

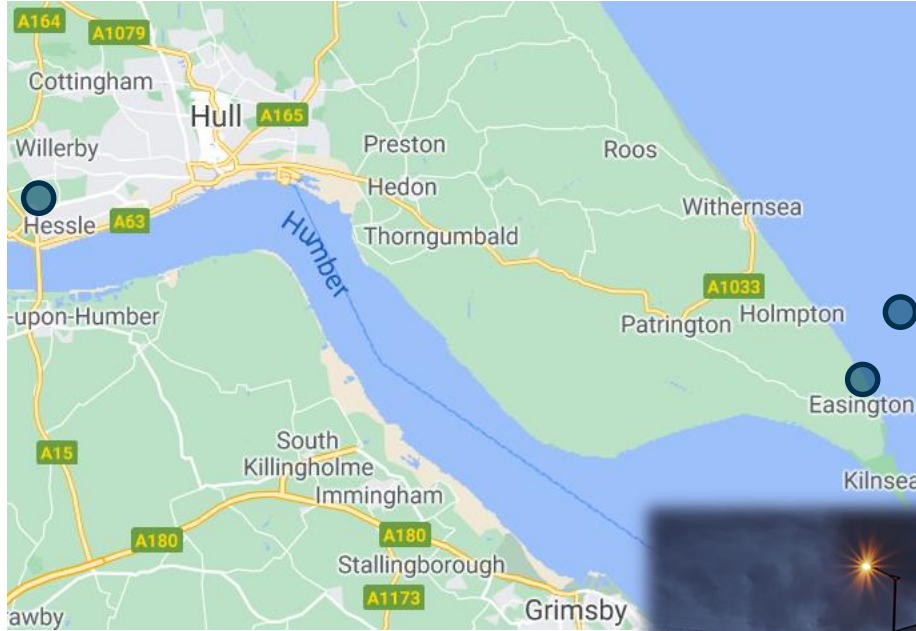
Zero Carbon Humber

Centrica plc

Adam Beardmore



Centrica Storage - Our Business





ZERO CARBON HUMBER

ABP | ASSOCIATED
BRITISH PORTS



BRITISH
STEEL

centrica

drax



**MITSUBISHI
POWER**

nationalgrid



**uni
per**



ZCH Partnership | Wider letters of support – sent to Kwasi Kwarteng

ZERO CARBON HUMBER

Letters of support

ZERO STARTS HERE

Logos of supporters: ABP, ASSOCIATED BRITISH PORTS, BRITISH STEEL, centrica, drax, equinor, MITSUBISHI POWER, nationalgrid, SSE Thermal, TRITON POWER, uni per, AMRC.

ZERO CARBON HUMBER SUPPORTERS

Logos of supporters: ART Fuels, APOLLO, auria, BISHOP BURTON College, CATCH, CBI, C-Capture, Deep Branch, BIR COLLEGE GROUP, DNV-GL, EAST RIDING OF FORBESBARIE COLLEGE, L&D Talent, energy institute, ENGIE Fabricom, ETN, EU Turbines, fsb, g2w Ventures, GLOBAL CCS INSTITUTE, GMB UNION, Greater Lincolnshire, Grimsby Institute, Hull City Council, HULL & HUMBER Chamber of Commerce, Humber Local Enterprise Partnership, HOTA, MAKE UK, Marketing Humber, MITSUBISHI HEAVY INDUSTRIES, NORTH LINCOLNSHIRE COUNCIL, NORTH EAST LINCOLNSHIRE COUNCIL, THE NORTHERN POWERHOUSE PARTNERSHIP, Norwegian-British Chamber of Commerce, NP11, CATAPULT, On Line Design, OSL Consulting Engineers, PENSPEN, PremierOil, reabold, RMRI, Sheffield City Region, SIEMENS ENERGY, STORK A Flour Company, Team Humber MARINE ALLIANCE, UNIVERSITY OF HULL, UNIVERSITY OF LEEDS, The University of Sheffield, wime, Nix & Nix Yorkshire Local Enterprise Partnership.

UK Government Strategy | Industrial Clusters



Where to Start?

GRAND CHALLENGE

What is the Industrial Clusters mission?

Our aim to create a net-zero carbon industrial cluster by 2040 is a world first. We want to attract innovators, investors and problem solvers to create a low-carbon exemplar that others in the UK and internationally can learn from and replicate.

"We will establish the world's first net-zero carbon industrial cluster by 2040 and at least one low-carbon cluster by 2030"

This will be achieved by:

- ▶ Reducing emissions in one cluster to **net-zero by 2040**.
- ▶ In at least one cluster, by 2030:
 - **The low-carbon infrastructure** needed to support industrial decarbonisation will be in place and operational, attracting new investment and innovation.
 - **Multiple industrial facilities** will already have reduced their emissions, by the greatest possible extent.
- ▶ Positioning UK clusters as top areas for global inward investment and driving demand for low carbon products and technologies by **harnessing the power of markets, the public sector, universities and local communities.**

Largest industrial clusters by emissions

Cluster	Emissions (MtCO ₂)
Humberside	12.6
South Wales	9.0
Grangemouth	4.3
Teesside	3.4
Merseyside	3.2
Southampton	2.7

The mission is backed by public investment through the **Industrial Strategy Challenge Fund**

Based on high-emissions sites in scope of the EU ETS - may not be exhaustive

Humber| Emissions Summary

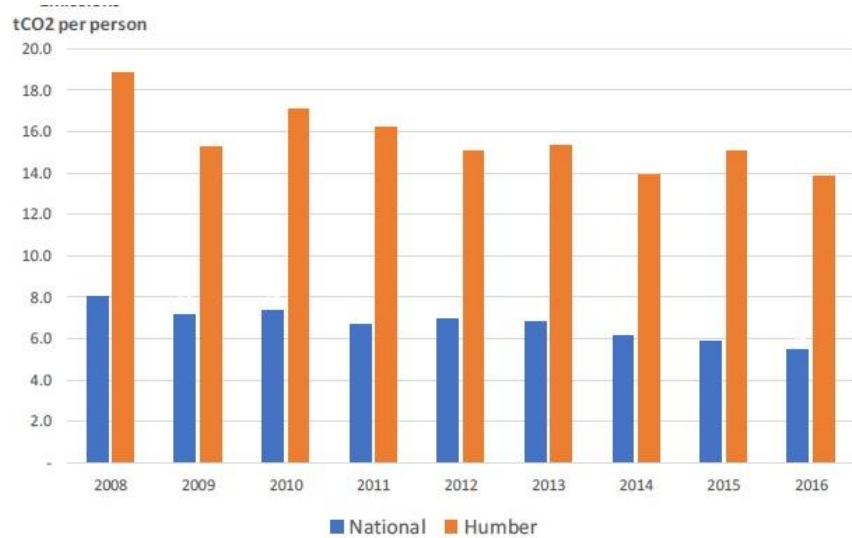


Figure 4 - Comparison between per capita emissions in UK and Humber

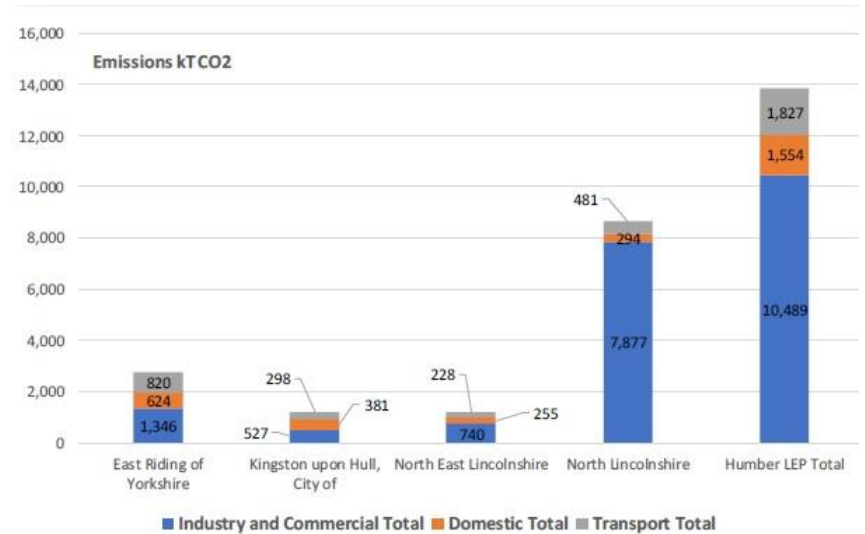
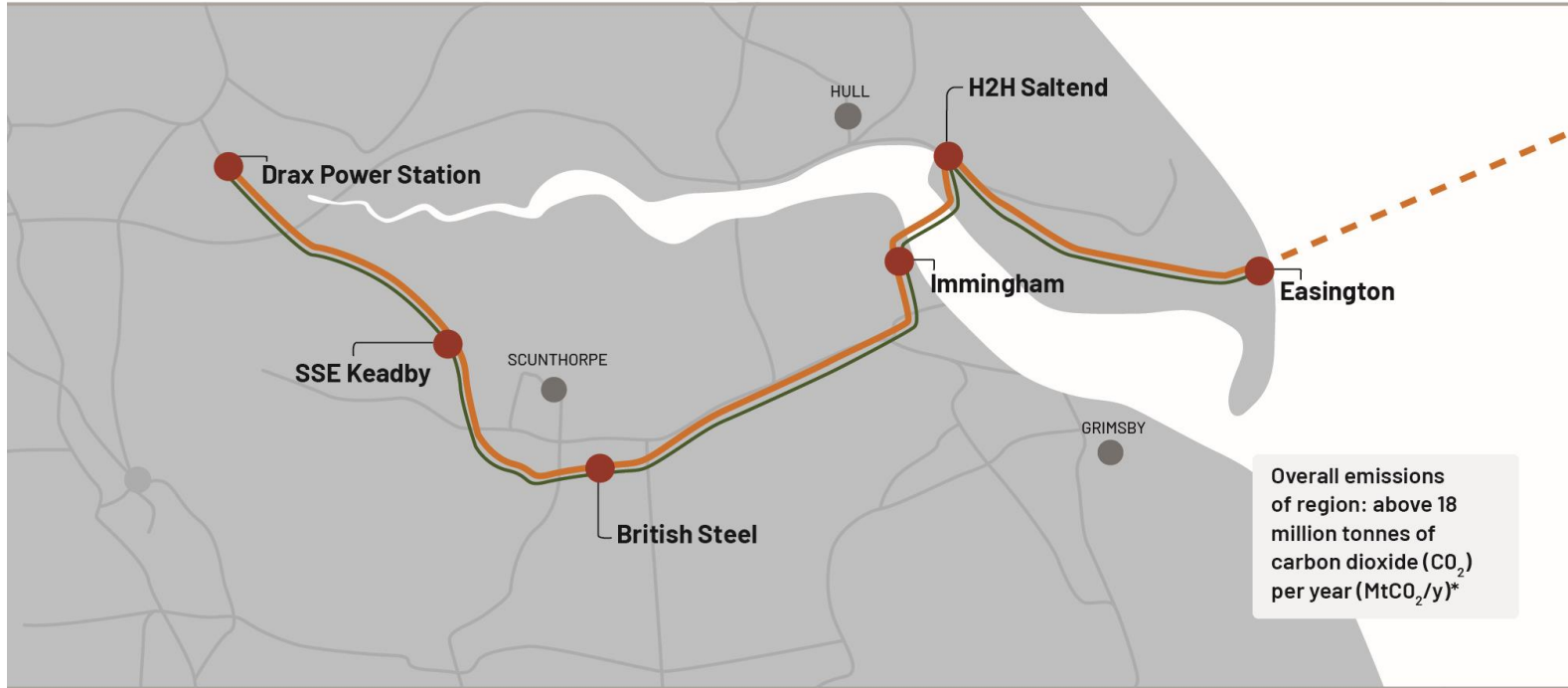


Figure 9 - Emissions in the Humber split by sector (2015 data)

ZCH Partnership | An anchor project “unlocking everything” for the UK

ZERO CARBON HUMBER SITE MAP



KEY

— Hydrogen pipeline (illustrative)

— CO₂ pipeline (illustrative)

● ZCH businesses / facilities

* Combined industry and power emissions for the Humber, excluding Drax Power Station

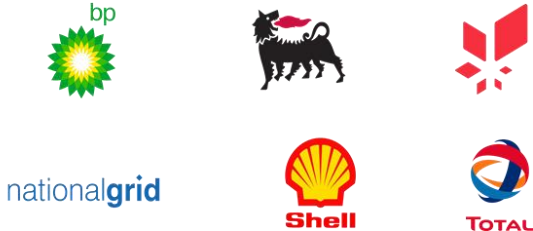
Offshore infrastructure| Northern Endurance Partnership



CCC 'Net Zero' (p35):

Carbon capture and storage (CCS) is essential. We (the CCC) previously recommended that the first CCS cluster should be operational by 2026, with two clusters, capturing at least 10MtCO₂, operating by 2030. For a net-zero target it is very likely that more will be needed.

At least one of the clusters should involve substantial production of low-carbon hydrogen.



H2H Saltend | A Hydrogen Economy Kick-Starter

Currently 3.5 Mtpa CO₂ Emissions



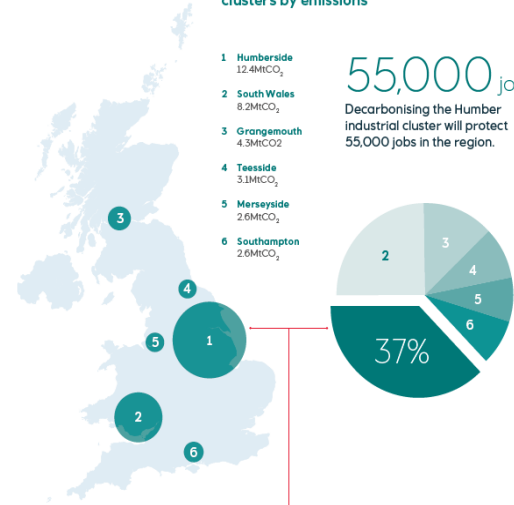
Hydrogen fuel switch concept: A unique decarbonisation strategy for the UK's most established chemicals site

Largest industrial clusters by emissions

- 1 Humber-side 12.4MtCO₂
- 2 South Wales 8.2MtCO₂
- 3 Grangemouth 4.3MtCO₂
- 4 Teesside 3.1MtCO₂
- 5 Mersyside 2.6MtCO₂
- 6 Southampton 2.6MtCO₂

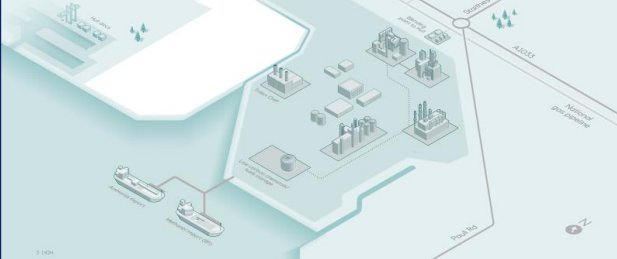
55,000 jobs

Decarbonising the Humber industrial cluster will protect 55,000 jobs in the region.



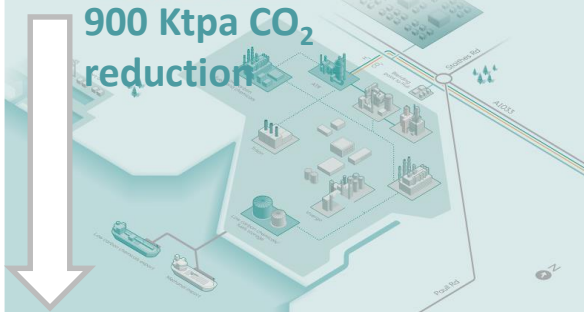
Net zero starts here

Unlocking business models for hydrogen, CCS and BECCS

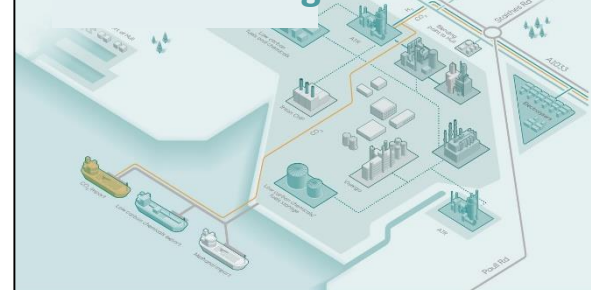


H2H Saltend | A Hydrogen Economy Kick-Starter

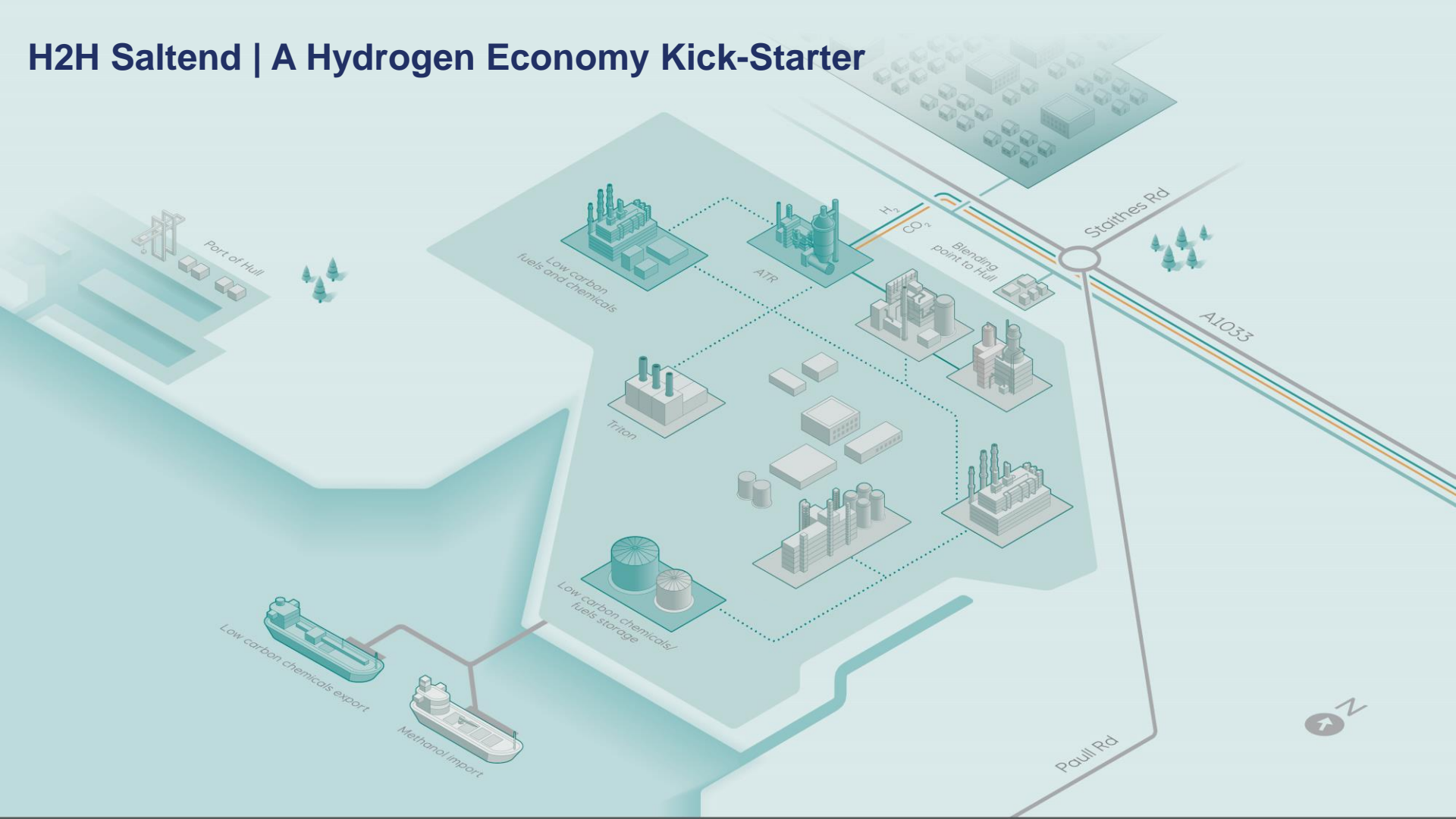
900 Ktpa CO₂ reduction



Blue facilitating Green



H2H Saltend | A Hydrogen Economy Kick-Start



ISCF Phase 2 | Humber Roadmap

Large Scale Implementation

We are here

Market Build

2030-2040

Value Chain Demonstration

2020-2027

H2H Saltend

600 MW H₂



Demonstrate at scale hydrogen value chain

- First of a kind at scale hydrogen production demonstrator and anchor CO₂ and H₂ infrastructure
- Hydrogen to power, low carbon chemicals and industry

2020-2029

Hydrogen expansion

>1,500 MW H₂



Build out capacity and infrastructure including technology development

- Build out hydrogen production capacity and delivery to increased demand
- Hydrogen storage in Aldborough
- Green hydrogen produced from renewable electricity
- Blending of hydrogen to natural gas heat networks

2021-2029

H2H Power

>12-16 TWh/y flexible power



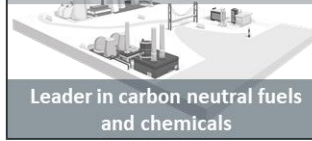
Complement renewables with clean flexible power

- Scale up hydrogen to power value chains in the Humber
- 100% fuelled hydrogen power plants
- Hydrogen-fired turbine technology development

2022-2030

H2H Fuels

>16,000 bpd low carbon fuels



Leader in carbon neutral fuels and chemicals

- Utilise captured bio-CO₂ from Humber to produce carbon neutral fuels
- Decarbonise hard-to-decarbonise sectors such as maritime, aviation, agriculture and industry

H21 North of England

>85 TWh hydrogen demand



Enable the transition to a sustainable and global hydrogen economy

- 'Deep decarbonisation' by converting the UK gas grid to hydrogen
- North of England as a starting point equating to 1/7th of UKs homes (12.5 mt CO₂ savings annually) with view to a UK-wide rollout

Funding opportunities (pre-FID):

ISCF (£131m)

HPF (£100m)

&

IETF (£315m)

Funding opportunities (post-FID):

CCS Infrastructure Fund (£800m)

Other potential funding packages:

Clean Steel Fund (£250m)

ZCH Partnership | Securing and creating UK jobs in a new market

CAPTURE FOR GROWTH

A ROADMAP FOR THE WORLD'S FIRST ZERO CARBON INDUSTRIAL CLUSTER:
PROTECTING JOBS, FIGHTING CLIMATE CHANGE, COMPETING ON THE WORLD STAGE

THE STRATEGIC IMPORTANCE OF THE HUMBER TO THE UK ECONOMY

The region contributes **£18bn** towards the UK economy each year, driven largely by its deep expertise in industrial processes such as refining, **petrochemicals and manufacturing**

South Yorkshire

has the largest concentration of steel conversion companies and precision forgers in the UK.

The Humber's chemical sector includes around **100 chemical and refining companies** whom employ approximately

6,000 people

and generate a combined annual turnover of **£8bn**. This accounts for **12% of the UK chemicals employment**, second only to North-West England.



The Humber Ports (Grimsby, Goole, Hull, Immingham) together handle more than

77 million tonnes of cargo annually (worth approximately £75bn), supporting over 33,000 jobs in the region and contributing £2.5bn to the UK economy.



The Humber is home to several power stations and two of the UK's six major oil refineries providing

27% of the UK's oil refinery production

19,000 people are employed in the energy sector.

55,000 people are employed in manufacturing and engineering, 15% of employment in the region.



The steel industry employs

10,000 people

with an average wage of **£35,000**

Overall, there are approximately

29,000 businesses

in the region providing over 400,000 jobs for the local area.

The region has over **20+ onshore wind farms**, which alone provide power for over **200,000 UK homes** and provides access to over **400 offshore wind turbines**. It currently deploys **1.87GW of power** with a further **11GW to be commissioned by 2030**. **85% of the UK's planned development**

Hy-Impact Series Study 1: Hydrogen for economic growth



Unlocking jobs and GVA whilst reducing emissions in the UK

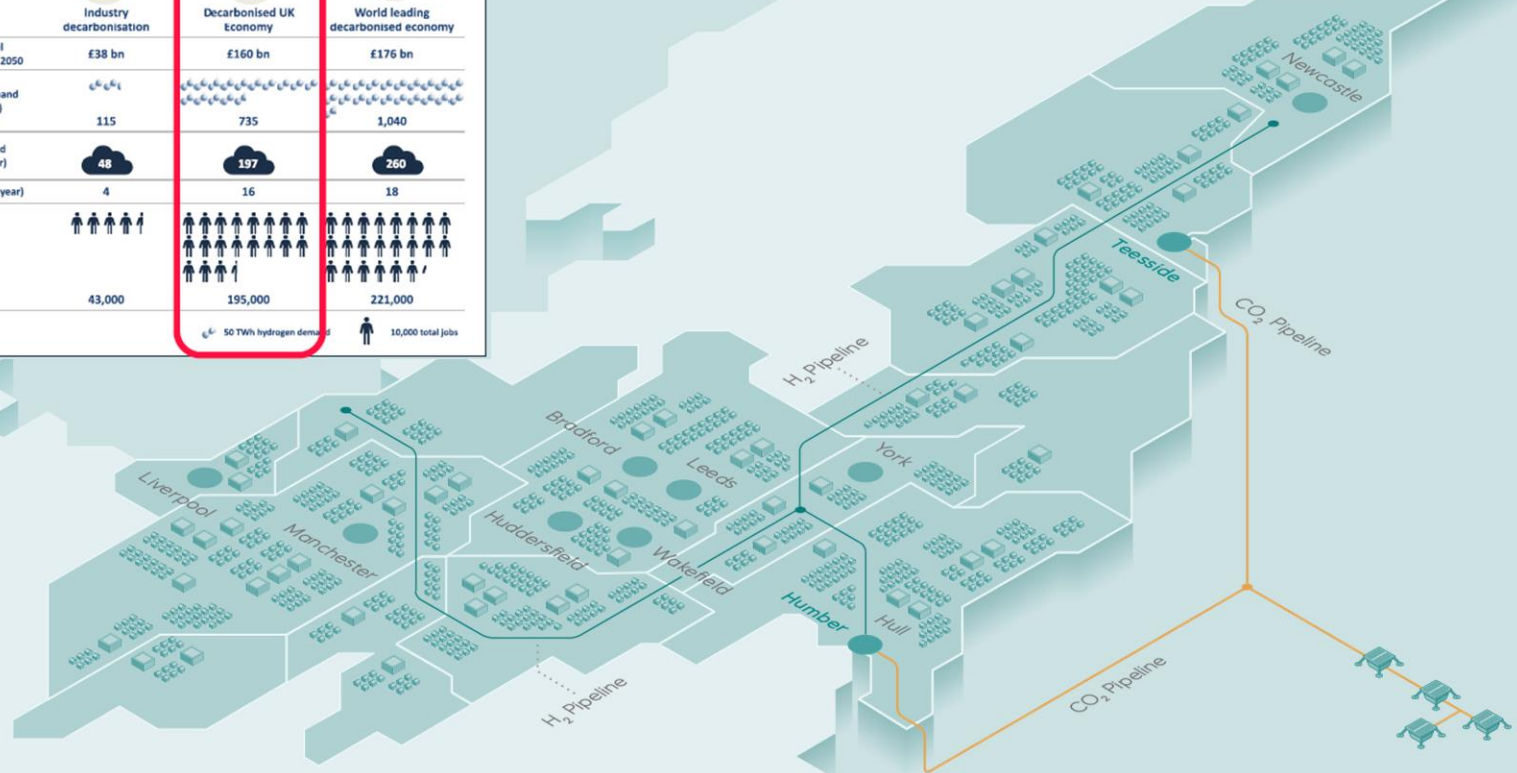
	Industry decarbonisation	Decarbonised UK Economy	World leading decarbonised economy
2050			
Total capital expenditure by 2050	£38 bn	£160 bn	£176 bn
Hydrogen demand (TWh/year)	115	735	1,040
CO ₂ captured (MtCO ₂ /year)	48	197	260
GVA (£ billion / year)	4	16	18
Total jobs	43,000	195,000	221,000

50 TWh hydrogen demand 10,000 total jobs

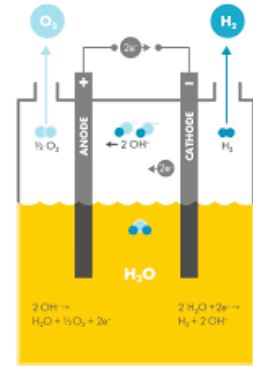
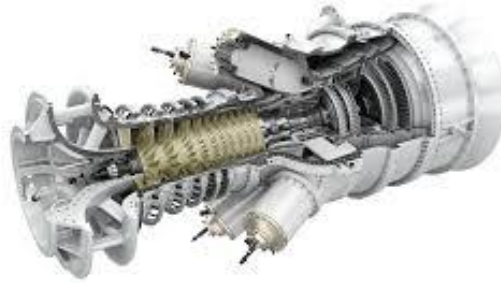
H21 North of England

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Total jobs	43,000	195,000	221,000

 50 TWh hydrogen demand
  10,000 total jobs



Supply Chain Opportunities for Energy Transition



Shell Hydrogen Study © Shell

