
North West
Hydrogen
Alliance
Delivering a world leading carbon capture cluster in the North West
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The **role of carbon capture, utilisation** and **storage** on **our journey** to **net zero**

Carbon Capture, Utilisation and Storage (CCUS) is an essential technology to help the UK in its fight against climate change and can be applied across the energy system. The Committee on Climate Change has called carbon capture and storage "a necessity not an option" if we are to meet net zero carbon emissions by 2050.

In 2020, the Government announced plans to invest up to £1 billion to support CCUS in four industrial clusters, or 'SuperPlaces', in its Ten Point Plan for a Green Industrial Revolution. CCUS will help decarbonise our most challenging sectors, provide low carbon power and a pathway to negative emissions. These clusters will be the starting point for a new carbon capture industry, which could support up to 50,000 jobs in the UK by 2030.

CCUS is also essential to the development of a hydrogen economy in the UK. It will enable blue hydrogen to be developed quickly and at scale, unlocking the hydrogen transportation and storage infrastructure which green hydrogen can then readily connect into.

In the North West, we are committed to becoming one of the first two carbon capture clusters. We already have a UK-first carbon capture and utilisation project in construction where food grade CO_2 will be used in sodium bicarbonate manufacture in Cheshire. There are also plans to develop a bioenergy with carbon capture and storage project (BECCS) at Protos near Ellesmere Port, and the region is home to leading hydrogen and carbon capture project HyNet North West which could deliver 100% of the Government's 2030 target for CO_2 storage capacity.

This document looks at the essential role CCUS must play in decarbonisation and how the North West is the natural location to be one of first two UK carbon capture clusters.

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Why Carbon, Capture, Utilisation and Storage?

CCUS technology has the ability to decarbonise multiple sectors:

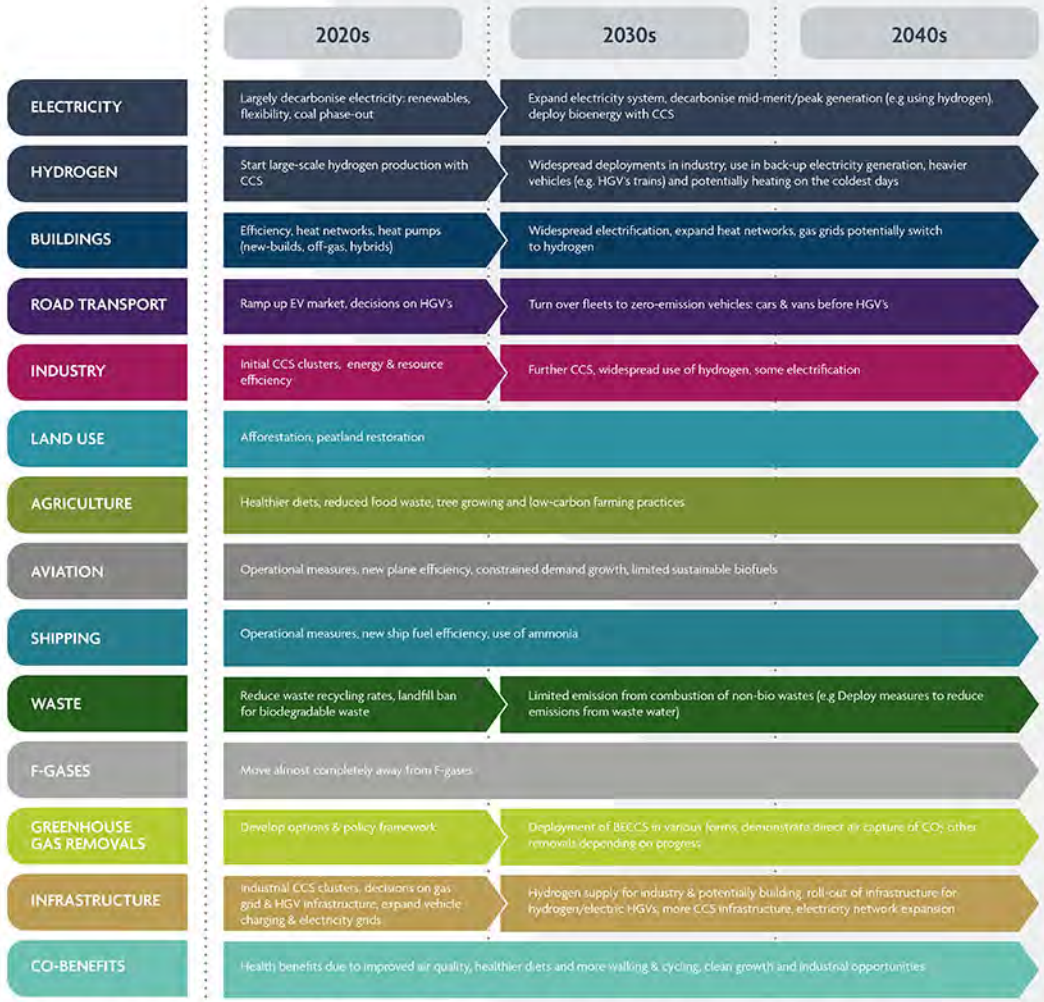
- It is the only option to decarbonise certain industries such as iron & steel, fertiliser and cement, enabling the manufacture of sustainable products
- It can provide a source of flexible, low-carbon power generation contributing to the net zero electricity mix
- It is one of the main routes for producing low-carbon hydrogen, which can be used to decarbonise domestic and industrial heating, as well as transport
- When combined with the generation of bio-energy or direct air capture, it will deliver negative emissions, essential to reach Net Zero.

The technology prevents CO_2 from entering the atmosphere by capturing it, compressing it and transporting it for permanent storage where it cannot enter the atmosphere. It can be safely stored in natural subsea or underground geological structures such as depleted oil and gas reservoirs.

Carbon capture generally offers a more expensive route for an industrial site to decarbonise than fuel switching to low carbon hydrogen but is the only option when the majority of the CO_2 emissions result from the raw material rather than fuel. Examples include ammonia, cement and lime production, and certain refining processes.

CO_2 is already being utilised in the UK, for example in the manufacture of sodium bicarbonate. Other uses could include crop production in greenhouses or in the food and drink sector. As the infrastructure is developed, more options for the re-use of the CO_2 are anticipated.

UK net-zero GHG scenario



Source: Net Zero The UK's contribution to stopping global warming, the Climate Change Committee May 2019

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Carbon capture and hydrogen

The UK has made great progress in decarbonising electricity generation. However, decarbonising electricity is the relatively easy part of the net zero challenge. The UK gas networks transport roughly three times as much energy as the electricity networks with an unmatched level of reliability.

Low carbon hydrogen is a vital component of a net zero energy ecosystem alongside nuclear and renewable electricity. The Climate Change Committee sees hydrogen as essential to meeting our decarbonisation obligations, and in its 6th Carbon Budget 2020 report estimates UK demand for 225TWh/annum of hydrogen by 2050. This is broadly equivalent to the energy required for heating all UK households with natural gas boilers for a year.

There are several ways to produce low carbon hydrogen. The most readily available today are:

Blue hydrogen
Produced by stripping the **carbon** from natural gas to produce **hydrogen** and **CO_2** which is captured and permanently stored

Green hydrogen
Produced by **splitting water** into **hydrogen** and oxygen using **renewable electricity**

We need to progress both. Blue hydrogen production technology is available at much greater scale and lower cost today and so needs to be accelerated whilst the available technology, scale and cost of green hydrogen is improved.

Blue hydrogen produced and distributed at scale will allow local industry and flexible power generation to decarbonise as early as the middle of this decade whilst stimulating the hydrogen market for transport and domestic heat. It will also provide a platform on which hydrogen from electrolysis and other technologies can build market share.

Blue hydrogen production using auto thermal reforming technology with CO_2 capture rates of 97% can be delivered cost effectively, at scale. Its scale unlocks the establishment of hydrogen transportation and storage infrastructure which green hydrogen can then readily connect into. HyNet North West is the leading example of a project to deliver such an integrated scheme.

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The North West – one of the UK's first two carbon capture clusters?

CO_2 transport and storage will be delivered in clusters because shared infrastructure offers the most efficient and lowest cost solution. In this region, leading hydrogen and carbon capture project HyNet North West can deliver amongst the lowest cost CO_2 transport and storage infrastructure in the UK by extensively repurposing existing onshore and offshore assets.

HyNet partner Eni was recently awarded a CO_2 appraisal and storage licence in the East Irish Sea.

HyNet North West can deliver over three-quarters of the Government's 2030 target for hydrogen production and 100% of the target for CO_2 sequestration. The HyNet North West consortium of major industrial companies stands ready to deliver the project and is currently mobilising a £72m engineering and consenting development phase through the BEIS Industrial Decarbonisation Challenge (IDC) programme, with over half of the funding provided by industry. The project aims to capture up to 10 million tonnes of CO_2 emissions each year and distribute 30TWh per year of hydrogen by 2030. Operations will begin as early as 2025.

The HyNet North West project benefits from the existing regional technical skill base in chemicals production, refining and offshore oil and gas production and processing. It is therefore able to deliver rapidly as we look to stimulate recovery from the economic shock of Covid-19. Critically, investment in HyNet North West safeguards existing industry, much of which is vulnerable to carbon price increases and free allowance reductions, risking substantial carbon leakage (where manufacturing is transferred out of the UK due to the cost of climate policies). Delivery of CCUS and hydrogen will make the region a very attractive place to invest in clean sustainable manufacturing.

Low cost and low risk

Deliver over three-quarters of hydrogen target

Deliver 100% of CO_2 target

Existing regional skill base

Safeguarding existing industry

An attractive place to invest

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Tata Chemicals

Tata Chemicals Europe is currently constructing a UK-first Carbon Capture and Utilisation project to capture 40,000 tonnes of food grade carbon dioxide for use as a raw material for high grade Sodium Bicarbonate manufacture in Cheshire. The project will capture flue gases from the combined heat and power plant at Tata Chemicals Europe's Northwich industrial site in Cheshire and will reduce carbon emissions by over 10%.

InBECCS

The North West is also set to be the home of a new bioenergy with carbon capture and storage project, InBECCS. The project will see a carbon capture demonstration facility developed at Ince BioPower at Protos in Cheshire, which will pioneer the first negative emissions project in the North West and could be ready as early as 2025.

Tata Chemicals Carbon Capture & Utilisation, Cheshire

InBECCS, bioenergy with carbon capture & storage, Protos, Cheshire

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Carbon, capture, utilisation and storage in the North West

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CCUS technology can decarbonise multiple sectors

INDUSTRIAL CARBON CAPTURE

Capturing carbon from industries such as cement and ammonia production

SUSTAINABLE AVIATION FUEL

Decarbonising fuel production

HYDROGEN PRODUCTION

Decarbonising domestic and industrial heating, industry and transport

ENERGY FROM WASTE

Capturing carbon from energy from waste

BIOENERGY WITH CARBON CAPTURE STORAGE

Can deliver negative emissions

TATA CHEMICALS CARBON CAPTURE & UTILISATION

UK first carbon capture and utilisation project in construction where food grade CO_2 is used in sodium bicarbonate manufacture in Cheshire

The North West is primed to be **one** of the **first two carbon capture clusters**

CO_2

HyNet North West is the UK's most affordable carbon capture and storage scheme and is deliverable by 2025.

CO_2 storage in **Liverpool Bay**

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What's needed to make this happen?

A firm policy framework from Government is essential to secure investment in CCUS and low carbon hydrogen. Without the cost of carbon fully internalised in our energy markets, delivering low carbon solutions requires a revenue support regime. Whilst grant funding may be of assistance in addressing aspects of risk allocation, revenue support is required to address the increased operational costs of low carbon hydrogen production. Therefore, implementation of appropriate policy is required now. The commitment of the Government to delivering such a framework is very welcome.

Government has recently launched a process to select the UK's first two CCUS clusters to be implemented in the mid 2020's. HyNet North West is uniquely able to offer a low cost, highly deliverable, large scale, and integrated cross border hydrogen and CCUS scheme which will benefit the whole of this region. The time limited opportunity to repurpose gas extraction assets for a new clean future combined with the economic benefits of infrastructure investment across the region mean that HyNet North West must be a "Track 1" project.

Conclusion

In the North West we have a unique opportunity to repurpose existing onshore and offshore assets before they need to be decommissioned and deliver one of the lowest cost carbon capture clusters in the UK. We can accelerate the UK's transition to a low carbon future and support the levelling up agenda.

The opportunity to create a world leading low carbon industrial cluster, which is vital for the journey to net zero, must be grasped without delay.

Partners

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