



equinor

H2H Saltend

The first step to a
Zero Carbon Humber





The UK's ambitious climate targets deserve equally ambitious solutions that build on UK strengths. This project represents a bold but practical first step towards delivering the world's first net zero industrial cluster by 2040. This is an unparalleled project, location and partnership that can play a leading role in the UK's journey to net zero by 2050, renew the UK's largest industrial cluster, and unlock technology that will put the UK at the forefront of a global hydrogen economy.

Irene Rummelhoff
Executive Vice President,
Marketing, Midstream & Processing (MMP)
Equinor

ZEROCARBON
HUMBER

This project forms part of the Zero Carbon Humber vision to build the world's first zero carbon industrial cluster and decarbonise the North of England.

www.zerocarbonhumber.co.uk

Putting the Humber at the heart of the UK's low carbon future and a global hydrogen economy.



Why the Humber?

The Humber region is rich in industrial expertise and diversity at a scale that is unrivalled anywhere else in the UK. H2H Saltend will build upon the Humber's unique qualities and its geography to deploy and grow the UK's first low carbon infrastructure for hydrogen and carbon dioxide (CO₂) emissions.



Why hydrogen?

Switching from fossil fuels to low carbon hydrogen is pivotal in launching the UK on its way to net zero by 2050. Hydrogen provides a practical, scalable solution to decarbonise existing industries that currently depend on fossil fuels. An established hydrogen economy in the Humber is well-positioned to support the UK's future decarbonisation, with endless possibilities to adapt.



Why Equinor?

Experience matters. Equinor has over 20 years' experience in safely storing carbon emissions and producing hydrogen from natural gas. Equinor has supplied energy to the UK for over 35 years and is proud to be part of the Zero Carbon Humber alliance that seeks to make the region the UK's first net zero industrial cluster.

H2H Saltend is one of the first of its kind in the UK.

- 1st** The first demonstrator of blue hydrogen at scale to switch existing power and industry to low carbon fuel.
- 1st** The first at-scale production of low carbon chemicals.
- 1st** The UK's first low carbon infrastructure for hydrogen and CO₂ emissions.

1 The Humber industrial cluster

The Humber represents the greatest opportunity for a decarbonised industrial hub and a hydrogen economy in the UK. Deploying low carbon hydrogen infrastructure in the region will demonstrate UK leadership in the Race to Zero. As the UK's largest industrial cluster by size, emissions and geography, it offers significant potential, and is close to the UK's most extensive geological CO₂ storage in the Southern North Sea.

2 The kick-starter: the H2H Saltend project

As part of the Zero Carbon Humber ambition, the Hydrogen to Humber Saltend (H2H Saltend) project is a fitting way to launch the decarbonisation of the region. Anchored at Saltend Chemicals Park, a cluster of world-class chemicals and renewable energy businesses, H2H Saltend will facilitate the deployment of infrastructure for blue hydrogen and CO₂ emissions at the heart of the Humber industrial cluster.

3 The switch: growing hydrogen across the Humber

Blue hydrogen production can be scaled up to allow timely fuel switching by users across the Humber. It can form the basis for a developed hydrogen market, including for growing levels of green hydrogen, and in the longer run help start a global trade of hydrogen. Critical industries across the region will be able to connect into the hydrogen and CO₂ infrastructure as it grows, and either fuel switch or capture their emissions.

4 The reward: opportunities for global trade

The H2H Saltend project will open up new export opportunities for hydrogen and low carbon chemicals. The Humber's location provides easy access to world markets via the Port of Hull and the Port of Immingham. This offers the UK the opportunity to become a world leader in the trade and export of low carbon products into a global marketplace, and share expertise built up in the region.

5 The advantage: practical experience in low carbon

Equinor is a leader in low carbon technologies and has the necessary experience and expertise to deliver the H2H Saltend project. Equinor has been investing in low carbon energy solutions for more than 20 years, and owns and operates the only two commercial Carbon Capture and Storage (CCS) projects in Europe. Equinor supplies natural gas to the UK with one of the lowest carbon footprints in the industry and is building the world's largest offshore wind farm in the UK at Dogger Bank with SSE.

6 The vision: a Zero Carbon Humber

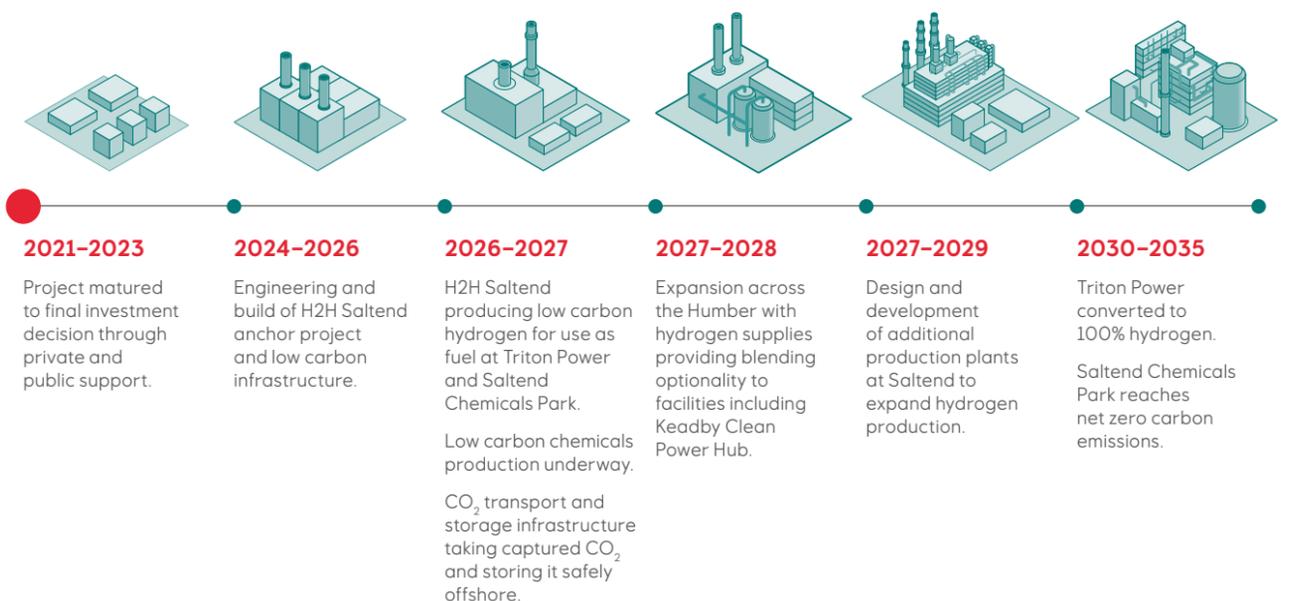
The Humber is united in its ambition to decarbonise and committed to leading the way to a net zero and hydrogen future. Home to a huge variety of industries and world-leading businesses, the region represents a diverse partnership coming together to deliver the world's first decarbonised industrial cluster and a Zero Carbon Humber.

Growing impact at every step

H2H Saltend project timeline

Local results

Regional impact



The time to act is now.
The UK must grow its economy while delivering on its net zero ambition.
A high value, low carbon recovery is the answer.

Countdown to net zero

10 million tonnes

The UK Committee on Climate Change has recommended that two industrial clusters should capture at least 10 million tonnes per year of CO₂ by 2030, and at least one of them should involve substantial production of low carbon hydrogen. The Humber represents the UK's best opportunity to develop the world's first hydrogen economy.

Net Zero: The UK's contribution to stopping global warming

As specified in the Paris Agreement, we must limit the rise of global average temperatures to well below 2°C in order to limit the harmful effects of global warming. To do this, we must reduce the volume of greenhouse gases that are released into the atmosphere.

CO₂ emissions are one of the key contributors to global warming. Some of the biggest emitters are energy-intensive industrial clusters. The Humber is the UK's largest industrial cluster and alone emits over one third of the emissions from the UK's six largest industrial clusters. Decarbonising industrial clusters significantly reduces emissions while protecting existing jobs, creating new ones and positioning the UK to trade in the growing green products market.

The time to act is now. In its substantial report, *Net Zero: The UK's contribution to stopping global warming*, The Committee on Climate Change stressed the need to replace fossil fuels with cleaner alternatives. At-scale production of low carbon hydrogen is needed by 2030 alongside Carbon Capture and Storage (CCS) infrastructure in order to achieve the UK's 2050 net zero target. There is now a race against time to deploy low carbon infrastructure and utilise the most effective technologies to make the greatest reduction in CO₂ emissions.

In addition to climate change commitments, countries are prioritising cleaner, sustainable economic growth after the devastating impact of the global coronavirus (COVID-19) pandemic. Local economies and industrial hubs across the UK have been affected. A low carbon economic recovery is needed to drive growth while staying on track to achieve climate targets.



Blue hydrogen is low carbon hydrogen produced from natural gas with the associated CO₂ captured and safely stored. **Green hydrogen** is low carbon hydrogen produced by electrolysis of water using renewable electricity.

Fuel switch

Fuel switching is the process of changing current fuel sources to greener alternatives. For example, a power station that burns natural gas can be fuel-switched in whole or in part to hydrogen, lowering its carbon footprint.

The challenge

Delivering a low carbon recovery

The UK government has set an ambitious target to reduce greenhouse gas emissions to net zero by 2050. One of the key focus areas for policy is the decarbonisation of industrial clusters and their significant single-source emitters.

The UK's Industrial Decarbonisation Challenge aims to develop and deploy low carbon technologies in order to accelerate the cost-effective decarbonisation of industry. By the mid-2020s, low carbon infrastructure will be deployed at scale, boosting the competitiveness of key industrial regions.

The solution

A switch to hydrogen

An ambitious target requires ambitious but real-world solutions. Decarbonising industrial clusters can be delivered through at-scale hydrogen production, enabling fuel switching from unabated fossil fuels to low carbon hydrogen. This journey is achievable through a blue hydrogen expansion strategy to create a hydrogen market, facilitating the entry of growing amounts of green hydrogen over time. This is exactly what the Hydrogen to Humber concept will achieve, with H2H Saltend acting as the kick-starter project to decarbonise the entire industrial cluster.

1.

The Humber industrial cluster

The Humber represents a unique opportunity to launch the world's first hydrogen economy in the UK.



The Humber region is the UK's biggest industrial economy, employing 55,000 people in the manufacturing sector alone.¹

The UK's largest industrial cluster

As the UK's largest industrial cluster in terms of geography, energy use and emissions, the Humber presents a unique opportunity to decarbonise industry at scale. Saltend Chemicals Park, located to the east of Hull, has emissions comparable to the Teesside or the Merseyside industrial cluster. Hence, the Humber industrial cluster has the greatest potential to contribute the largest reduction in CO₂ emissions and help the UK reach net zero.

The UK's biggest industrial economy

The Humber region is also hugely important to the UK economy. It contributes £18 billion each year to UK Gross Value Added. A quarter of this comes from the manufacturing industry, which employs 55,000 people.²

It has been estimated that fuel switching to hydrogen could create 43,000 new jobs in the UK across just five energy-intensive sectors, and this could increase by a further 175,000 with the UK building a world-leading low carbon economy. Most of this growth is likely to be concentrated around the Humber and other industrial clusters.³

Carbon taxation is another economic reason to prioritise the development and deployment of low carbon technologies and infrastructure. It is estimated that by 2040, firms in the region could save up to £2.9 billion per annum by capturing and storing rather than releasing their CO₂ emissions.⁴

43,000

Fuel switching to hydrogen could create 43,000 jobs across just five energy-intensive sectors in the UK.

Hy-Impact Series Study 1: Hydrogen for economic growth

+ £18bn

The Humber contributes £18 billion to UK Gross Value Added every year.

Hy-Impact Series Study 1: Hydrogen for economic growth



The Humber is the closest industrial cluster to Endurance, the most well-understood geological storage site for CO₂ emissions in the Southern North Sea.

The ideal location to unlock impact

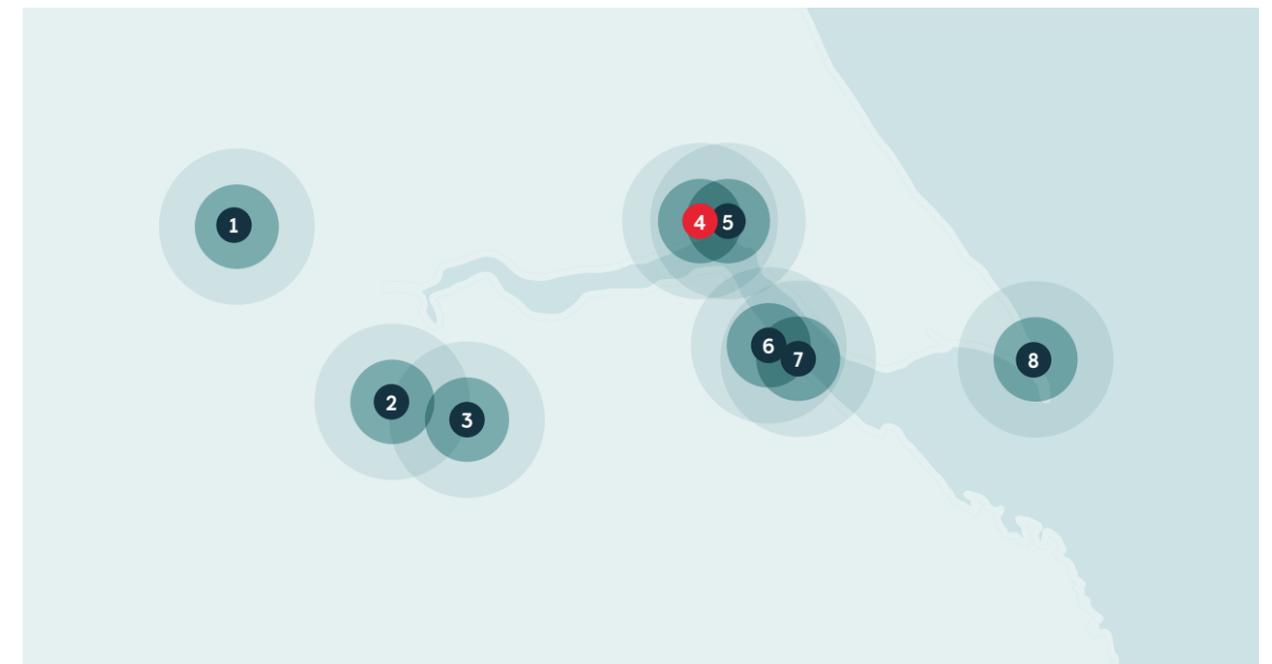
The Humber is well-positioned for the most effective deployment of hydrogen and Carbon Capture and Storage (CCS) infrastructure. It is the closest cluster to the Endurance aquifer, a large potential carbon storage site in the Southern North Sea. Endurance is the most well-understood geological store thanks to extensive development work undertaken by industry experts.

In Equinor's opinion, Endurance represents one of the best geological features considered in the UK Continental Shelf to date. Its development is very well matured with supporting validation of seismic data giving high confidence in the ability of the store to deliver large scale, long term safe storage of CO₂.

The Humber's close proximity to Endurance would minimise cost, time to build and disruption during the deployment of the required low carbon infrastructure. It therefore presents a technically credible opportunity to develop a low carbon industrial cluster by 2030. This can then expand to become a net zero cluster by 2040 with a supply chain of credible projects and a long-term CO₂ storage strategy.

The impact of decarbonising the Humber will be felt across the country. Industries within and beyond the Humber will be able to share low carbon infrastructure which will have the ability to quickly scale capacity, becoming rapidly cost-effective.

Key locations in the Humber industrial cluster



- 1 – Drax power station
- 2 – Keadby power station (SSE)
- 3 – British Steel steelworks

- 4 – Saltend Chemical Park
- 5 – Port of Hull (ABP)
- 6 – Immingham refineries

- 7 – Port of Immingham (ABP)
- 8 – Easington gas terminal

1, 2, 4 – Zero Carbon Humber, Capture for Growth Report
3 – Hy-Impact Series Study 1: Hydrogen for economic growth

At the heart of UK industry

The Humber region is home to large and diverse industries. It has a history of welcoming and supporting ambitious industrial, low carbon and renewable energy projects. The Humber will soon receive electricity from Dogger Bank, the world's largest offshore wind farm, and already does so from Europe's largest renewable energy project at Drax.

The large biofuel potential at the Vivergo Fuels plant also demonstrates the Humber's commitment to investing in sustainable fuel for the future. This shared vision provides an opportunity for low carbon infrastructure to be shared between industries, increasing its reach and cost-effectiveness.

Equinor is committed to investment in the Humber region and has a track record of working in partnership with world-class companies on world-changing projects. Through the Zero Carbon Humber alliance, Equinor is partnering with leading businesses in the region to deliver cutting-edge technologies to decarbonise the Humber industrial cluster.

If H2H Saltend is delivered with private and public support, the Zero Carbon Humber partners will collaborate to develop the Humber into the UK's, and the world's, first net zero industrial cluster.

12%

The chemicals and refining sector in the Humber industrial cluster account for 12% of total employment in the UK chemicals sector, second only to North-West England.

Zero Carbon Humber, Capture for Growth Report



Largest industrial clusters by emissions

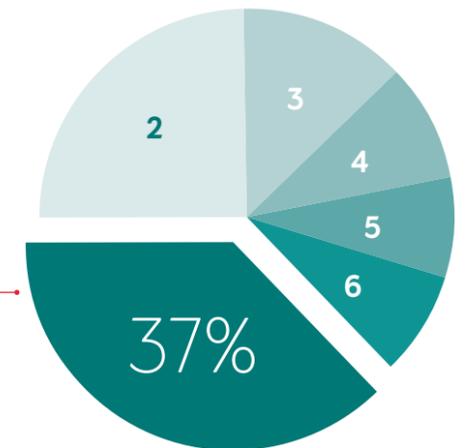
BEIS, Industrial Clusters Mission Infographic

- 1 **The Humber**
12.4MtCO₂
- 2 **South Wales**
8.2MtCO₂
- 3 **Grangemouth**
4.3MtCO₂
- 4 **Teesside**
3.1MtCO₂
- 5 **Merseyside**
2.6MtCO₂
- 6 **Southampton**
2.6MtCO₂

55,000 jobs

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

Zero Carbon Humber, Capture for Growth Report



Net zero starts here

As the largest industrial cluster, the Humber emits more CO₂ than any other UK industrial cluster: one and a half times more than the second largest cluster. By delivering clean hydrogen and enabling low carbon infrastructure, this project will kick-start the Humber's decarbonisation process, taking an important step in the UK's journey to net zero.

The heavy concentration and variety of industries in the Humber represents a significant decarbonisation proposition.

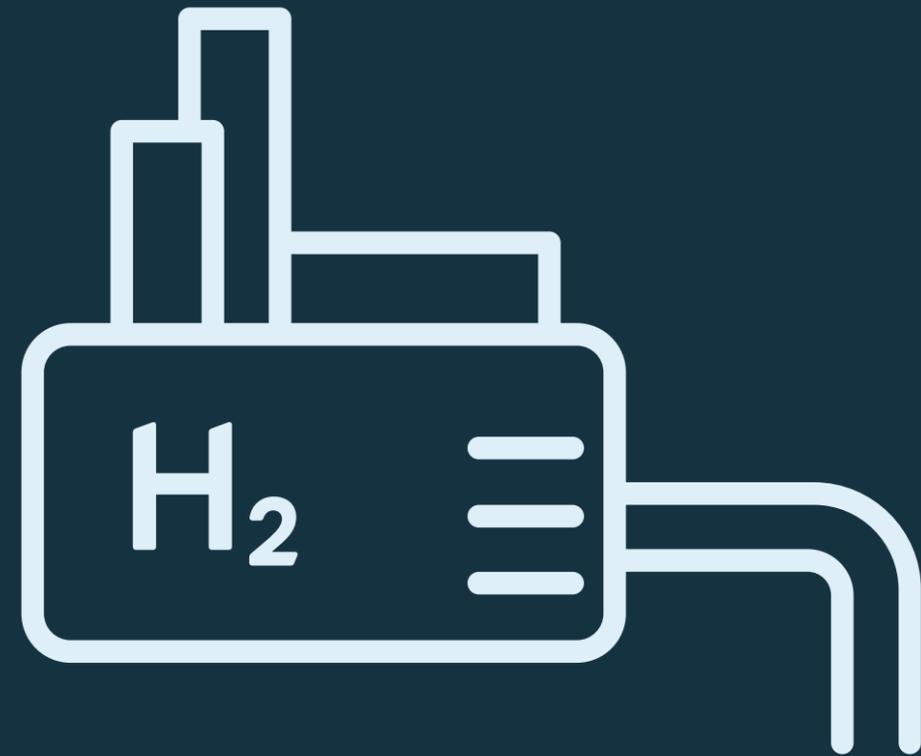
These large industries have the ambition and scale to take advantage of multiple low carbon technologies. These include at-scale fuel switching, bio-energy with CCS, and post-combustion capture methods.

The Humber industrial cluster has the potential to reach net zero by 2040 by showcasing a full range of decarbonisation technologies. This would put a global spotlight on the UK and generate jobs by leading a new worldwide market.

2.

The kick-starter The H2H Saltend project

Saltend Chemicals Park is the kick-starter for the hydrogen revolution in the UK.



Fuel-switching industry and power



Low carbon chemicals for export and maritime fuel-switch



Decarbonising domestic heat

Companies at Saltend Chemicals Park

ABP | ASSOCIATED
BRITISH PORTS



centrica

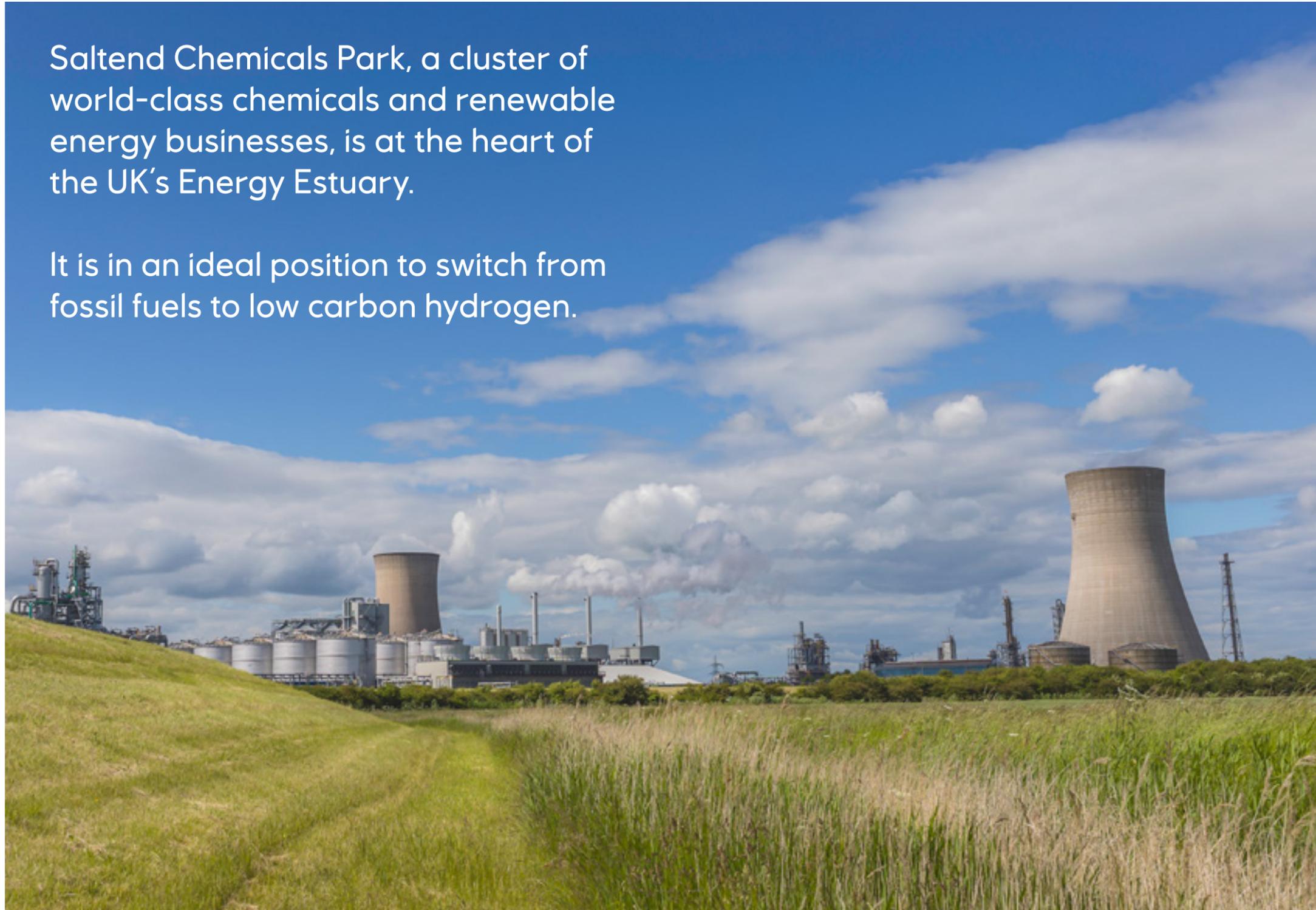
MHPS



TRITON POWER

Saltend Chemicals Park, a cluster of world-class chemicals and renewable energy businesses, is at the heart of the UK's Energy Estuary.

It is in an ideal position to switch from fossil fuels to low carbon hydrogen.



A unique location

Saltend Chemicals Park is in a unique location, close to potential carbon storage facilities in the Southern North Sea and adjacent to the Port of Hull, one of the busiest ports in the country. This provides easy access to global markets for the export of low carbon products and potential imports of CO₂ for storage.

Foundations for success

Saltend Chemicals Park is home to an ideal combination of power and industry to deliver cost-effective decarbonisation. The integrated nature of the existing infrastructure means that, by switching fuel from natural gas to low carbon hydrogen, multiple end-users can easily achieve decarbonisation by utilising shared low carbon infrastructure.

Saltend Chemicals Park produces millions of tonnes of petrochemicals every year which are essential for everyday items from clothing to paint and pharmaceuticals to packaging. Decarbonising Saltend Chemicals will, by association, decarbonise the chemicals produced there and the products made from those chemicals. This will kick-start the world's first production of low carbon chemicals and a competitive low carbon export economy.

H2H Saltend will see CO₂ emissions reductions from the outset. 900 thousand tonnes of CO₂ emissions can be saved each year in the first phase of H2H Saltend. This will lead the way for the Park to achieve net zero by 2035 – a UK first.

25km

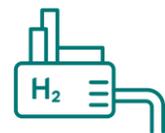
Saltend Chemicals Park is 25km from Easington, the planned access point to carbon storage facilities in the Southern North Sea.

Combining technologies to create an integrated low carbon solution.

1 Hydrogen produced at scale to replace natural gas.



2 CO₂ captured and stored in safe offshore sites.



Hydrogen from H2H Saltend will enable flexible, low carbon power generation for Saltend Chemicals Park.

This world-leading project requires serious commitment in low carbon infrastructure anchored in the Humber. To switch Triton Power's gas-fired power plant from fossil fuels to hydrogen, an Auto Thermal Reformer (ATR) of 600MW or more will need to be constructed to produce blue hydrogen. This will initially be blended at 30% (or higher) with natural gas in the Mitsubishi Hitachi Power Systems (MHPS) turbines at the power plant. Switching at least 30% of the natural gas to hydrogen will significantly reduce the emissions associated with power and steam production.

The interconnected nature of the industries at Saltend Chemicals Park present a unique opportunity for world-leading decarbonisation across the site by maximising use of shared infrastructure to create cost-effective and innovative emissions reduction solutions.

In addition, other industrial users at Saltend Chemicals Park will also be able to fuel switch from natural gas to hydrogen. This includes the flexibility to blend into the Hull gas network that is located directly adjacent to the site. Hence H2H Saltend has the ability to support the decarbonisation of domestic heat as well as power and industry.

The CO₂ by-product from hydrogen production will be captured, transported and stored deep under the seabed in safe, natural offshore storage facilities. Endurance is one of the best understood options in the UK for CO₂ storage. A 25km onshore pipeline will be constructed through open farmland to transport CO₂ from Saltend Chemicals Park to the proposed landfall at Easington.

Saltend Chemicals Park benefits from easy access to the Humber's deepwater shipping channel. This has potential for low carbon chemicals produced at Saltend to be exported in the global market.

Low carbon chemicals can also be used as maritime fuel, helping to reduce shipping emissions. This supports the International Maritime Organisation's (IMO) target to halve global shipping emissions by 2050. The potential for maritime fuel switching could also make the Port of Hull the first in the world to offer low carbon refuelling.

How the impact of H2H Saltend scales over time

Initial stage 2026-2027

Blue hydrogen blended at 30% with natural gas to power MHPS turbines at Triton Power's power plant.

H2H Saltend captures up to 1.4 million tonnes of CO₂ in its first year of operation.

CO₂ transport and storage infrastructure in use.

Other industrial customers are switched to 100% hydrogen.

Low carbon chemicals are produced for export or as maritime fuel.

2030

H2H Saltend will have captured up to 8.25 million tonnes of CO₂.

2035

Saltend Chemicals Park to reach net zero carbon emissions.

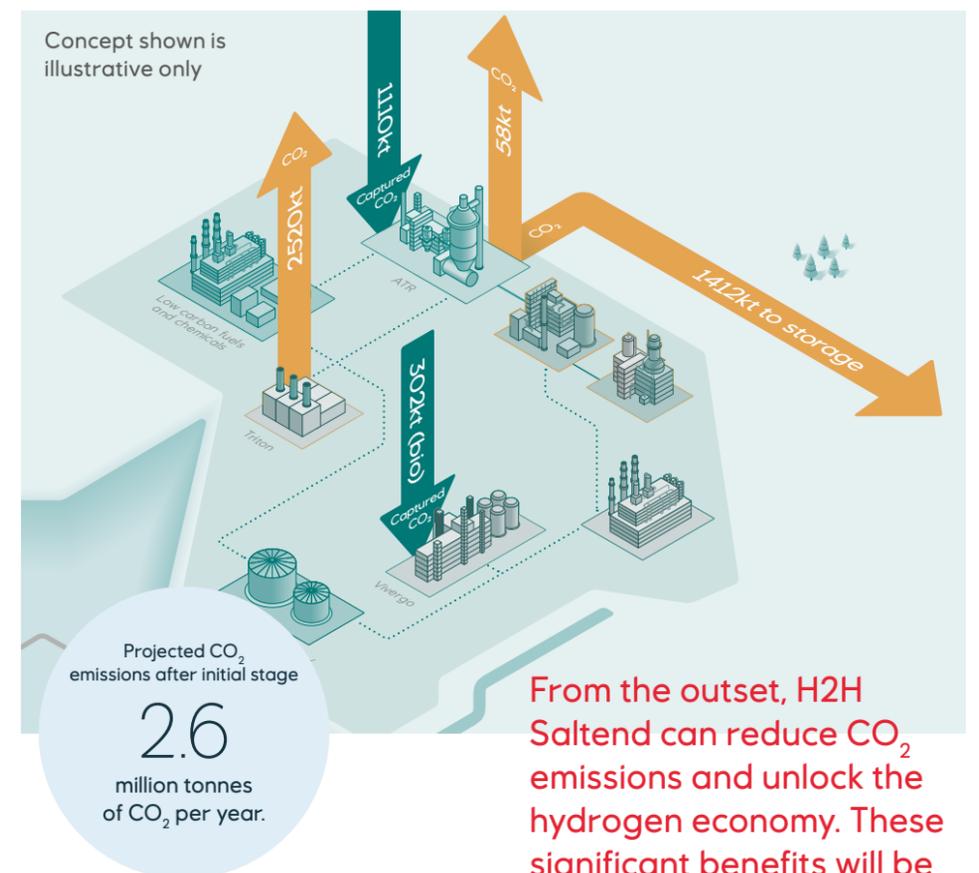
2040

The Humber will be the UK's first decarbonised industrial cluster.

2050

UK's target to reach net zero carbon emissions.

IMO's target to halve global shipping emissions.



From the outset, H2H Saltend can reduce CO₂ emissions and unlock the hydrogen economy. These significant benefits will be delivered through private and public collaboration.

3.

The switch Growing hydrogen across the Humber

The technology exists today to produce low carbon hydrogen at scale, whilst collecting CO₂ and safely storing it deep under the seabed.

Blue hydrogen is widely regarded as the most cost-effective means of producing low carbon hydrogen at scale.

How blue hydrogen works

Hydrogen is the ultimate fuel of the future. It is the most abundant molecule in the universe, but on Earth free hydrogen does not exist in significant quantities, which is why it must be produced from alternative sources.

Blue hydrogen is produced at scale by splitting natural gas into hydrogen and CO₂. The hydrogen is then used as fuel for power and industry customers and the CO₂ by-product is captured and safely stored.

H2H Saltend is designed to capture at least 95% of the CO₂ by-product from the production of blue hydrogen, significantly lowering the carbon footprint of power and industry customers that fuel-switch.

95%

At least 95% efficiency in capturing CO₂ when producing blue hydrogen.

Due to the readily available supplies of natural gas to the UK, and a supply chain that largely already exists, blue hydrogen is well-placed to provide cost-effective hydrogen at scale.

With increasing levels of electrification and renewables, green hydrogen is expected to play a larger role over longer timescales, first supplementing and then replacing blue hydrogen.

The infrastructure deployed as part of the H2H Saltend project will allow a seamless shift to blue and green hydrogen in the future.

Analysis by Aurora Energy Research sets out that a hydrogen pathway utilising the UK's comparative advantage in blue hydrogen and CCS could make the UK a leader in hydrogen production costs until merchant green hydrogen becomes competitive in 15–20 years.

Aurora Energy Research, Hydrogen for a Net Zero GB: an integrated energy market perspective

Future-proof investment

H2H Saltend will help the UK meet its energy needs while moving to net zero. It can also flex to align with future government priorities and policy.

Once the infrastructure has been established, there are a number of routes open to roll out low carbon hydrogen across different sectors including heat, power, industry and transport, in line with government policy. Investing in H2H Saltend now future-proofs the region by establishing two infrastructure systems in one: a hydrogen transmission system and a Carbon Capture and Storage (CCS) system linking to CO₂ storage in the Southern North Sea. The hydrogen transmission system will, over time, transport both blue and green hydrogen to customers across the region.

Keeping pace with demand

At-scale fuel switching to blue hydrogen is the most effective way to significantly reduce CO₂ emissions as soon as possible. It is a low risk opportunity for decarbonisation that can adapt with future increases in sustainable energy sources.

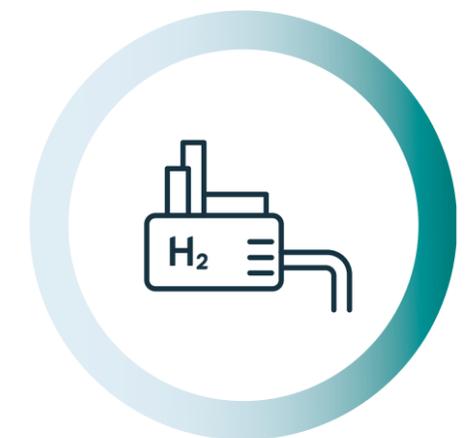
In the interim between now and a fully sustainable future, it is important to take significant and impactful steps to reduce emissions. Fuel switching to blue hydrogen is the most viable technical solution available, and is a pathway that links the fuel source that dominates today to a more sustainable future.

Renewable power continues to grow but most of the UK's energy system still relies on oil and natural gas. For the UK to reach its climate targets, these fuels must be replaced with low carbon alternatives, starting with blue hydrogen and progressing to higher levels of green hydrogen. Fuel switching is the stepping stone to a fully sustainable energy system.

Projected use of hydrogen across the UK economy by 2050

The Committee on Climate Change predicts that by in 2050, production of blue hydrogen will be four times that of green hydrogen. Together, blue and green hydrogen will meet the projected energy demands of industry, heat transport and shipping, whilst lowering the carbon footprint of the UK.

Net Zero: The UK's contribution to stopping global warming



There is significant potential to rapidly expand the low carbon revolution that starts at Saltend Chemicals Park.

Building momentum



H2H Saltend could provide low carbon chemicals to act as marine fuels, making the Port of Hull one of the first in the world to offer low carbon maritime refuelling.

H2H Saltend can be expanded to take Saltend Chemicals Park to net zero CO₂ emissions by 2035, paving the way for the Humber to become the world's first decarbonised industrial cluster by 2040.

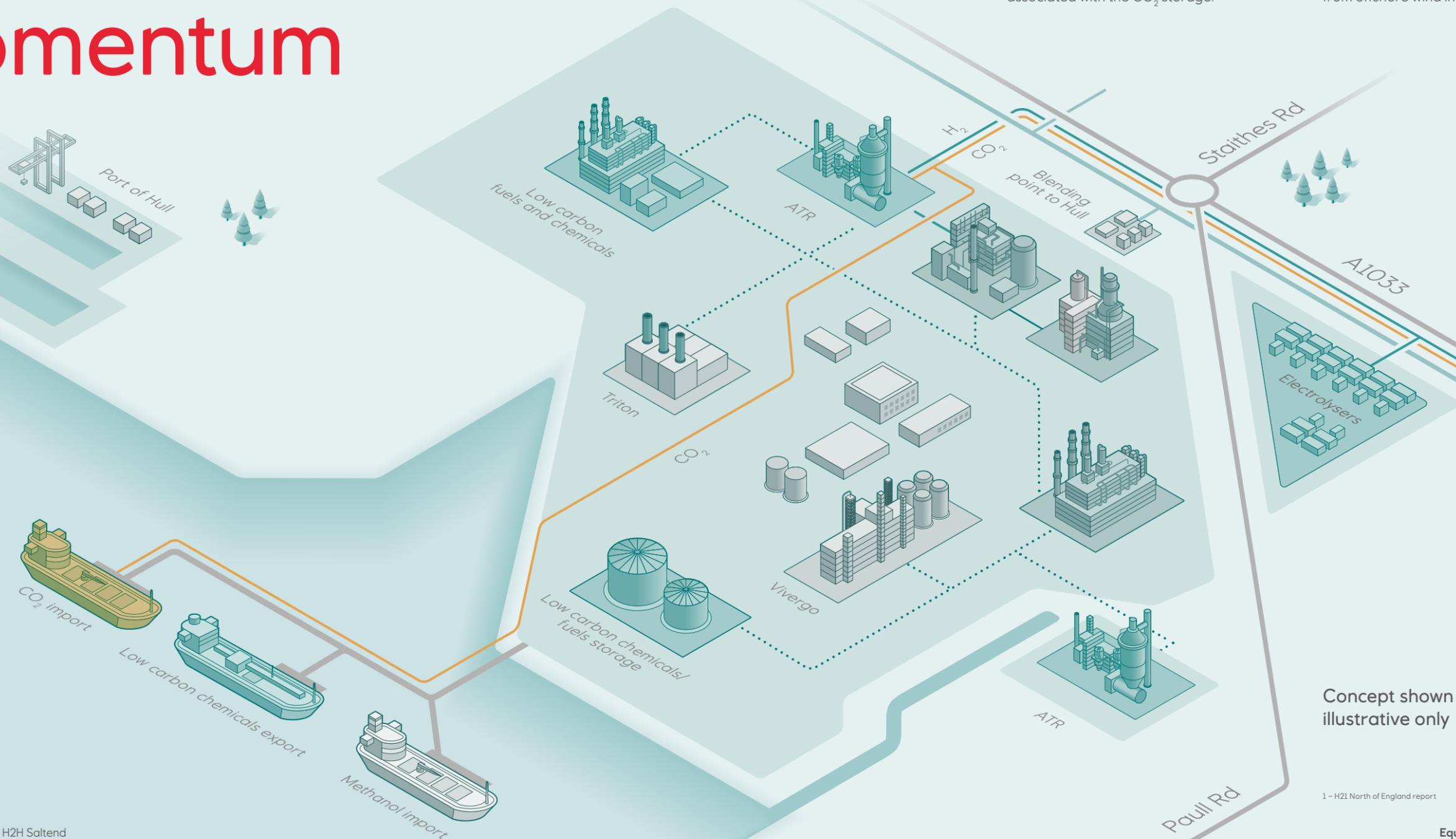
Low carbon chemicals produced at Saltend Chemicals Park can provide competitive low carbon products for export, demonstrating cleaner growth in the region.

The CO₂ transport and storage infrastructure will be designed to expand across the Humber region, lowering the threshold for all Humber industries to connect. This will rapidly reduce emissions in the Humber and drive down costs associated with the CO₂ storage.

Eventually this system could allow CO₂ to be imported by ship from other industrial clusters lacking access to CO₂ storage facilities.

The hydrogen produced at Saltend Chemicals Park can be utilised for cross-sector decarbonisation of industry, power, transport and heat. Future expansion of the project could see it produce enough blue hydrogen to start the decarbonisation of domestic heat in the north of England. This exciting potential is laid out in the H21 North of England report.¹

There is also the potential to incorporate green hydrogen production, making use of increasing supplies of renewable energy from offshore wind in the Humber.



Concept shown is illustrative only

¹ - H21 North of England report

Creating a wider impact

After the initial infrastructure is established, hydrogen production capacity can be increased across the Humber to large-scale, technology-ready customers. A complete fuel switch to hydrogen could mean that the Humber requires over 13 terawatt-hours of low carbon hydrogen for industry and 165 terawatt-hours for power by 2030.

The power stations at SSE's Keadby Clean Power Hub, including Europe's most efficient gas fuelled power station, are just one example of potential hydrogen users. Such access to hydrogen for fuel switching across industries in the Humber will allow sustainable and cost-effective decarbonisation over time.²

Once in place, the low carbon infrastructure could also be scaled up to connect to the metropolitan areas of Leeds, York and Bradford, further west to Manchester and Liverpool and north to the Teesside industrial cluster as set out in the H21 North of England report. This will create a network of low carbon hydrogen for industry, power and domestic heat. There is great potential to roll out low carbon hydrogen right across the north of England, making H2H Saltend the hydrogen kick-starter for the UK.³

There are many potential avenues to be explored for extending the low carbon economy beyond Saltend Chemicals Park and the Humber. The H2H Saltend project will facilitate the export of the world's first low carbon chemicals, giving the region the edge in competitive, low carbon products.

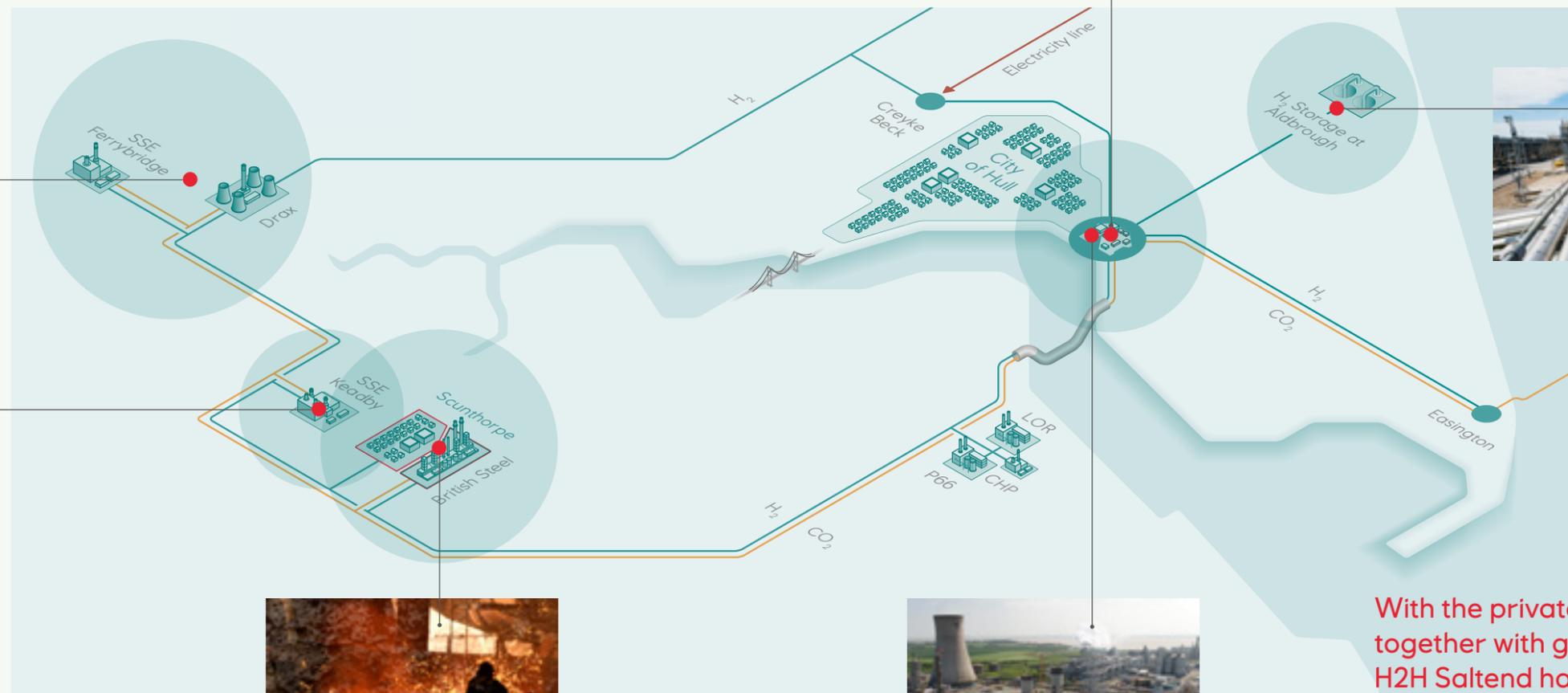
If the UK develops a world-leading hydrogen economy, the expansion of low carbon infrastructure could generate over 200,000 jobs and add £16 billion each year to the UK's economy.¹



Expansion of hydrogen production and transmission system further west towards Drax and Ferrybridge.



Transmission of hydrogen produced at Saltend will provide the option for decarbonisation at SSE Keadby Clean Power Hub.



Development of green hydrogen production at Saltend Chemicals Park through electrolysis.



H2H Saltend enables the decarbonisation of industry and power across the Humber region and can expand further to deliver low carbon energy in heat and transport too.



Potential to develop hydrogen storage at Aldrough.



Hydrogen available to support decarbonisation of British Steel, one of only two steelworks in the UK.



Expansion of hydrogen production capacity at Saltend (fuel switch at Triton to 100% hydrogen).

With the private sector working together with government, H2H Saltend has the potential to deliver meaningful impact to the region, the UK, and the wider world.

1, 2 - Hy-Impact Series: A summary of four studies assessing the role of hydrogen in the UK net-zero transition

3 - H21 North of England report

Building the value chain

With H2H Saltend as the kick-starter for low carbon infrastructure, hydrogen pipelines can expand across the Humber, transporting hydrogen for use by multiple industry and power customers. As demand increases, more ATRs can be built around Saltend and at appropriate industrial locations across the Humber, for example in the Immingham area.

By anchoring the low carbon infrastructure at Saltend Chemicals Park, it can be extended in all directions to allow fuel switching for many customers. The transmission of hydrogen produced at Saltend will offer the potential for decarbonisation at SSE Keadby Clean Power Hub. Extending pipelines to this part of the Humber would give other customers in the area the option to connect in and fuel switch.

45%

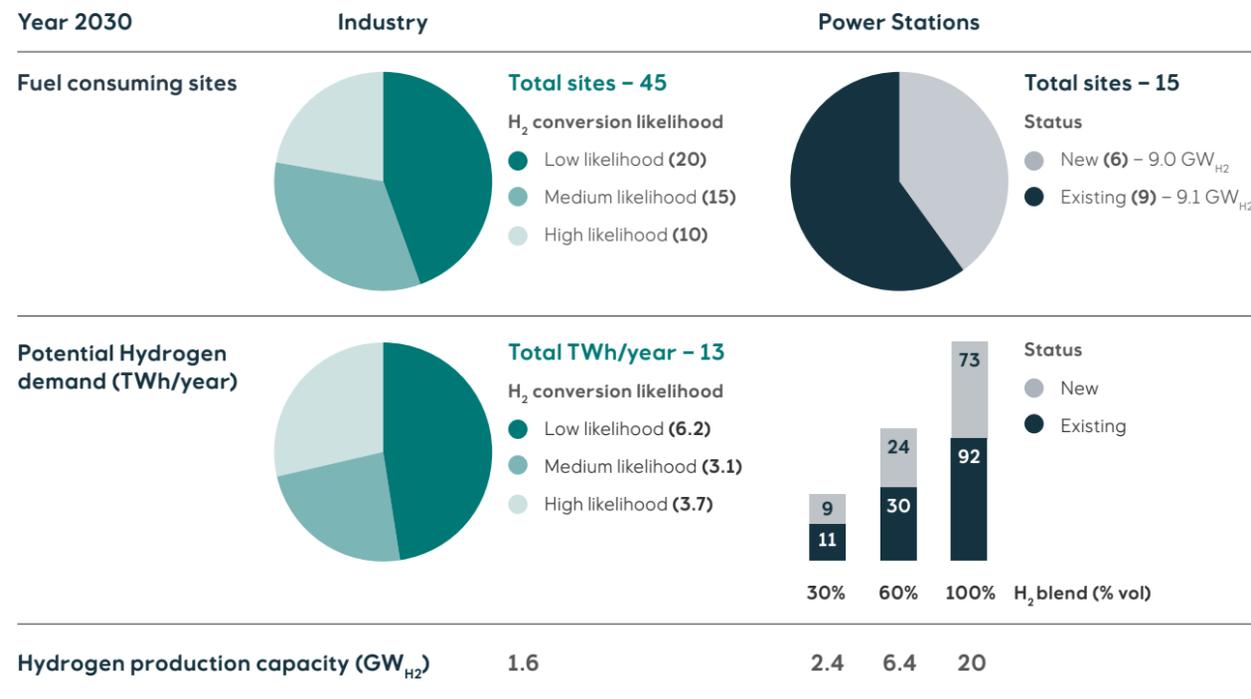
The UK could need up to 480 terawatt-hours of hydrogen by 2050, approximately 45% of total energy demand.

Aurora Energy Research, Hydrogen for a Net Zero GB: an integrated energy market perspective

60

60 potential industrial and power customers have been identified that can switch to low carbon hydrogen in the Yorkshire and Humber region.

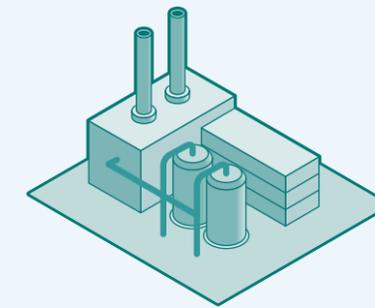
Overview of key results for the potential demand for hydrogen in the Yorkshire and Humber region



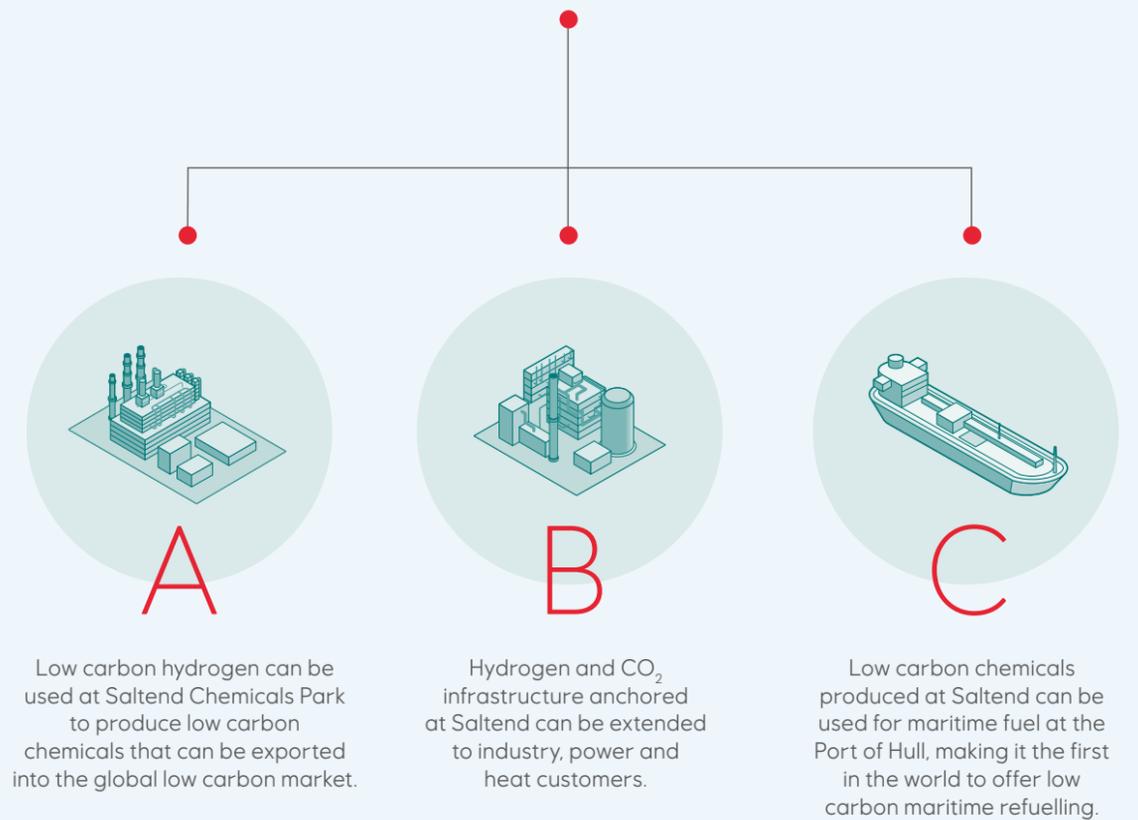
From Saltend, Low carbon infrastructure will be extended from Saltend, providing the flexibility for the Humber industrial cluster to meet future cleaner energy targets in line with government policy as it develops.

The world's first at-scale low carbon chemicals production at the H2H Saltend project will put the UK at the forefront of the global market in low carbon products, providing significant export potential.

Equinor's ambition is to expand the infrastructure at Saltend five-fold, enough for 3 gigawatts of blue and green hydrogen by 2030.



Low carbon infrastructure at Saltend Chemicals Park supplies low carbon hydrogen for energy and captures CO₂ emissions.



4.

The reward Global trade opportunities

The H2H Saltend Project will launch a new low carbon hydrogen economy with global potential.



In addition to generating low carbon energy in the Humber, hydrogen produced in the UK can be exported to new markets across the world.

Leading a new global economy



56% of all heat could be generated by hydrogen, as outlined in the H21 North of England report.

H21 North of England report



Northern Lights, an innovative new project in Norway led by Equinor, will be the world's first CO₂ storage facility that takes shipping imports. This new commercial CO₂ trade can be replicated in the Humber, boosting growth in the region.

Creating trade in low carbon products and carbon management

Once Triton Power has completed its partial switch to hydrogen, all the power and steam it produces and supplies to Saltend Chemicals Park will be lower carbon. All chemicals produced at Saltend will therefore have a reduced carbon footprint, increasing their competitiveness in an increasingly carbon constrained world. The creation of a global market of low carbon products, in addition to the knowledge and expertise of workers in the region, will put the Humber at the forefront of a global hydrogen economy.

An additional trade opportunity is to increase the utilisation of Carbon Capture and Storage (CCS) infrastructure by importing CO₂ from other regions. There is potential for CO₂ to be imported by ship, with Saltend Chemicals Park acting as a receiving terminal, then transported by pipeline and safely stored below the Southern North Sea. This allows other industrial clusters, in the UK and elsewhere, access to these carbon storage facilities, further increasing the cost-effectiveness of the low carbon infrastructure.

UK hydrogen economy

Anchoring low carbon hydrogen infrastructure at Saltend Chemicals Park is the first step to a UK hydrogen economy. Low carbon hydrogen production can be established in the Humber and then transported across the region. Hydrogen has great potential to be used for domestic transport and heat, converting everyday energy usage to cleaner, low carbon energy. The H21 North of England report outlines the potential to expand production in step with growing hydrogen demands from homes, businesses, power and transport across the UK.



Creating a global hydrogen economy

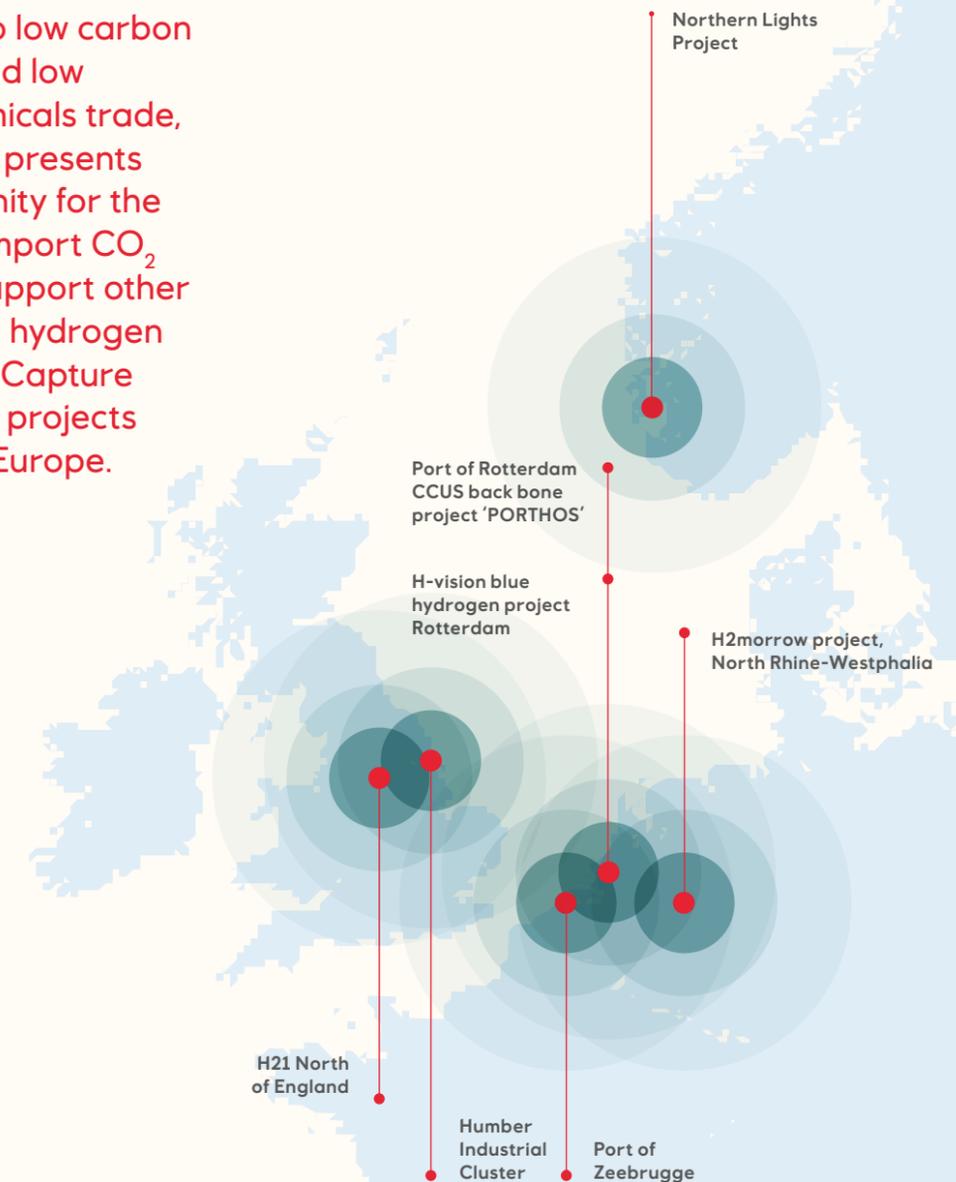
The successes at Saltend Chemicals Park can be replicated in industrial clusters across the world. First-movers will be best placed to reap the rewards and shape global market developments. This provides an ideal opportunity for the UK and the Humber to lead the way in hydrogen's global future.



Equinor is working with the maritime industry to develop the world's first supply vessel to run on zero-emission ammonia.

Photo: Eidesvik Offshore

In addition to low carbon hydrogen and low carbon chemicals trade, H2H Saltend presents the opportunity for the Humber to import CO₂ via ship to support other international hydrogen and Carbon Capture and Storage projects in Northern Europe.



5.

The advantage Practical experience in low carbon

Equinor is a leader in low carbon technologies. Working alongside our partners and peers in industry, we are dedicated to creating real change.



Equinor is an experienced low carbon operator and a values-driven organisation committed to turning natural resources into energy for people and progress for society.

Shaping the future of energy



To date, we have safely captured and stored over 23 million tonnes of CO₂.



We operate in over 30 countries in the world and have been an energy partner of the UK for over 35 years.

Forward-thinking and values-driven

Equinor is committed to investing in low carbon energy for now and the future. With an open and collaborative approach, working alongside industry peers, Equinor delivers long-term value to the communities in which it operates. Equinor is proud to collaborate with industry leaders to deliver cleaner growth within the Humber region, while seriously considering the global potential and environmental impact of its operations.

Equinor is the UK's leading energy provider. Its energy supplies from Norway meet more than one quarter of the UK's demand for natural gas and around one fifth of its demand for oil, both produced with one of the lowest carbon footprints in the industry.

It is also investing billions in crucial energy infrastructure. These include the Mariner oil field (one of the largest and most digitally advanced offshore investments in the UK over the last decade), Hywind Scotland (the world's first floating offshore wind farm) and Dogger Bank (the world's largest offshore wind farm and starting generation in 2023).

20 years of expertise

Although H2H Saltend is the first of its kind in the UK, hydrogen production and Carbon Capture and Storage (CCS) technology have been successfully developed in Norway for over 20 years. To date, Equinor has safely captured and stored over 23 million tonnes of CO₂ as part of multiple projects.

The Northern Lights project, Equinor's recent venture with Shell and Total, has recently announced a final investment decision. This project is an important milestone in developing a full-scale CO₂ handling chain in Norway and will be the first CO₂ storage facility able to store CO₂ from multiple industries and countries. This is a ground-breaking project that brings viable commercial CO₂ storage a step closer to realisation and could be replicated in the Humber.

Equinor is confident it can apply its expertise from these projects to the Humber, supporting the Zero Carbon Humber ambition to become the UK's and the world's first decarbonised industrial cluster.

Tried and tested

While some of these technologies are new to the Humber and the UK, Equinor has decades of experience in producing hydrogen and developing CCS, and has been involved in more than 40 projects worldwide. Deploying these technologies in the Humber will launch it and the UK into a new global marketplace where it can lead the world in offering low carbon products.

40

Equinor is involved in over 40 CCS projects around the world.



The Sleipner field in the North Sea

Since 1996, the Sleipner field has safely captured and stored over 1 million tonnes of CO₂ per year. Operated by Equinor and partners, it is the world's first offshore CCS plant.



Snøhvit natural gas field

Snøhvit is the first major development on the Norwegian continental shelf with no surface installations. Sub-sea production facilities supply natural gas to land for liquefaction and CO₂ is piped back for re-injection into a natural reservoir.

6.

The vision A Zero Carbon Humber

A region rich in industrial expertise and a project of unrivalled scale, coming together to deliver the first net zero industrial cluster.

This is an unparalleled opportunity to lower the carbon footprint of industry across the Humber and accelerate the UK towards its net zero ambitions.

Working together

H2H Saltend will be delivered by world-class companies working together to decarbonise the UK's largest industrial cluster, making it the first net zero industrial cluster in the world. Equinor is committed to working alongside its peers in industry to develop and deploy the low carbon technology and infrastructure needed to make this possible. Anchoring this technology at Saltend Chemicals Park will provide opportunities for the wider Humber region to access and use the low carbon infrastructure, maximising its use and making it more cost-effective.

A new hydrogen powerhouse

In order to decarbonise the Humber industrial cluster, low carbon infrastructure must be deployed efficiently and effectively. Anchoring the decarbonisation of the Humber region at Saltend Chemicals Park allows blue hydrogen to be produced at scale and delivered to industry for use as fuel. By converting Triton Power's gas-firing turbines to a blend of blue hydrogen and natural gas, all businesses that are supplied by power and steam from this plant will have a reduced carbon footprint. This is the first step to linking the whole Humber industrial cluster with low carbon infrastructure, creating the UK's first hydrogen powerhouse.

As part of the Zero Carbon Humber alliance, H2H Saltend brings together partners committed to decarbonising the UK chemicals sector and the Humber industrial cluster.



H2H Saltend will be the first of its kind in the UK

1

The UK's first low carbon infrastructure for hydrogen and carbon emissions.

H2H Saltend will deliver two low carbon infrastructure systems in one project: a CO₂ transport and storage system and a hydrogen production and transmission system. These will be the first of their kind in the UK.

2

The UK's first at-scale low carbon blue hydrogen production for existing power and industry.

Blue hydrogen produced at Saltend Chemicals Park will be a world first, produced at-scale with minimum 95% capture and 80% efficiency. It will be supplied to existing power and industry customers in the Humber.

3

The UK's first large scale low carbon chemical production.

The low carbon chemicals produced at Saltend Chemicals Park will be exported and could be used as maritime fuel at the adjacent facilities at the Port of Hull. This would be the first port in the world to offer low carbon maritime refuelling.

Switching on a hydrogen future

Hydrogen is the fuel of the future. H2H Saltend will deliver tangible reductions in CO₂ emissions starting in industry and power. It will deliver new low carbon infrastructure, create low carbon products for export, and accelerate the UK on its journey to net zero.

H2H Saltend is the launchpad for a hydrogen economy in the UK that will deliver low carbon energy to industry throughout the Humber region, demonstrating cleaner growth through the creation of a low carbon export economy.

Saltend Chemicals Park is an ideal site to efficiently and effectively deliver low carbon infrastructure to the largest industrial cluster in the UK, significantly reducing CO₂ emissions and leading the way for the Humber to become the world's first decarbonised industrial cluster by 2040.

Through private and public support, this project can help ensure the UK's commitment to net zero by 2050 is achieved, while encouraging cleaner economic growth and protecting and creating jobs in the process. Working with industry-leading partners, real-world results can be delivered quickly to reduce industrial emissions and then deliver further reductions as the infrastructure is rolled out. H2H Saltend has the potential to launch the UK into a new chapter of cleaner growth and global energy leadership.

In line with the UK's Industrial Clusters Mission and the Industrial Decarbonisation Challenge, H2H Saltend will deliver significant steps towards the UK's climate change goals.

H2H Saltend

Operational by 2026.	✓
Hydrogen at scale by 2030.	✓
Low carbon flexible power generation to complement renewable power.	✓
Costs significantly lower through the sharing of low carbon infrastructure.	✓
Potential for low carbon maritime fuels in line with international targets to halve shipping emissions by 2050.	✓
Opportunity for UK leadership in technologies, services and markets to produce low carbon industrial products.	✓
A low carbon economic recovery with sustainable jobs in the UK.	✓

H2H Saltend is the kick-starter to a Zero Carbon Humber. Working together with private and public sector support, the Humber can become the world's first net zero industrial cluster by 2040.

www.h2hsaltend.co.uk

www.zerocarbonhumber.co.uk

www.equinor.com/en/what-we-do/hydrogen.html

www.equinor.com/en/what-we-do/northern-lights.html

For any queries please contact equinoruk@equinor.com

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