

HUMBER 2030 VISION

JOBS | GROWTH
DECARBONISATION

Our shared vision

Decarbonising the UK's largest industrial cluster



High-skilled, green jobs. Private investment to drive economic growth. A decarbonised future for our country. This is our shared vision for the Humber.

Climate change is the defining challenge of our time, compelling us to decarbonise our economy, develop energy resilience and invest in new green technologies. The UK has adopted a global leadership position, passing into law a commitment to net zero by 2050, and challenging the world to follow at COP26. The actions that the government and businesses take to deliver net zero will determine the future of our country and its place in the world.

Decarbonising the Humber, the industrial cluster emitting more CO₂ than any other in the country, is essential to achieve net zero. It is critical to supporting jobs and economic growth and delivering a sustainable future for generations to come. The Humber presents the UK's biggest decarbonisation opportunity, providing world-leading infrastructure and investment, alongside innovation and technology that can be replicated around the world.

Quite simply, the UK can't achieve net zero and grow the economy without decarbonising the Humber. The Humber has an array of nationally critical energy and decarbonisation projects, which must be delivered for the UK to reach net zero by 2050. From carbon capture and storage to low carbon hydrogen, these projects are the answer to the challenge of decarbonising industry and delivering clean energy for the future.

None of this will be possible without the construction of a pipeline network, to remove CO₂ from carbon intensive industries like power generation, steelmaking, chemicals, and refining, and deliver hydrogen to enable fuel switching at scale. Offshore carbon dioxide storage is also vital, and the Humber has access to more licensed North Sea storage than any other cluster.

Businesses are already working closely together, pledging around £15bn in investment to deliver these projects, while developing cutting-edge training facilities to ensure local people are equipped to take on new high-skilled, green jobs.

The Humber has delivered for the UK before, leading the clean energy transition through its thriving offshore wind sector, stepping up to deliver world-class skills, manufacturing facilities and supply chains. Today, business stands ready to make the Humber the world's leading net zero industrial cluster. Government has taken an important first step in backing the East Coast Cluster. Now is the time to deliver.

**Humber
Energy
Board**



“There are few places around the world more crucial to the road to net zero and industrial decarbonisation than the Humber – it is a location from which so much can be achieved and learned”



Jörgen Sandström
Head of Energy, Materials, Infrastructure
Program - Industrial Transformation,
World Economic Forum

Over £15 billion of private investment is to be unleashed in the Humber



The Humber has long been the most carbon intensive region in the country, producing roughly 40% of our industrial emissions due to its capabilities in chemicals, concrete, steel and energy. Those strengths have turned the industrial cluster into a vital part of the northern economy; but offshoring jobs would mean higher net emissions overseas as well.

Now we must choose instead a green industrial revolution. The region's businesses have joined forces to develop shared decarbonisation infrastructure, with £15bn of private investment ready to flow in.

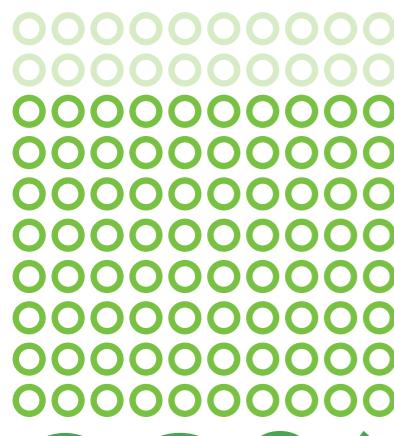
This is a once in a generation chance to secure a step change in productivity, secure billions in foreign direct investment from around the globe and create many thousands of well-paid jobs through a just transition.

A handwritten signature in black ink, appearing to read 'W M'.

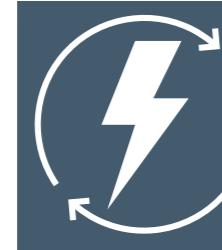
HENRI MURISON
CHIEF EXECUTIVE OF THE NORTHERN
POWERHOUSE PARTNERSHIP



The Humber is the largest industrial decarbonisation opportunity in the UK

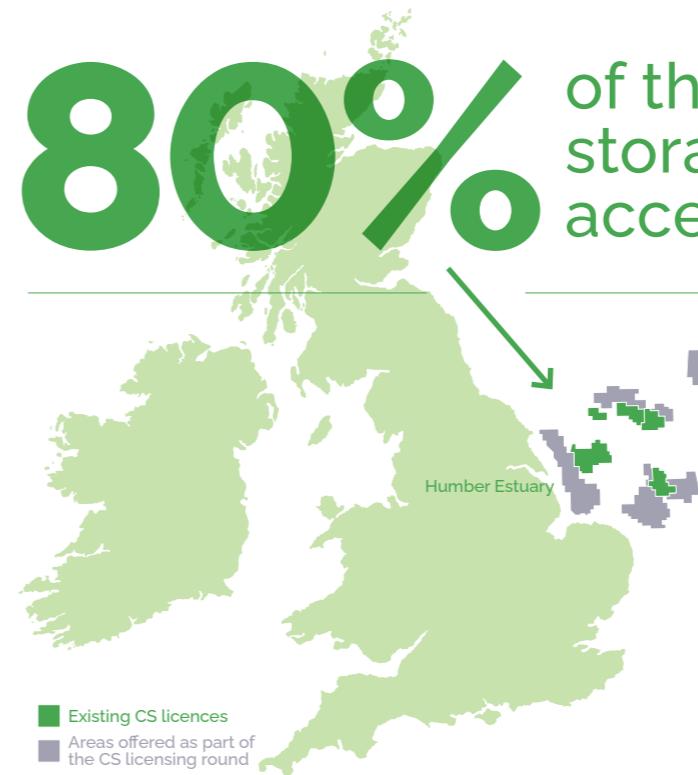


80%
OF HUMBER CO₂ EMISSIONS
ELIMINATED VIA
DECARBONISATION
PROJECTS



THE HUMBER CAN MEET
50% OF THE UK'S
RENEWABLE POWER NEEDS

1 in 10 regional jobs will be safeguarded and thousands of new jobs created by decarbonising the Humber



of the UK's licensed CO₂ storage capacity is accessible from the Humber



The Humber has hydrogen storage capacity to power
2 million
UK homes for 1 year

£15 BN
private investment ready to be invested in
Humber-based energy transition

30%

of UK Government H₂ production targets can be met by the Humber

The Humber: UK's Energy Estuary



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drax

BECCS



Bioenergy with CCS at Drax (BECCS) – Through producing negative emissions and sustainable renewable electricity, Drax will power the nation while enabling the UK to decarbonise.

BECCS at Drax will transform Drax Power Station from the largest decarbonisation project in Europe to the largest negative emissions project in the world, anchoring the pipeline in the Humber and creating and supporting up to 10,000 jobs in the region. Subject to a £2bn investment decision being taken in 2024, BECCS at Drax will use proven technology to remove 8 MT of CO₂ emissions from the atmosphere each year by 2030, while continuing to be the UK's single largest source of renewable energy, powering the equivalent of over 4 million homes. BECCS can also help kickstart a new CCS industry right here in the Humber, driving new clean growth and supporting thousands of new green jobs. Drax has already started engaging local businesses to ensure they can benefit from the significant supply chain opportunities that this investment will bring to the region.

Government consulting on business models



Decarbonisation potential
8 MT CO₂ p.a. negative emissions by 2030



Investment
£2bn investment to be made by Drax

equinor

H2H Saltend



Zero Carbon Humber's kick-starter project, this flagship low carbon hydrogen production facility with carbon capture will fuel switch Triton Power station and reduce the emissions of local chemicals manufacturers.

H2 Saltend is located at Saltend Chemicals Park, one of the region's most carbon intensive sites, responsible for more emissions than the entire Merseyside region. It is Equinor's flagship 600 MW low carbon hydrogen production plant with carbon capture, which offers to reduce the site's CO₂ emissions by nearly one million tonnes annually, representing a 30% reduction in the Saltend Chemicals Park's total current carbon emissions. At least six local industrial operators could potentially use this hydrogen to lower the carbon footprint of their processes and products, one being the on-site Triton Power Station, seeking to fuel switch from natural gas to hydrogen, enabling low carbon power and steam to be supplied to local users.

Government Track 1 shortlisted



Decarbonisation potential
600 MW hydrogen production facility, initially reducing the emissions of Saltend Chemicals Park by 0.9 MT CO₂ p.a.



Jobs
521 jobs safeguarded with 97 direct permanent jobs created

HUMBERZERO®**Humber Zero**

A world-scale CO₂ reduction project to support the decarbonisation of critical UK industry. It involves post combustion carbon capture. Participants include Phillips 66 Limited and VPI Immingham.

Humber Zero is a world-scale project to reduce the CO₂ emissions of critical industry in the Immingham industrial area using carbon capture. The first phase of the project is a consortium between Phillips 66 Limited and VPI Immingham and aims to remove up to 3.8 MT of CO₂ from the Immingham industrial area every year. The CO₂ emissions from some processes at the VPI Immingham Combined Heat and Power Plant and Phillips 66 Limited Humber Refinery will be captured and compressed. The CO₂ will then be transported off site via pipeline (independent projects) for storage under the North Sea.

Government Track 1 shortlisted

 **Decarbonisation potential**
Up to 8 MT CO₂ p.a. by 2030

 **Investment**
In excess of £1bn private sector investment value

**Keadby 3 Carbon Capture Power Station**

The proposed Keadby 3 Carbon Capture Power Station would be a new 910MW power station in North Lincolnshire, fitted with carbon capture technology to remove CO₂ from its emissions.

SSE THERMAL and EQUINOR are developing Keadby 3 Carbon Capture Power Station, which gained planning permission in December 2022 and could be operational by the mid-2020s. Keadby 3 would use natural gas as its fuel and be fitted with a carbon capture plant to remove the CO₂ from its emissions. The plant would plug into the shared pipelines being developed through the East Coast Cluster with the CO₂ being stored off the coast. When complete, Keadby 3 Carbon Capture alone is expected to offset up to 1.5 MT of CO₂ – at least 5% of the UK Government's 2030 target. In 2022, it became the first power CCS project in the UK to receive planning permission and a progress update could be included in the planned Track 1 expansion process.

Government Track 1 shortlisted

 **Decarbonisation potential**
Capturing 1.5 MT of CO₂ p.a., equivalent to at least 5% of the UK's 2030 target

 **Investment**
Overall investment of £2.2bn and could generate £1.2bn for the UK economy over its lifetime



The Humber is home to eight offshore wind farms including the world's largest

The Humber has access to over 80% of the UK's licensed CO₂ storage capacity, enough to accommodate up to 46 years of the area's industrial carbon emissions, with much more on the way



Prax Lindsey Oil Refinery Carbon Capture



Prax Lindsey Oil Refinery plans to deploy carbon capture technology on its strategic energy infrastructure to capture some 1.2 MT p.a. CO₂

Prax Lindsey Oil Refinery is critical infrastructure, helping to ensure the UK's energy security and providing the fuels needed to keep the UK moving. It is vital that we decarbonise. To do this, the Prax Group plans to deploy carbon capture technology as part of the proposed East Coast Cluster and V Net Zero Pipelines to capture >85% of our CO₂ emissions. As part of the current manufacturing and industrial processes at the refinery, flue gases including CO₂ are released into the atmosphere. The Prax Lindsey Oil Refinery Carbon Capture Project will see a dedicated amine-based carbon capture unit built to capture carbon, before it is released. The unit will dehydrate / decontaminate the captured CO₂ and compress it into a dense fluid, whereupon it will be routed for safe storage under the North Sea via the East Coast Cluster and V Net Zero pipelines.

Government Track 1 shortlisted



Decarbonisation potential
1.2 MT CO₂ p.a. captured



Investment
£269m private sector investment



ZerCal250



Singleton Birch has existing lime production capacity of over 300,000 tonnes of lime per year

The Origen-Singleton Birch ZerCal250 project utilises Origen's ZerCaL technology to replace and extend the existing lime production facilities that emit more than 250,000 t CO₂ into the atmosphere per year. For every tonne of lime produced around one tonne of CO₂ is emitted. Origen's innovative kiln design can 1) decarbonise the lime industry (contributes ~1% to global emissions) 2) expand existing lime markets by significant orders of magnitude and 3) produce "ZerCaL" (lime produced without emitting CO₂) – a first-of-its-kind – which can then be used to perform Direct Air Capture, effectively removing CO₂ from the atmosphere, and storing it permanently. The benefits to wider society lie in using an engineered solution to combat climate change at an industrial scale, while safeguarding a 200-year-old industry and the industrial supply chain it supports (steel, cement, glass production, water treatment etc).

Government Track 1 shortlisted



Decarbonisation potential
Prevents 0.25 MT CO₂ p.a.



Investment
Up to £300m private sector investment

nationalgrid

The Humber Low Carbon Pipelines



The Humber Low Carbon Pipelines project will provide the vital infrastructure required to unlock the potential of the Humber region by providing connections to the various decarbonisation projects.

Our proposed pipeline network will consist of two underground pipelines – one for CO₂ and the other for hydrogen. The pipelines are intended to connect to major industrial emitters and power stations in the Humber region. The pipelines will continue to a landfall point on the Holderness coast. The onshore CO₂ pipeline will then connect via an offshore pipeline to the Endurance offshore storage location.

The project will also include a number of above ground installations and a tunnel under the Humber Estuary. The project is the backbone of Zero Carbon Humber, which together with Net Zero Teesside, forms the East Coast Cluster. Developing this infrastructure is essential for accelerating the decarbonisation of industry and creating and protecting thousands of jobs in the region, as well as making the Humber a hub for clean energy technologies.



Decarbonisation potential

Up to 17 MT CO₂ p.a. transported to storage and transporting up to 10 GW hydrogen



Investment

£1bn private sector investment



Aldbrough Hydrogen Storage



The Aldbrough Hydrogen Storage project plans to store low carbon hydrogen either within the existing natural gas storage facility or at a new site adjacent to the Aldbrough Gas Storage facility in East Yorkshire. The project could be operational by early 2028.

SSE Thermal and Equinor are collaborating on what could be one of the world's largest hydrogen storage facilities. The proposed Aldbrough Hydrogen Storage facility could be in operation by early 2028, with an initial expected capacity of at least 320 Gigawatt hours (GWh), which is enough to power over 860 hydrogen buses a year. The Aldbrough site is ideally located to store the low carbon hydrogen set to be produced and used in the Humber region. The benefit of the large-scale hydrogen storage at Aldbrough extends well beyond power generation. It would enable growing hydrogen ambitions across the region, unlocking the potential for green hydrogen, and supplying an expanding offtaker market including heat, industry and transport from the late 2020s onwards.



Storage capacity

At least 320 GWh of hydrogen storage capacity



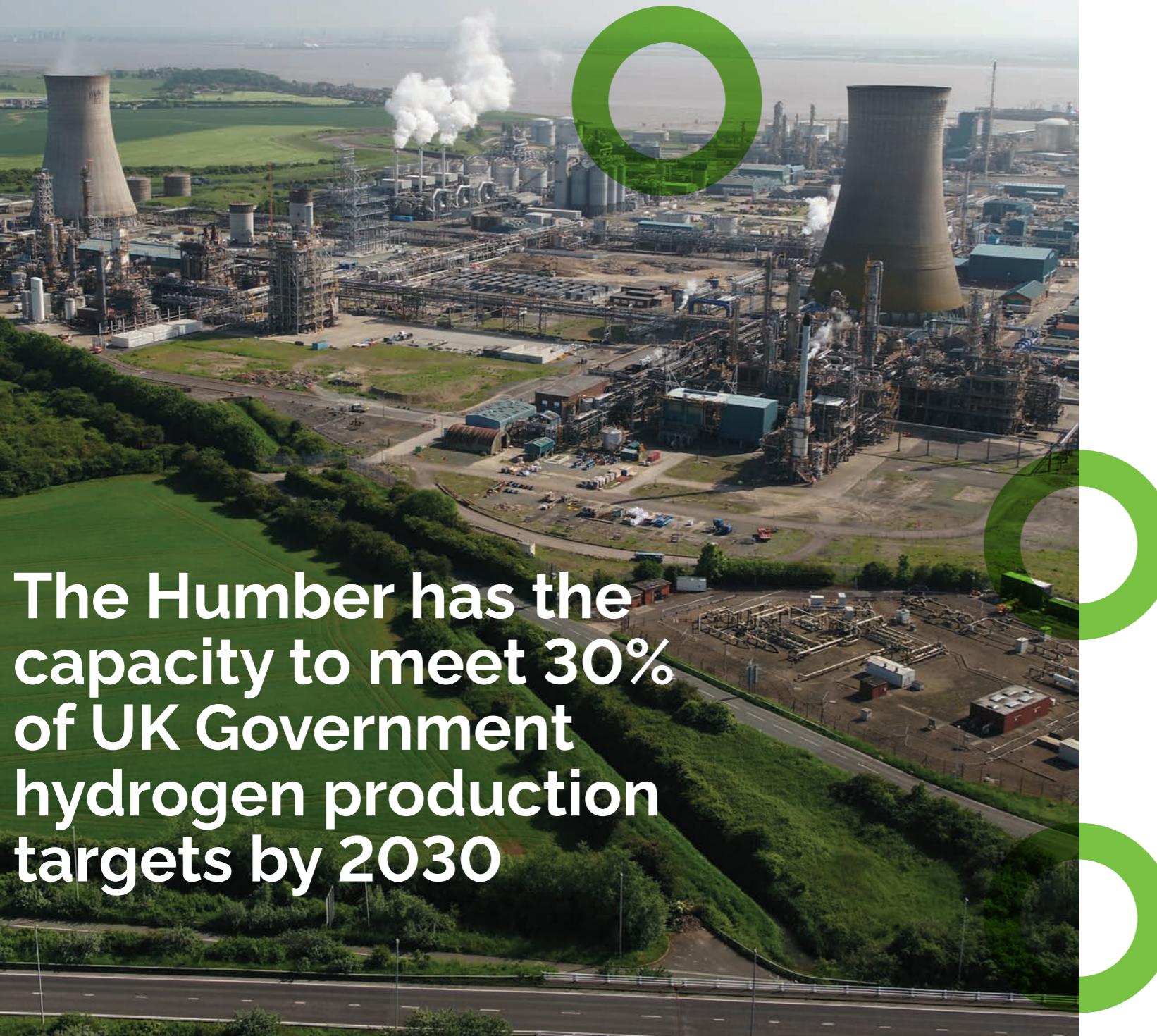
Storage capacity

Hydrogen storage sufficient to power 860 hydrogen buses



Decarbonising the Humber will safeguard 1 in 10 existing jobs in the region and provide thousands of new well paid jobs





Gigastack



Gigastack is a large UK electrolytic hydrogen project which has been led by a consortium of Phillips 66 Limited and Ørsted (UK) Limited. The project would harness offshore wind to power electrolysis and produce hydrogen, a low-emission fuel, to power industry.

Through a 100 MWe-scale electrolyser system using renewable power, it is planned that hydrogen will be produced through electrolysis and supplied to Phillips 66 Limited's Humber Refinery to replace some of the hydrocarbon gas used to fuel the industrial-scale heaters. The Gigastack project has the potential to expand to up to 300Mwe, which would offer further potential industrial decarbonisation opportunities in the Immingham region, as well as a potential expansion into hydrogen mobility. Gigastack received £7.5m from BEIS through Phase 2 of the UK Government's Low Carbon Hydrogen Supply Competition for initial engineering.



Decarbonisation potential
100 MWe scale electrolyser system powered by offshore wind with potential expansion to 300 MWe



Investment
£300m private sector investment value



H2H Production 2



Equinor's second low carbon hydrogen production facility with carbon capture. At 1.2 GW it is double the size of the flagship H2H Saltend, located in the Humber for regional industrial users.

At 1.2 GW, H2H Production 2 is Equinor's proposed second low carbon hydrogen production facility with carbon capture. It is double the size of Equinor's flagship H2H Saltend, building towards the company's ambition to achieve 1.8 GW of hydrogen production within the Humber by 2028 – nearly one fifth of the government's UK-wide 2030 10 GW ambition. The low carbon hydrogen produced at this site can be transported for use by industrial emitters across the region, via the common infrastructure created through the Zero Carbon Humber and East Coast Cluster network. Equinor is working with local organisations and contractors to ensure that local businesses can benefit from these opportunities. They are also working with local educational institutions to inspire young people and equip them with the right knowledge and skills to work within these low carbon technologies over the coming decades.

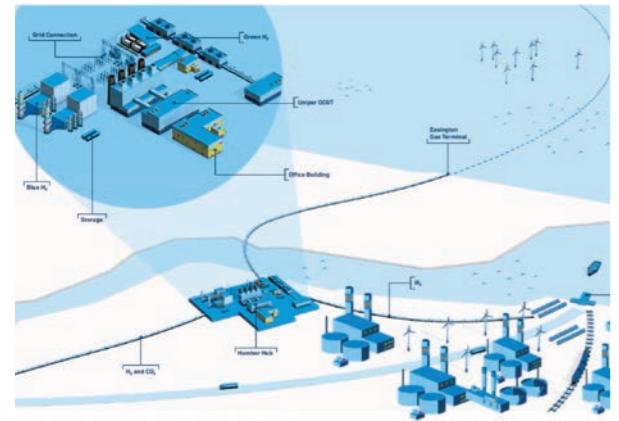
Decarbonisation potential
1.2 GW hydrogen production facility with carbon



Jobs
521 jobs safeguarded with 150 permanent jobs created



Humber H₂ub



Humber H₂ub aims to produce low carbon hydrogen at Uniper's Killingholme site and is expected to capture approximately 1.6 MT CO₂ p.a. and be operational later this decade.

Shell and Uniper are progressing plans to produce blue hydrogen at Uniper's Killingholme site on the South Humber Bank. The Humber H₂ub project includes a proposed blue hydrogen production facility with a capacity of up to 720 MW, using gas reformation technology with carbon capture and storage. The captured carbon would be fed through the proposed Zero Carbon Humber onshore pipeline, part of the East Coast Cluster, selected as one of two carbon capture and storage clusters to be taken forward by the government. The hydrogen produced could be used to decarbonise heavy industry, transport, heating and power throughout the Humber region. The project is expected to be operational later this decade.



Hydrogen production

720 MW blue hydrogen production capacity with **1.6 MT CO₂ p.a.** captured



Jobs

Around **120** permanent jobs created



Humber Hydrogen Hub (H₃)



The H₃ project looks to capture up to two million tonnes of CO₂ per annum and contribute to achieving net zero in the wider Humber industrial region by 2040.

VPI Immingham and Air Products have entered a joint development agreement to drive forward the Humber Hydrogen Hub (H₃), which seeks to develop a flagship 800 MW low carbon hydrogen production facility in Immingham. The majority of hydrogen produced would be used to decarbonise VPI Immingham's existing power production, with residual hydrogen production available for industrial users in the region.

As the UK's largest industrial cluster, the Humber has the highest levels of industrial CO₂ emissions. H₃ would produce low carbon hydrogen at large scale, combining market-leading hydrogen production, carbon capture technology and offshore carbon dioxide storage currently under development for the Humber region.

Decarbonisation potential

Up to **2 MT CO₂ p.a.** captured

H₂ Hydrogen production
800 MW low carbon hydrogen production



The Humber will be able to produce half of the UK's renewable electricity, enough to power 25 million homes



ABP | KEEPING BRITAIN TRADING

AIR PRODUCTS

Immingham Green Energy Terminal



Air Products and ABP are working together on a new green energy terminal in the Port of Immingham. The terminal will be a key piece of national infrastructure.

On the marine side, the terminal would comprise a new approach trestle and jetty infrastructure designed to service the handling of liquid bulk goods, principally green ammonia to begin with, with the potential to import and export others, including CO₂, in the future. The green ammonia would then be stored on land in storage tanks and processed in hydrogen production units and liquefiers to create green hydrogen for onward transport to other parts of the UK. The project aligns closely with the aims of the UK Government towards net zero through the production and delivery of low carbon hydrogen. It would contribute to the decarbonisation of transport and directly supports Humber's levelling up agenda.

Decarbonisation potential
CO₂ The manufactured hydrogen will eliminate around 0.58 MT CO₂ p.a.

Hydrogen production
H₂ The project would contribute at least 300 MW of hydrogen production capacity

sse Thermal

equinor

Keadby Hydrogen Power Station



The proposed Keadby Hydrogen Power Station, located in North Lincolnshire, could be 'the world's first major 100% hydrogen-fired power station could be operational by 2030.'

SSE Thermal and Equinor are developing Keadby Hydrogen Power Station, which would have a peak demand of 1,800 MW of hydrogen, producing zero carbon emissions at the point of combustion. It could be the world's first major 100% hydrogen-fired power station, securing at-scale demand for hydrogen in the region for decades to come. With appropriate policy mechanisms in place, Keadby Hydrogen could come online before the end of the decade. Keadby Hydrogen could account for a sixth of the offtake of the UK Government's 10 GW low-carbon hydrogen production goal.

Decarbonisation potential
CO₂ World's first 100% hydrogen-fuelled power station, producing zero emissions at the point of combustion

Fuel consumption
The proposed station would have a peak demand of 1,800 MW of H₂



Refinery of the Future



The only producer in Europe of specialty graphite coke used in lithium-ion batteries and the only UK refinery to make and supply sustainable aviation fuel at scale.

The Phillips 66 Limited Humber Refinery has a long-term commitment to building a thriving, lower carbon business platform by leveraging existing capabilities and advancing investments in new energy technologies. The refinery already produces lower carbon road fuels and is the UK's only refinery to make and supply sustainable aviation fuel (SAF) at scale. Additionally, the refinery is Europe's only producer of specialty graphite coke used in lithium-ion batteries. These are the same high-performance batteries that power electric vehicles, personal electronics, medical devices and grid storage. As part of the transition to The Refinery of the Future, the refinery is also part of Humber Zero, a world-scale carbon capture project, and the Gigastack project, which aims to harness offshore wind to power electrolysis and produce hydrogen fuel, to power industry.



Decarbonisation potential
1.8 MT CO₂ p.a.



Investment
In excess of £1bn private sector investment value

centrica

Rough Hydrogen Storage



Centrica's redevelopment of Rough would provide 10 TWh of hydrogen storage capacity to UK infrastructure and is the least-cost option to meet the UK's hydrogen storage demand.

As the remaining gas in the Rough reservoir nears economic depletion, alternative uses for the unique facility have been investigated by Centrica Storage Limited (CSL). Given the UK Government's target to transition to net zero greenhouse gas emissions by 2050, CSL has identified that the Rough field could provide a vital component in the UK's hydrogen infrastructure. Re-purposing Rough, an existing depleted gas field that historically has operated as the UK's largest proven natural gas storage facility, is expected to be the most cost-efficient option to meet the long-term need for hydrogen storage. Rough's unique geological and geographical advantages position it well to support a growing hydrogen economy and have no insurmountable technical barriers to conversion to hydrogen storage. The successful redevelopment could offer a phased capacity build up to 10 TWh of storage to UK infrastructure.



Hydrogen storage
120 bcf/10 TWh of hydrogen storage
(working gas)



Investment
£1.6bn private sector investment

The Humber has enough hydrogen storage capacity to power 2 million UK homes for one year

8



The Humber will lead the world in greenhouse gas removals technology, meeting UK Government targets by 2030



Triton Power Station



Fuel switching Saltend Chemical Park's Triton Power Station from natural gas to a low carbon hydrogen blend, reducing its emissions as well as those of its power and steam customers.

Triton Power Station is currently fuelled by natural gas and provides power and steam to industrial users at Saltend Chemicals Park in addition to energy to the national grid. Decarbonising the power station by displacing natural gas with low carbon hydrogen can considerably reduce its emissions, while also reducing those of its users, such as chemicals manufacturers at the adjacent chemicals park. Initially, hydrogen can be blended with natural gas at a ratio of circa 30% by volume, with the ambition to increase this to 100% as technology evolves and hydrogen storage infrastructure develops.

Phase 1 will reduce emissions at Saltend Chemicals Park by nearly 1 MT p.a., with greater savings over time as the level of hydrogen blend increases.

Resulting low carbon chemicals manufactured at the park could also command greater interest on the domestic and international market.

Decarbonisation potential

 Initially contributing to the reduction of Saltend Chemical Park's CO₂ emissions by nearly **1 MT CO₂ p.a.**

Decarbonisation potential

 This represents a **30% reduction** in the park's total current carbon emissions



Viking CCS



A carbon capture, transport and storage network for Humber, targeting a reduction of 15 million tonnes per annum of UK emissions by 2035, supported by initial investment of £3bn.

Led by Harbour Energy, Viking CCS will develop the infrastructure to transport and store CO₂ in secure offshore storage sites. Working with a wide range of capture partners, the project will create a carbon capture, transportation and storage network that will promote inward investment and attract new industries to the area.

Located in the Humber, the UK's most industrialised region and largest emitter of CO₂, the project is central to establishing a world-leading carbon capture industry in the UK and meeting the government's net zero emissions targets. Expected to be operational from 2027, Viking CCS will reuse existing pipelines and utilise decommissioned gas fields in the Southern North Sea to provide UK industries with a competitive option for the transport and storage of their CO₂ emissions.

Decarbonisation potential

 **15 MT CO₂ p.a. by 2035**

Investment

 Supported by initial investment of **£3bn** across the full CCS chain



**High-skilled, green jobs.
Private investment to
drive economic growth.
A decarbonised future
for our country.**

**THIS IS
OUR SHARED
VISION FOR
THE HUMBER**



We stand ready to

deliver for the UK



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North
Lincolnshire
Council



RWE



SIEMENS Gamesa
RENEWABLE ENERGY



UNIVERSITY
OF HULL



UNIVERSITY OF
LINCOLN



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