, with EV manufacturing ecosystems, battery production and the widespread use of hydrogen as a fuel. One of the most significant investments is Nissan's EV36Zero Hub, which brings together electric vehicles, renewable energy and battery production, setting a blueprint for the future of the automotive industry. In addition, the BritishVolt gigafactory at Blyth will produce 300,000 battery packs a year when fully operational. Vauxhall's facility at Ellesmere Port will be the first all-electric vehicle manufacturing plant in the UK, where not only will the vehicles coming out the plant be green, but the plant itself will be green as well.

The acquisition of Hyperdrive Innovation and BorgWarner Gateshead by US tech business Turntide Technologies aims to position the company to accelerate existing technologies and capabilities to reduce energy use and cost for commercial transportation services. A new division of Turntide Technologies, Turntide Transport will establish operations in Gateshead marking the beginning of a multi-year £100m investment in the region. The company will focus on modernizing intelligent motor systems throughout the commercial transportation industry.

When complete these projects will provide:

- **400,000 EV batteries** per year
- An opportunity to save at least **100,000 tonnes** of carbon per year, by shifting to zero emission vehicles
- **15,000 jobs** in the region





As well as innovating and scaling up in the manufacture of electric vehicles, the North of England is also leading the way in the development of hydrogen vehicles and the networks required to support them, like the Vanguard Hydrogen project, that will develop a central hydrogen refuelling station for Cheshire East Council using hydrogen produced from solar PV.

Teesside Airport is the UK's first pilot area to test hydrogen vehicles as part of the Tees Valley's status as the country's Hydrogen Transport Hub. The £2.5m project will see the airport have commercial and support vehicles fitted with 100% hydrogen zero emission engines.

Greater Manchester is implementing the largest Clean Air Zone outside of London to tackle air pollution, launching in May 2022, with financial support to help businesses, traders and others switch to cleaner vehicles.

# Accelerating the Shift to Zero Emission Vehicles (cont.)

## How we are supporting this growth in the North

 <b>Skills</b>	 <b>Infrastructure</b>	 <b>Supply chains</b>	 <b>Trade and Investment</b>
<p><b>Scarborough Tec and York Colleges</b> The York &amp; North Yorkshire LEP, through its Getting Building Fund has supported the purchase of more than £240,000 EV training equipment for Scarborough Tec and York Colleges.</p>	<p><b>Electric Vehicle Charging Infrastructure Project</b> This project aims to improve the provision of Electric Vehicle Charging Points (EVCP) across Tees Valley, to overcome the most significant barrier that prevents people from switching to electric vehicles. Electric vehicles are becoming increasingly acceptable as the alternative to petrol or diesel for private car users, but there remains 'range anxiety'; the fear that the car will run out of charge before the trip is completed. Creating a network of EVCPs which meets the demands of potential EV drivers across Tees Valley will reduce range anxiety, increase take up of EVs, and deliver reductions in carbon emissions.</p>	<p><b>Athena project</b> In this project, the development of hydrogen refuelling corridors for Heavy Goods Vehicles (HGVs) within the geographic area of the NP11 will be analysed in collaboration with the associated stakeholders. Data analysis and simulation modelling techniques will be utilised to gain an understanding of the current road freight movement on strategic corridors within the North in an attempt to determine the optimal location and capacity of hydrogen infrastructures required in serving the hydrogen needs of the given corridors.</p>	<p><b>EV North</b> EV North is supporting the North East's transition to become a true automotive powerhouse and a location of choice for automotive investment. They are promoting EV manufacture and development possibilities, raising the profile of the region and its capabilities and encourage collaborative projects.</p>
<p><b>Zero Emission Centre of Excellence – Nissan &amp; Gateshead College</b> The centre will act as a business incubator for the electric vehicle industry, creating jobs in the region and developing knowledge and technology. Research and development will initially focus on charging infrastructure and battery second life.</p>	<p><b>HyBus project</b> Liverpool City Region is purchasing 20 hydrogen fuel cell electric buses to run between Liverpool and St Helens. Hydrogen refuelling infrastructure will be located at Arriva's St Helens depot. This will be combined with other infrastructure improvements e.g. bus priority measures and improved waiting facilities to deliver modal shift and reduced transport emissions.</p>	<p><b>DER Centres – Newcastle University</b> The Driving the Electric Revolution Centres (DER Centres) are backed by £30m Government funding and will provide open access facilities with state-of-the-art equipment, bringing together the UK's technology and manufacturing expertise in electrification research and development. The centres will help businesses across numerous sectors, including transport, energy, construction and agriculture, to invest and work together to capitalise on the region's strengths in this technology.</p>	<p><b>International Advanced Manufacturing Park (IAMP)</b> IAMP One in Sunderland/South Tyneside is a designated Enterprise Zone and as such, occupiers can benefit from Enhanced Capital Allowances status, and hosting a lot of development for Zero Emission Vehicles in the area.</p>
	<p><b>Project Vanguard</b> Storengy is operating a central hydrogen refuelling hub for Cheshire East Council vehicles and Storengy vehicles. The electrolyser is now fully operational, and green hydrogen is produced via a solar PV array.</p>		

# Green Public Transport, Cycling and Walking

## Why this is important

While the shift in vehicle technology away from fossil fuel combustion is critical in order to reduce emissions, a shift away from private vehicles will be key to reducing congestion and journey times and improving quality of life and health outcomes. This encompasses not only public transport provision, but also provides inhabitants with attractive infrastructure to make walking and cycling an attractive choice.

## What we are doing in the North

A leading project in the development of hydrogen vehicles and the networks required to support them is the hydrogen transport hub being developed in the Tees Valley, aiming to be operational by early 2022.

An example of local efforts made on making public transport carbon neutral is Warrington Council's successful bid for zero emission buses, which will enable Warrington's Own Buses (WOB), the Council's arm's length bus company, to roll out an electric fleet as well as providing associated charging infrastructure which would be available to all other bus operators in the town.

The region is also a centre for the development of low-carbon trains. Hitachi's production facility at Newton Aycliffe in County Durham and Alstom's centre facility for train modernisation in Widnes could provide a base for the manufacturing of both hydrogen and electric trains. Siemens is also investing in a new train production factory in Goole. The £200 million facility in the Humber region will create 700 jobs, boost local supply chains and generate long-term investment.

Different areas are also developing networks to facilitate cycling and walking. For example, Liverpool's Cycling and Walking Improvement Plan has plans to develop 31 key routes across the city region to create a safe, well integrated and well linked network of cycling and walking routes. Greater Manchester is building the UK's largest joined up walking and cycling network, with all routes designed to the highest quality, with 100km+ of new cycling and walking infrastructure in 2021 and 500 miles by 2025.

## Future opportunities

There are clear ambitions for alternative fuels and use of hydrogen in transport that are linked to the existing hydrogen production base. There is ambition to develop hydrogen as a fuel source, particularly in the form of installing fuelling infrastructure and using hydrogen to decarbonise public transport.

One example of this is the Tees-Leeds hydrogen corridor that will provide hydrogen infrastructure between the two regions for transport, domestic heating and industrial use. These transport based opportunities are identified primarily by Leeds City Region LEP (particularly through the H21 Project and hydrogen corridor), Sheffield City Region LEP and the North East LEP.

The low carbon manufacturing base in the region is well-placed to take advantage of growth in global demand for low-carbon trains.





## Future collaboration

A pan-Northern collaboration to enhance and expand on the experience gained from the Tees Valley Multi-Modal Hydrogen Transport Hub and Transport for the North projects will further develop a cross-regional public transport network, using hydrogen and EV capabilities.

Although local authorities' plans to develop cycling and walking infrastructure will need to reflect local circumstances and geography, there is nevertheless scope for areas to share experiences of 'what works' in order to ensure rational design of future schemes and encourage behavioural change.

# Green Public Transport, Cycling and Walking

## How we are supporting this growth in the North

<b>Skills</b> 	<b>Infrastructure</b> 	<b>Supply chains</b> 	<b>Trade and Investment</b> 
<p><b>NZN: Skills and Productivity</b> Net Zero North creates a strategic opportunity for universities, FE colleges and employers to work together to re/up-skill workers into good quality jobs in new clean industries.</p>	<p><b>Tees valley Multi-modal Hydrogen Transport Hub</b> The Hydrogen Transport Hub will be a living lab that acts as a catalyst for the fulfilment of green hydrogen's role in decarbonising transport across modes. This will accelerate the development of education, training and skilled employment surrounding green technology that builds upon industrial heritage and will contribute to inclusive green growth and position the UK as a global leader in energy transition.</p>	<p><b>Athena project</b> In this project, the development of hydrogen refuelling corridors for Heavy Goods Vehicles (HGVs) within the geographic area of the NP11 will be analysed in collaboration with the associated stakeholders. Data analysis and simulation modelling techniques will be utilised to gain an understanding of the current road freight movement on strategic corridors within the North in an attempt to determine the optimal location and capacity of hydrogen infrastructures required in serving the hydrogen needs of the given corridors.</p>	<p><b>ZEBRA (Zero Emission Bus Regional Area) Fund</b> The ZEBRA scheme with a funding of up to £120 million, helps local transport authorities introduce zero-emission buses. The scheme under the name of Zero Emission Buses Regional Area is set to allow local transport authorities to: bid for funding to purchase zero-emission buses, reduce the carbon emissions from their local public transport, improve air quality in towns and cities across England.</p>
<p><b>Local Skills Improvement Plan trailblazer application</b> A program focused on developing local skills improvement plans to help meet the local labour market skills needs of the employers.</p>	<p><b>High speed rail hub at Crewe, including Crewe North Junction &amp; Initial capacity improvements</b> Provision of high speed rail services across the North to the rest of the UK, radically reducing journey times and providing enhanced connectivity. Enhancing connectivity between the North's largest economic centres, with faster more frequent services, to build on HS2.</p>	<p><b>Ricardo consulting</b> Ricardo, a world-class environmental, engineering and strategic consulting company, has announced that it has received Government funding to create a retrofit hydrogen fuel cell bus demonstrator for the UK's first hydrogen transport hub in the North-East of England. Ricardo will develop a scalable, modular solution, enabling it to be installed, with minimal adaption, to multiple single and double decker platforms. The modular concept may also be saleable as a 'new fuel cell' module to coach builders across the European Union enabling them to develop new fuel cell buses by taking a rolling chassis and applying their coach build body alongside the fuel cell module solution.</p>	<p><b>YorBus &amp; Teesflex</b> YorBus and Teesflex are pilot programs for on-demand bus services. This service allows passengers to book a ride through a dedicated app. It can be pre-booked, and it goes to bus stops only when needed, while the system in the background works out the optimal routes.</p>
	<p><b>The Bee Network</b> The Bee Network is Greater Manchester's plan to deliver a London style, integrated transport system across bus and metrolink by 2025, including commuter rail by 2030. It includes plans to transition to a 50% electric fleet by 2027, with the right capital support, and an ambition to have a fully electric fleet by 2032.</p>	<p><b>Cummins Inc.</b> The company has begun developing a hydrogen-fuelled internal combustion engine. The proof-of-concept test is building on Cummins' existing technology leadership in gaseous-fuel applications and powertrain leadership to create new power solutions that help customers meet the energy and environmental needs of the future.</p>	

# Jet Zero and Green Ships

## Why this is important

Aviation and shipping present significant technical challenges, with further innovation required to develop solutions that give the requisite range within physical confines. As well as contributing to the achievement of net zero targets, innovators in these sectors can also enjoy significant commercial returns by exporting new technologies to global markets.

## Future opportunities

The development of low-carbon shipping and aviation will offer opportunities for innovators to patent products that can be used at scale all over the world and contribute to the UK's efforts to decarbonise these sectors. Global growth rates in the sustainable aviation fuel market are expected to see a compound annual growth rate of more than 50% from 2021 to 2030, meaning that companies who gain a foothold in the market will be able to grow rapidly.

## Future collaboration

Efforts to develop sustainable fuels remain at the development stage, and full commercialisation is some time away.

Nevertheless, efforts to develop fuels (such as the Altalto project described here) will potentially benefit from partnerships between the public and private sectors as well as between different regions in order to provide sufficient and suitable waste feedstocks.

## What we are doing in the North

Decarbonisation of hard to reach transport sectors such as marine and aviation can benefit from the North's strength in innovation, biofuels and hydrogen capabilities. Green Fuels, Green Skies (GFGS) is a competition aimed at the development of sustainable aviation fuels (SAF) production plants. The Altalto plant at Immingham, a collaboration between Velocys, British Airways and Shell, will be a commercial waste-to-fuel plant. The proposed plant will take hundreds of thousands of tonnes of household and commercial solid waste and turn it into clean burning sustainable aviation fuel, reducing net greenhouse gases by 70% compared to the fossil fuel equivalent.

A.P. Moller-Maersk, in collaboration with Ørsted, is testing a prototype charging buoy at one of Ørsted's windfarms which can bring green electricity to offshore wind farm service vessels and potentially to a wide range of maritime vessels. In addition, Bibby Marine Services are developing zero carbon propulsion solutions for Service Operation Vessels, which could be applicable to a wider range of large vessels.





Port of Tyne, Siemens and a project consortium of three further partners have been granted funding by the Department of Transport to create a blueprint for the decarbonisation of the UK's ports as a part of the Clean Maritime Demonstration Competition. Siemens and the Port of Tyne will work with Connected Places Catapult, Newcastle University and the North East LEP to deploy a real-time digital platform for scenario planning and feasibility studies that will help determine the future power needs of Port of Tyne.

Given the early stage of many of these technologies, the overall scale of benefits is uncertain at this stage. Based on current understanding, some of the potential benefits are as follows:

- Low-carbon jet fuels currently in development could provide emissions reductions of more than **70%** on a lifecycle basis when used in place of conventional fossil jet fuel.
- The Moller-Maersk/Orsted collaboration estimates savings of 5.5mt CO<sub>2</sub> in the first 5 years of operation.

# Jet Zero and Green Ships (cont.)

## How we are supporting this growth in the North

<b>Skills</b> 	<b>Infrastructure</b> 	<b>Supply chains</b> 	<b>Trade and Investment</b> 
<p><b>NZN: Skills and Productivity</b> Net Zero North creates a strategic opportunity for universities, FE colleges and employers to work together to re/up-skill workers into good quality jobs in new clean industries.</p>	<p><i>No current infrastructure projects due to the development phase status of these technologies</i></p>	<p><b>First sustainable aviation fuel pipeline direct to airport in the UK – Fulcrum Northpoint</b> Manchester Airports Group (MAG) and Fulcrum BioEnergy recently signed a Memorandum of Understanding (MOU) establishing a partnership committed to develop and deliver Sustainable Aviation Fuels (SAF) in the UK. The transport of Sustainable Aviation Fuel (SAF) direct from the proposed production plant in Stanlow, Cheshire, Fulcrum Northpoint, to Manchester Airport via an existing pipeline will be a first for the UK.</p>	<p><b>Green Fuels, Green Skies competition (GFGS)</b> The key objective of the GFGS competition is to support the development of the UK Sustainable Aviation Fuel (SAF) sector towards the deployment of innovative SAF production technologies at commercial scale that are capable of reducing emissions from the aviation sector in the UK within the near-term.</p>
<p><b>Local Skills Improvement Plan trailblazer application</b> A program focused on developing local skills improvement plans to help meeting the local labour market skills needs of the employers.</p>			<p><b>Clean Maritime Demonstration Competition (CMDC)</b> Research and development funding for feasibility studies and technology trials in clean maritime technologies to accelerate maritime decarbonisation in the UK.</p>
		<p><b>2050 Maritime Innovation Hub</b> The 2050 Maritime Innovation Hub, is a partnership between the Port of Tyne, Drax, Offshore Renewable Energy Catapult (OREC), Nissan, Connected Places Catapult, Accenture, Royal HaskoningDHV, Ubisoft and the Department for Transport. It inspires partners to collaborate to develop solutions to technological challenges facing the maritime sector and the wider logistics industry both nationally and globally.</p>	



# Transport priorities

Collaboration will be key for successful transition to net zero in the transport sector. This table identifies potential areas of collaboration, how these maximise environmental and economic benefits from clean growth and some initial actions to realise these benefits.

Collaboration opportunities	What this looks like in the North	How this maximises benefits	What needs to be done
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>Long distance EV and hydrogen infrastructure planned at regional level to account for transport flows/demand</li> <li>Distributed green hydrogen co-located with transport demand</li> <li>Planned interaction with power grid (EV aggregation for grid balancing services, network reinforcement)</li> <li>Large-scale battery manufacturing plants</li> <li>Joined up regional public transport networks</li> </ul>	<ul style="list-style-type: none"> <li>Addresses range anxiety, drives EV uptake</li> <li>Grid benefits (avoided reinforcement investment)</li> <li>Efficient provision of charging infrastructure</li> <li>Battery plants provide competitive advantage for auto sector</li> <li>Greater use of public transport, reduced journey times and lower emissions</li> <li>Economies of scale will reduce costs and encourage uptake</li> </ul>	<ul style="list-style-type: none"> <li>Learning and collaboration on local low-carbon transport plans to discover ‘what works’</li> <li>Dialogue with electricity networks to inform investment plans</li> <li>Work to attract battery manufacturers, green hydrogen producers to the region</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>Comprehensive provision of skills required by EV/battery manufacturing sectors as they expand</li> <li>Understanding of volume, timing and location of EV charging roll out and skills profiles required</li> <li>Skills provision to support the roll out of hydrogen refuelling stations</li> <li>Sharing of expertise between transport planning departments in local/regional authorities</li> </ul>	<ul style="list-style-type: none"> <li>Local workforce able to support roll out of key infrastructure</li> <li>Sufficient expertise in transport planning to ensure efficient low-carbon provision</li> <li>Local jobs and value for the region, especially in high-value manufacturing sectors</li> </ul>	<ul style="list-style-type: none"> <li>Dialogue with manufacturers and developers (EVs, batteries, hydrogen) to understand project pipelines and future skills needs</li> <li>Ensure fora for transport planners to share experience and learning</li> </ul>
<b>Supply chains</b>	<ul style="list-style-type: none"> <li>Continued development of low-carbon fuels of the future, with collaboration between innovation centres across the region to maximise learning</li> <li>Development of local clusters around major manufacturing facilities (auto and rail), so needs can be locally met</li> </ul>	<ul style="list-style-type: none"> <li>Local innovation allows industry to capture future markets e.g. low-carbon aviation and shipping fuels</li> <li>Local value, high value jobs</li> <li>More competitive manufacturing sectors</li> <li>Knowledge spillovers within local clusters</li> </ul>	<ul style="list-style-type: none"> <li>Continued support for innovation (public and privately funded)</li> <li>Ensure manufacturers are aware of supply chain capabilities in the region</li> </ul>
<b>Trade and Investment/ Internationalisation</b>	<ul style="list-style-type: none"> <li>Cross regional marketing campaign to highlight local excellence in overseas markets</li> <li>Regional funds finance innovative start ups in the new fuels area</li> <li>Freeports allow for the development of manufacturing hubs/centres of excellence</li> </ul>	<ul style="list-style-type: none"> <li>Increased exports of leading and innovative regional products</li> <li>Increased inward investment</li> <li>Development of high value transport manufacturing clusters in Freeports</li> </ul>	<ul style="list-style-type: none"> <li>Ensure eligibility of transport projects for regional funds e.g. Northern Powerhouse fund</li> <li>Support development of local manufacturing clusters e.g. through Freeports</li> <li>Regional approach to marketing region with investors (with assistance from national government)- targeting export markets and investors</li> </ul>

# Natural and built environment priorities

This section covers the activities needed to decarbonise the built sector and maximise the region's natural assets. As well as innovative approaches to buildings material and design, it also describes projects aimed at maximising the North's natural assets to improve sustainability and wider social outcomes, and to drive clean energy production using abundant bioenergy sources in the region



04

# Greener Buildings

## Why this is important

Buildings account for 17% of the UK's CO<sub>2</sub> emissions. It will be one of the most challenging sectors to decarbonise, due to the sheer number of interventions needed at a household level. A range of technologies will be required to deliver zero carbon buildings, covering both building fabrics and heating technologies. It will be important to secure consumer 'buy in' to the solutions offered, so that they are able to enjoy a similar level of comfort and convenience to today.

There is a significant overlap with other priorities: domestic heat demand will play an important role in determining investment decisions in sectors such as hydrogen and low-carbon electricity.

## What we are doing in the North

The North is hosting network innovation projects, as well as infrastructure improvements regarding heat networks, heat pumps and energy efficiency in buildings. There are also several examples of alternative heating schemes being tested, like at the Seaham Garden Village, where there is a potential of 6MW of low cost, low carbon sustainable energy extracted from minewater. The extension to the Gateshead district heating scheme also aims to make use of the area's minewater resources.

The region is also leading the way in exploring the possibilities for new technologies in domestic heating. The InTEGReL project, led by Northern Gas Networks, is a new integrated energy facility based in Gateshead that will allow academics and engineers to develop heat decarbonisation solutions, including low-carbon hydrogen. Also, DNV GL is researching how to reliably and safely use hydrogen for heating and cooking. The tests are part of major initiatives that could see hydrogen being mixed with or replacing natural gas in existing UK transmission and distribution networks.

In the area of building fabrics and design, the Gateshead Innovation Village is a live research project which is testing a range of modern construction methods and energy efficient technologies on one site, and has created a community of 41 homes for affordable rent.

The AMRC NW Low Carbon Demonstrator project led by the University of Sheffield will demonstrate low carbon retrofitting for manufacturing legacy buildings.

Local Energy Hubs are also delivering important work across the region, supporting and accelerating the development of local and regional, low and zero carbon energy projects like energy efficiency in buildings, decentralised heat and power, large scale housing retrofitting and community energy among others.

In Greater Manchester, all new buildings will be designed to be net zero carbon by 2028. A Mayoral Retrofitting Task Force has been established to tackle Greater Manchester's urgent building retrofit challenge and look at how home improvements can be mass-deployed as well as opportunities for supporting green skills, jobs and low-carbon growth.

## Future opportunities

Several LEPs in the North have significant ambitions for developing heat networks within their own areas. In some places this includes linking heat networks and engaging new forms of thermal storage or heat sources, such as geothermal and mine water. The North East LEP aims to take steps to commission studies investigating how to de-risk and commercialise district heating as a strategic growth sector.

All LEPs are targeting future roll-out of heat pumps or at least consider the potential of the technology within their energy strategies. Some urban areas with service economies, such as the Liverpool LEP area, discuss electric heating as a potential optimum solution for facilitating automated energy management.

The Northern Housing Consortium represents the views of housing organisations in the North of England, and provide social housing for tenants. Their work can carry a future opportunity by delivering learning and innovation acquired by their valuable experience on the social housing market.

A recently commissioned research by the York & North Yorkshire LEP on the opportunity of circular, bio based construction across the North East & Yorkshire has shown evidence that the industry could generate up to £1.9 billion, with the GVA to the economy having the potential to reach £14.8 billion.

## Future collaboration

Although local authorities will develop local plans that best fit their circumstances in developing plans for decarbonising the building stock, there is nevertheless scope for first movers to share their experience of what works in planning the transition.

If hydrogen is proven as a suitable technology for domestic heating, the switchover will need to be planned at a regional level, with agreed sequencing for how different areas will transition.

# Greener Buildings (cont.)

## How we are supporting this growth in the North

 Skills	 Infrastructure	 Supply chains	 Trade and Investment
<p><b>Low Carbon Academy</b> Academy to educate over a thousand people in retrofitting skills in the Greater Manchester area, and around £1.1m has been awarded to the Low Carbon Academy. The funding will enable the launch of the Retrofit Skills Hub. It will be delivered by North West Skills Academy – Low Carbon Academy along with partners The Retrofit Academy, The Manchester College, Oldham College and Fabric. A total of 1,140 people will be trained to ensure the city-region’s homes and buildings are fit for a low-carbon future.</p>	<p><b>Delivering Network Visibility in Cheshire's Energy Innovation District</b> Led by EA Technology in partnership with SP Energy Networks, this project is facilitating secure, low carbon and equitable energy in the region – promoting indigenous growth, encouraging inward investment and stimulating innovation. They have installed the VisNet monitoring equipment into 673 Low Voltage (LV) substations within the Energy Innovation District sub-region (Chester, Ellesmere Port, Frodsham), and thus creating one of the most monitored LV electricity networks in the world.</p>	<p><b>Concretene demonstration</b> The Graphene Engineering Innovation Centre at the University of Manchester has developed a graphene-enhanced concrete called Concretene: this is expected to allow for a removal of a significant proportion of build material from a project without impacting its strength or integrity.</p>	<p><b>North East and Yorkshire (NEY) Energy Hub</b> The North East and Yorkshire (NEY) Energy Hub has received a total of £53.2 million of Government funding as part of Phase 2 of the Local Authority Delivery scheme (LAD 2), helping local authorities across the North East and Yorkshire improve the energy efficiency of low-income households.</p>
<p><b>Scarborough Construction Skills Village (CSV)</b> This innovative skills village model teaches real skills in a real environment - brick-laying, joinery, groundwork and general construction maintenance skills to accredited standards. CSV also upskills adults who want to learn new skills or who want to gain extra qualifications in construction.</p>	<p><b>HPO Programme – Heat Networks</b> Heat networks in the North East were recently selected as part of the Government’s High Potential Opportunities Programme (HPO), which selects opportunities to promote to foreign investors and drive investment into the UK’s regions and nations. Over 20 potential heat network schemes have so far been identified, with an estimated total value of around £280 million.</p>	<p><b>Community Renewal Fund</b> North Yorkshire secured £768k funding from the Community Renewal Fund to develop a suite of Local Area Energy Plans for the region and to deliver a package of innovative low carbon energy feasibility studies.</p>	<p><b>Energy House 2.0 project</b> When complete in February 2022, the Energy House 2.0 laboratory will play an important role in the development of new low-carbon homes and retrofit technologies. Two environmental chambers will each be able to accommodate two detached houses and recreate a wide variety of weather conditions.</p>
<p><b>JTL Training Centre – York</b> The not-for-profit, work-based training provider helps to fill the skills gaps in traditional trades, dedicated to create the next generation of electricians and has almost 8,000 apprentices working with JTL for more than 3,500 employers across both England and Wales.</p>	<p><b>GM Go Neutral Smart Energy Framework</b> The GM Go Neutral Smart Energy Framework is a £300m investment opportunity in solar PV and battery storage. This is a mixture of ground mounted, carpark, and on-building local generation which has been identified with public sector asset owners.</p>		<p><b>Decarbonising Doncaster</b> Decarbonising Doncaster is a landmark, place-based project that informs the urgent work of Doncaster’s Climate Change Commission, thereby supporting Doncaster to tackle climate change emergency whilst concurrently developing a sustainable, green economy.</p>
<p><b>The Hamish Ogston Foundation Heritage Building Skills Programme</b> It is a major five year in-work training and apprenticeships programme in the North of England, aimed at reducing shortages in heritage craft skills, improving the condition of Heritage at Risk (HAR) sites and creating viable career opportunities for young people from less-advantaged backgrounds.</p>			

# Protecting our Natural Environments

## Why this is important

The North of England has a range of beautiful landscapes and is rich in a diverse range of natural assets. Protecting and expanding these natural assets will lead to a multitude of benefits for nature, the economy and people in the region. Nature-based solutions can help address climate issues such as carbon emissions and flooding, create climate resilience of businesses and increase job opportunities to support our economic prosperity, and increase the wellbeing of our inhabitants. Sustainable land-use, as well as creating its own decarbonisation opportunities, also needs to be considered in terms of its interaction with related sectors e.g. agritech/renewables/vertical farming/biodiversity to support the overarching low carbon agenda.

## What we are doing in the North

Serious efforts are being made for large-scale greenhouse gas (GHG) removal projects under the government's Strategic Priorities Fund (SPF), facilitated by the UK Research and Innovation (UKRI). Among the five innovative GHG removal demonstrator projects, three will happen in the North. The management of the Doncaster peatlands, the scaling-up of perennial bioenergy crops in Lincolnshire and Lancashire and the use of biochar at a sewage disposal site in Nottinghamshire will all contribute significantly to not only the GHG reduction effort, but to the preservation of the natural environment in the area. Alongside these sit flooding prevention efforts, for example the Weardale Flood Management Scheme, which will use a series of nature based solutions such as storage areas, wooden leaky barriers and timber fences to reduce flood risk across 41km<sup>2</sup>, and allow the restoration of 150 hectares of peatland and the creation of up to 75 hectares of woodland.

The Nature North partnership, is taking forward crucial initiatives that need Government support such as the Great Northern Forest, Great North Bog, and Eden North.

The Great Northern Forest initiative has already established over 3 million new trees since 2018 and is transforming the landscape from coast to coast and in and around cities such as Liverpool, Chester, Manchester, Leeds, Bradford, Sheffield, York and Hull, planning to plant at least 50 million trees across the North of England.

The Great North Bog is an ambitious, grand-scale peatland restoration initiative. It is a landscape approach to restoration across nearly 7000 square kilometres of upland peat in the Protected Landscapes of northern England.

The Sustainable Landscapes Humber Project will see farmers growing cover crops between harvesting and sowing to reduce flooding and improve soil health.

Eden Project North will be a destination that combines indoor and outdoor experiences, connecting people with the internationally-significant natural environment of Morecambe Bay while also enhancing wellbeing. The project has far-reaching environmental, social and economic ambitions.

Jones Food Company located in Scunthorpe, owns and operates the largest vertical farm in Europe. Their farms uses renewable energy, including solar power to grow the produce. They use up to 95% less water than traditional farms, cutting edge rainwater harvesting and they re-cycle the little water they use.

Biomass and bioenergy projects like the REnescience Northwich Project, and the BECCS project by Drax can serve as a footprint for future circular economy projects in the region.

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## Future opportunities

The Environment Act has recently passed into UK law. This creates the framework for cleaner air, restoring natural habitats, increased biodiversity and better use of resources, facilitating the transition to a more circular economy. The Act's binding environmental targets will require organisations to take actions to comply, creating opportunities for firms which develop innovative solutions.

A small number of LEPs have ambitions to implement programmes aiming to develop biomass as an energy source and develop ancillary industries and supply chains. Future opportunity for CCUS means that biomass could become a negative emissions technology as CO<sub>2</sub> is sequestered. The Committee on Climate Change has stated that biomass uses that enable long-term carbon storage should be prioritised. For power and heat generation, this is only possible with CCUS.

Distributed biomass power can also be a means of sustainably using waste from various sectors e.g. farming, domestic, York, North Yorkshire. East Riding and Cumbria LEP acknowledge the merits of biomass primarily on a decentralised basis, citing the high proportion of properties not connected to the gas grid.

The Development of a Northern Forest is a stated aim in some plans, and will help increase biodiversity whilst dramatically growing the forestry sector. This will create large numbers of new jobs whilst supporting a wide range of sectors, including green energy through biomass.

### Future collaboration

The 2020 'Natural Assets North' report highlighted the need for a pan-Northern regional effort to join up and coordinate local efforts to build environmental resilience and to develop a strategic Plan for Nature. This will help maximise natural capital, and ensure the region's landscapes and biodiversity continue to benefit its inhabitants and generate economic value.

It will be important to create a scale of opportunity to invest and engage with potential demand-side investors in new target sectors e.g. the health sector (mental health aspect of natural capital investments), and agri-business (farming). It is essential for the North to work together on this, to add to the evidence base to what constitutes an attractive investment in natural capital (e.g. social returns).

LEPs in the region are working with Local Nature Partnerships to explore how nature-based solutions can help achieve net zero emissions and sustainability. These include development of natural capital investment plans, and exploring the range of new green jobs and skills that could emerge in the region to support environmental and climate change targets.

# Protecting our Natural Environments (cont.)

## How we are supporting this growth in the North

 Skills	 Infrastructure	 Supply chains	 Trade and Investment
<p><b>FixOurFood Programme</b> FixOurFood, one of the four 5-year research programmes funded by the BBSRC Transforming Food Systems Strategic Priorities Fund is led by University of York, and brings together a world leading five year interdisciplinary consortia of five universities (York, Leeds, City, Oxford and Cranfield), a range of partner organisations coupled with an anchor institutions platform.</p>	<p><b>Northumbrian Water – NWGROW</b> Turning sewage sludge from sewage treatment plants into environmentally-friendly fertiliser called "biosolids".</p>	<p><b>Yorkshire Hemp Supply Chain</b> Grow Yorkshire commissioned a 'Yorkshire Hemp Supply Chain' research project to investigate the opportunities available in the region to develop the supply chain and develop new strategies. This research paper has been widely used to develop further regional and national projects exploring the environmental and industrial opportunities of Hemp.</p>	<p><b>Environmental Land Management schemes</b> A government scheme, intended to support the rural economy while achieving the goals of the 25 Year Environment Plan and a commitment to net zero emissions by 2050. Through these schemes, farmers and other land managers may enter into agreements to be paid for delivering the following: clean and plentiful water; clean air; thriving plants and wildlife; protection from environmental hazards; reduction of and adaptation to climate change; beauty, heritage and engagement with the environment.</p>
<p><b>NZN: Skills and Productivity</b> Net Zero North creates a strategic opportunity for universities, FE colleges and employers to work together to re/up-skill workers into good quality jobs in new clean industries.</p>		<p><b>HEMP-30</b> Led by researchers at the University of York and Biorenewables Development Centre (BDC), Hemp-30 aims to increase the amount of industrial hemp 100-fold in the UK from 800 hectares to 80,000 hectares establishing industrial hemp as a major UK crop. The first development phase of the project has been awarded £200,000 from the UK government's Biomass Feedstocks Innovation Programme, funded through the Department for Business, Energy &amp; Industrial Strategy's (BEIS) £1bn Net Zero Innovation Portfolio.</p>	<p><b>NZN: Grow Smarter</b> Grow Smarter will deliver a vision for a thriving, innovative, and integrated net-zero landscape of the future – driving innovation and carbon-efficient land management in the rural economy, including natural carbon capture, regenerative agriculture, and bio-derived materials.</p>
<p><b>BioYorkshire</b> BioYorkshire is a ten year programme that will accelerate the translation and application of research discoveries into full scale biotechnology applications. It will use the region's world class science base to deliver the profitable bio-based production of chemicals, materials, and fuels. The project will also support net-zero food production, farming and wider land use practices.</p>			<p><b>Greater Manchester Environment Fund</b> Greater Manchester has established the Greater Manchester Environment Fund, the UK's first regional environmental impact fund, which is already restoring 500ha of habitats and developing local biodiversity and carbon investment opportunities.</p>

# Natural and built environment priorities

The North has a great opportunity to collaborate on energy efficiency and natural environment efforts. This table identifies potential areas of collaboration, how these maximise environmental and economic benefits from clean growth and some initial actions to realise these benefits.

Collaboration opportunities	What this looks like in the North	How this maximises benefits	What needs to be done
<b>Infrastructure</b>	<p>Energy efficiency improvements in building stock across the North to facilitate uptake of technologies such as heat pumps</p> <p>Smooth, planned transition to low-carbon heat (Hydrogen and heat pumps) based on a regional approach</p> <p>A reconfiguration of electricity networks for a more distributed generation and storage as well as demand for electric heating</p> <p>Continued roll out of established distributed technologies e.g. rooftop solar PV, batteries</p> <p>Heat networks using native local energy (waste industrial heat, mine water) with aggregation where possible</p> <p>Energy from Waste projects use local inputs, drive resource efficiency</p> <p>Low carbon future homes use best/traditional local materials</p>	<p>Increased heat pump uptake</p> <p>Reduction in households in fuel poverty</p> <p>Heat transition takes account of regional strengths and is least cost</p> <p>Heat networks drive local synergies e.g. use of waste heat</p> <p>It ensures economic development takes place along sustainable lines</p>	<p>Work with energy networks (gas and electricity) to develop and support their net zero plans</p> <p>Understand national plans and decisions for heat transition</p> <p>Local planning for energy efficiency roll out</p> <p>Work with agricultural sectors to understand opportunities for carbon sequestration/replanting/use of agricultural waste</p> <p>More recovery from waste streams and recycling by LAs</p>
<b>Skills</b>	<p>Installer base to support the roll out of low-carbon heat at scale (heat pumps, hydrogen boilers) alongside energy efficiency, roll out</p> <p>Skilled workforces to develop and maintain new heat networks and drive network conversion</p> <p>Expert planners to drive household conversion to low-carbon heat sources</p> <p>Skilled workforce and skill provision for green jobs</p> <p>GIS/Modeling capacity developed to allow the tracking of outputs from natural capital projects</p>	<p>Avoidance of bottlenecks and delays in low carbon heat roll out</p> <p>Planning of heat roll out captures local synergies, drives efficiency</p> <p>Local jobs and economic value</p> <p>Achieving woodland and peatland restoration targets</p> <p>Better understanding of the benefits and outputs from natural capital projects</p>	<p>Clear roadmap for decarbonisation of heat to allow regional planning and upskilling</p> <p>Consider cross-sector overlaps e.g. electricians could install heat pumps</p> <p>Facilitate fora for knowledge sharing by local planners</p> <p>Work with gas networks (NGN, Cadent) to understand hydrogen roll out needs</p> <p>More green jobs and connecting skills to provide growth in nature-based solutions</p>
<b>Supply chains</b>	<p>Development of local heat pump installation and maintenance businesses</p> <p>Innovation in the development of low-carbon homes using local materials</p> <p>Development of innovative new technologies for deriving energy from waste</p> <p>Build-up expertise in delivering new categories of natural capital projects</p>	<p>Use of local materials, implementation of circular economy principles</p> <p>Innovation (building materials and design, energy from waste) can be exported to other countries</p>	<p>Continued support for network innovation projects in the region e.g. Integrel</p> <p>Local planning regulations to drive use of local content and materials</p>
<b>Trade and Investment/ Internationalisation</b>	<p>Joined up approach to marketing region's strengths in innovative new waste technologies</p> <p>Shared approach to attracting investment in new regional infrastructure</p> <p>Investment and growth in carbon sequestration (i.e. carbon credits)</p>	<p>Exports of innovative technologies and materials developed in region</p> <p>Funding facilitates development of new infrastructure</p> <p>Providing sufficient funding for crucial natural environment projects</p>	<p>Work with local innovators to showcase products to international audience</p> <p>Drive the development of innovative clusters and centres of excellence e.g. around Freeports</p> <p>Encouraging growth in green finance and the opportunity for private investment into natural environment</p>

# Supporting factors



05

# Green Business and Innovation

**Overseas markets for our products, a healthy inflow of investment finance and the right support for innovative local businesses to develop new products and services will ensure that the North benefits fully from the clean growth opportunities on offer. What the North is doing to support clean growth is part of a wider effort to ensure a conducive environment for dynamic businesses across high growth sectors.**

## Trade and Investment

### Regional context

In order to grow, the North needs to attract higher levels of Foreign Direct Investment (FDI)- FDI projects currently safeguard or create 90 jobs per 100,000 population in the North, compared to 180 nationwide. Similarly, there is also scope to increase exports, which account for only 24% of Northern GDP compared to 30% for the UK as a whole.

The NP11 has developed a trade and investment proposal based on the North's Prime Capabilities, one of which is energy/clean growth, covering the region's strengths in offshore wind, low-carbon hydrogen, nuclear, zero emission vehicles and CCUS. The NP11 is seeking to drive a closer, more collaborative relationship with the Department for International Trade (DIT), to give the wind region a greater voice in strategy development and central initiatives to ensure policy delivers the greatest impact for the region. Other key trade and investment priorities for the region are as follows:

**Creating a competitive Global Britain:** review UK's competitive position around sustainable incentivisation to attract high-value investment into the region; understand investor behaviour to create bespoke competitive propositions; emphasis on social value/economic impact through procurement; develop attractive infrastructure for investing firms, including skills provision.

**Enhancing the North's superclusters:** target 'apex' Original Equipment Manufacturers (OEMs) in Prime Capabilities (including energy/clean growth) through investment in account management and relationship building.

**Improving overseas investment pipeline:** develop marketing/promotional campaign for the North and expand representation in key markets.

### How the North is addressing this agenda through clean growth

Decarbonising the UK's economy is a particularly capital-intensive challenge. In its Sixth Carbon Budget, the Committee on Climate Change estimated that meeting

Net Zero would require around £50bn per year of low-carbon investment, a five-fold increase on today's levels. Given the scale of the decarbonisation challenge in the North, and the importance of emissions-intensive sectors to its economy, it is vital that the region finds a way to unlock these unprecedented volumes of capital.

Ways in which the North is already seeking to address this challenge include:

**Freeports:** these are special areas within the UK where different economic regulations apply. They will offer a comprehensive package of measures, comprising tax reliefs, customs and business rates retention, as well as planning, regeneration, innovation and trade and investment support. In the North of England, Freeports will be located in Liverpool City Region, Humber and Teesside. They will become operational from late 2021 onwards.

In the clean growth context, Freeports will allow innovative businesses the chance to invest and take advantage of low-carbon opportunities in the North. Teesside is an example of how Freeports can drive low-carbon growth. This is the UK's largest and most connected industrial zone, home to diverse, sustainable and low-carbon activity. The 4,500 acre site is home to large net zero investments such as Net Zero Teesside and MGT's 299MW biomass plant, as well as the Wilton International chemicals complex. The Humber Freeport aims to contribute to establish new innovation throughout the Greater Lincolnshire LEP's key priority sectors: decarbonisation and clean energy. The Mersey Freeport could create 14,000 new Liverpool City Region jobs and could boost the local economy by an estimated £850m as well as creating incentives to hit net zero carbon targets.

**E-Port** will deliver a blueprint for unlocking capital investment in a net zero carbon industrial cluster in the Ellesmere Port region over a 10 year period. It will define a range of future local energy system designs to inform a range of potential capital investment opportunities in infrastructure, energy generation/distribution/storage, control systems, and related products and services able to provide secure, low carbon, affordable energy. The estimated investment potential is around £500 million.

# Green Business and Innovation

## Trade and investment (ctd)

### How the North is addressing this agenda through clean growth

The **Northern Powerhouse Investment Fund (NPIF)** is supported by the European Regional Development Fund, provides commercially focussed finance through Microfinance, Debt and Equity Finance funds. NPIF is a collaboration between the British Business Bank and ten Local Enterprise Partnerships (LEPs) in the North West, Yorkshire, the Humber and Tees Valley. It provides around £500 million of investment, and enables the creation of more than 3,000 jobs.

The **UK Infrastructure Bank** is a new, government-owned policy bank, focused on increasing infrastructure investment across the United Kingdom. They partner with the private sector and local government to finance a green industrial revolution and drive growth across the country.

**Enterprise Zones** are designated areas across England that provide tax breaks and government support. They are great places to do business especially for both new and expanding firms. Enterprise Zones are part of government's strategy to support businesses and enable local economic growth.

## Innovation

### Regional context

As measured by public sector and business investment in R&D, the North trails the best performing regions: the NP11 has estimated that to 'level up' the North to the level of the highest performing areas in the UK would take £1.6bn of additional investment (assumed to leverage in £3.9bn from businesses). This will take a major shift in the regional distribution of Government R&D spending: whereas public sector investment in London and Scotland is around £275 and £227 per head respectively, in the North it is only £115. This has knock-on consequences for the Northern economy: for example, there are twice as many R&D-intensive jobs located in London, the South East and East of England as there are in the North.

In order to address this distortion and 'level up' innovation spending, the NP11 has recommended a range of measures based on the Government's Innovation Strategy priorities:

**Increase Business innovation in the North:** the UK invests less than its competitors in wider innovation by businesses outside of research institutions. To stimulate this investment in the North, alongside increased public expenditure the NP11 asks for funding streams for innovation diffusion, focused around Growth Hubs' local knowledge. This will involve Innovate UK working together with local partners e.g. LEPs and Combined Authorities. In addition, funding issues could be addressed by working with the British Business Bank to ensure access to funding at different stages of the innovation process, and working with local partners to monitor where new industrial strengths are emerging and allow these to be effectively nurtured.

**Increased local leadership:** local partners can help create a highly skilled workforce to fuel the innovation system by: identifying local skills needs, retaining local talent, and attracting innovators from beyond the North.

**Decentralised model of innovation delivery:** this involves increased capacity for local private sector leadership, building on the expertise and relationships of LEPs and Combined Authorities to create a place-based approach. These local bodies would have greater autonomy to prioritise resources towards local innovation ecosystems that can help clusters achieve their full potential. This model would also involve national innovation bodies such as Innovate UK adopting a more decentralised operational model which exploits the local intelligence and leadership of LEPs and Combined Authorities, and could ultimately result in the creation of a place-based innovation body ('Innovation North').

**Investing in the North's innovation strengths:** Clean Growth and Health/Life Sciences have been identified as prime Northern capabilities where innovation can tackle national challenges. For example, in relation to hydrogen the North has been identified as hosting the ideal combination of research excellence, industrial capability and testing sites for roll out which will allow the UK to become a global leader.

**University based innovation:** Universities are one of the main drivers of knowledge, innovation and growth for the North. They attract an annual research income of £1.26 bn, and in the last ten years they generated more than a 1,000 patents, 350 student start-ups and 230 companies and social enterprises.

# Green Business and Innovation

## Innovation (ctd)

### How the North is addressing this agenda through clean growth

Clean Growth has been identified as one of the North's prime capabilities where innovation can help address national challenges. Although further work is needed to develop the institutional framework which provides local innovators with the support their peers receive in other areas of the country, the region is nevertheless developing a collaborative, place-based approach to innovation which aims to maximise the region's low-carbon strengths.

The existing resources and programmes across universities offer a combination of collaborative strengths and innovative research teams, making the North the best place to deliver the outcomes of Grow Smarter for the region. Such specific low carbon projects include:

- GISMO: Greater Innovation for Smarter Materials Optimisation at Lancaster University. Over 250 innovative SMEs in the Cheshire and Warrington areas will benefit from the £4.4 million GISMO programme, which has been created specifically for chemical-using industries, such as the chemicals, aerospace, automotive, energy, applied healthcare, and life sciences sectors.
- An innovative cooling system by the University of Hull which has helped Hull City Council reduce electricity consumption at its data centre by as much as 80 per cent.

The **Catapult Network** supports businesses in transforming ideas into valuable products and services. They are a network of world-leading technology and innovation centres established by Innovate UK, delivering impact across the UK economy, enabling businesses to thrive in global markets.

The Catapults located in the North reflect the region's strengths. The **Offshore Renewable Energy (ORE) Catapult** accelerates the creation and growth of UK companies in offshore renewable energy, with their unique facilities, research and engineering capabilities bringing together industry and academia to drive innovation. The **Connected Places Catapult** is the UK's innovation accelerator for cities, transport, and places. They provide impartial 'innovation as a service' to public bodies, businesses, and infrastructure providers to catalyse step-change improvements in the way people live, work and travel.

**North East Energy Catalyst:** A partnership to unite the North East's leading energy innovation, demonstration and delivery capabilities. They are working on tackling major energy challenges and delivering on national policy, driving new economic growth opportunities, accelerating regional decarbonization, and inviting and co-ordinating engagement with partners.

**RedCAT, the Lancashire Centre for Alternative Technologies:** pump primed by investment from the Getting Building Fund, this is led by East Lancashire Chamber of Commerce. The centre, a not-for-profit venture, will also partner with the Chamber's existing Chamber Low Carbon pan-Lancashire support program, which provides free support to every Lancashire SME to transition to net zero.

**Technology, Innovation & Green Growth for Offshore Renewables (TIGGOR)** is a £3.5m programme designed to boost supply chain growth and productivity in the North of Tyne and wider North East England region's offshore wind and subsea sectors.

The **Greater Manchester Energy Innovation Agency** has been established as a partnership between three Greater Manchester universities, local government and industry to kick-start a decade of clean energy innovation to meet the region's 2038 carbon neutral target. The Agency's aim is to accelerate the trial and commercialisation of near-to-market low carbon technologies.

**The AMRC NW Low Carbon Demonstrator project** is a £20m, 4,500 m<sup>2</sup> state-of-the-art facility in a landmark location, which will have a focus on vehicle electrification, battery assembly and lightweighting technologies, is being built with capital funding provided through the Lancashire Enterprise Partnership (LEP)'s Growth Deal. The AMRC will play a key role in helping the county's aerospace and advanced manufacturing sectors to maintain their leading position in the UK, by driving growth, productivity and innovation and supporting Lancashire firms to compete nationally and internationally.

# Next steps

06



This prospectus has identified areas where different parts of the North can collaborate to deliver the Government's 10 Point Plan and ensure maximum environmental and economic benefits for the region. Based on the ambition of current projects and scale of pipeline together with supporting factors such as suitable infrastructure, skill base & supply chain readiness and regional innovation, **the core pan-Northern strengths are offshore technologies; new nuclear; hydrogen & CCUS; and maximising the value of the region's natural assets.**

Below we set out some initial actions that can be undertaken to provide the necessary underpinnings for future collaboration and ensure that the North can fully maximise these strengths:

#### Infrastructure

- Form strategy partnerships and focus innovation on whole system solutions e.g. renewable power and green hydrogen
- Sufficient funding must be provided for the implementation of the hydrogen transmission network to link industrial clusters
- Working business models must be elaborated and implemented for shared CCUS infrastructure, and for low carbon gas
- A more resilient and flexible grid, enough to meet net zero aspirations and ensure secure supplies for isolated rural areas

#### Skills

- Work with secondary, tertiary skills providers to ensure a full understanding of skills requirements in the region, with local providers and wider regional centres of excellence as appropriate
- Ensure that skills provision is coordinated with the delivery of net zero strategy in the North, with a talent pipeline across the region so that supply and demand can match

#### Supply chains

- Strengthen supply chain relationships across the region, and promote the alignment and organisation of supply chains for key low-carbon sectors across the region
- Increase the capacities of Growth Hubs

#### Trade & Investment / Internationalisation

- Delivery of Freeports to attract dynamic, innovative low-carbon businesses
- Widening the evidence base around the returns (including social returns) in novel investment categories e.g. natural capital
- Developing a shared approach to marketing the region to international investors and product markets

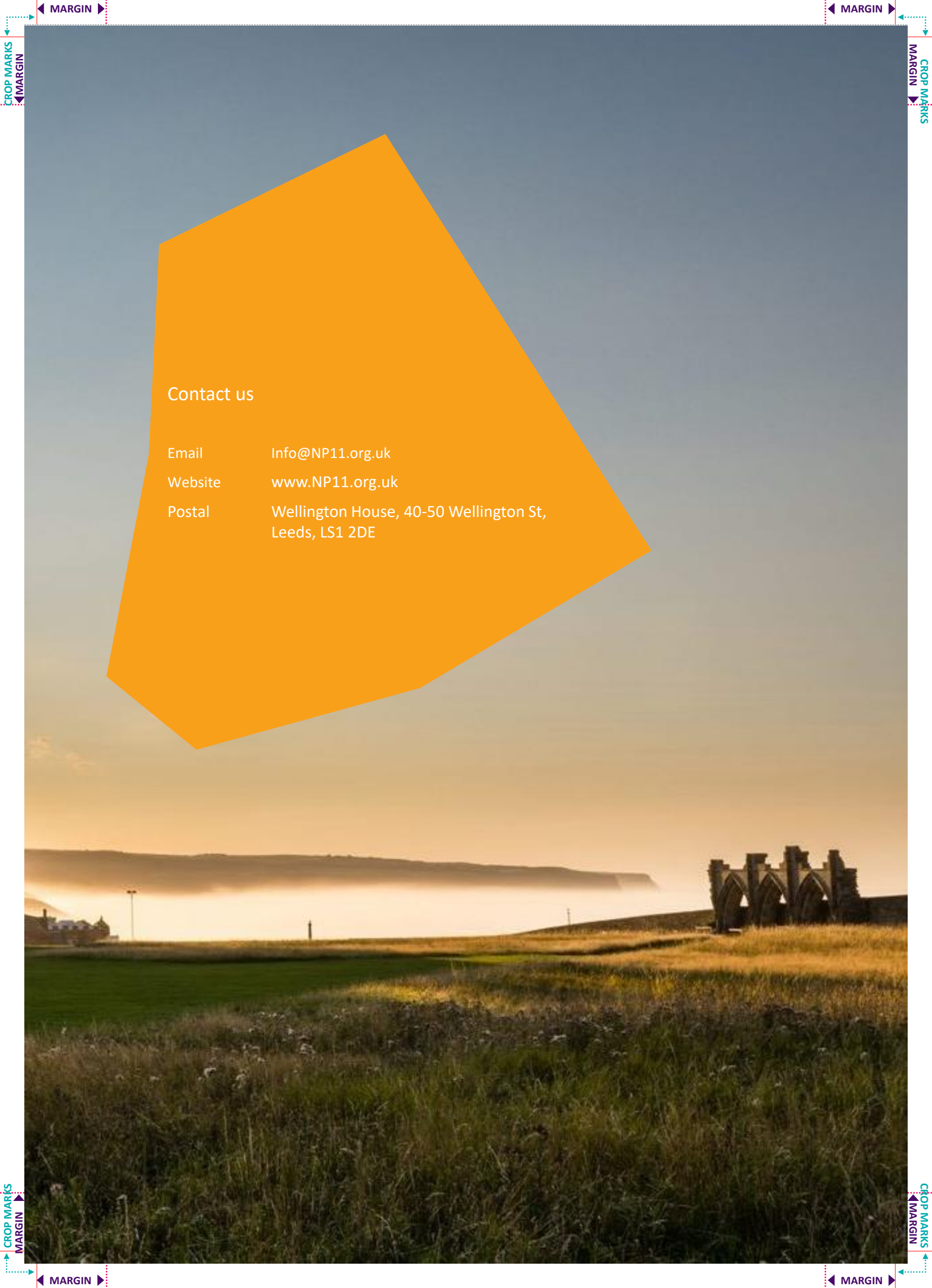
#### Innovation

- Identify ways of increasing the flow of innovation funding to Northern businesses and institutions e.g. through decentralised delivery models

**This prospectus is the first part of a project aimed at fully evidencing the benefits from collaboration and developing a roadmap to facilitate it in future. The next phase will involve:**

- Identify the principal at-scale development and investment opportunities in the region where a collaborative approach could maximise benefits
- Developing the economic case for promoting collaboration at scale e.g. synergies from shared procurement, supply chain coordination to identify the benefit from acting in a joined up manner across the North
- Assessing funding requirements and identifying potentially suitable structures where there is no current identifiable funding mechanism
- Assessment of the opportunities created by Freeports for cost base reduction, and synergies created with local clusters and supply chains
- Identifying blockers to enhanced collaboration, and developing a delivery plan to overcome these





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