Understanding the impacts of recent developments on the Humber Industrial Cluster Plan

FINAL REPORT

MAY 2024

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The Humber is one of the UK's biggest opportunities to reach net zero and deliver green jobs

Decarbonising the Humber is one of the UK's greatest opportunities and challenges as it strives to reach net zero by 2050. The Humber is the largest source of industrial emissions, and it currently supports over 360,000 jobs in emissions intensive but foundational sectors e.g., Iron and steel, power production and manufacturing. However, the Humber has an abundance of low carbon resources that can be utilised to create a low carbon hub of the future which can help decarbonise both the Humber and the wider UK.

In March 2023, the Humber Industrial Cluster Plan (HICP) provided a blueprint of mandates to enable decarbonisation in the Humber. This included actions such as large-scale carbon capture and storage (CCS) and hydrogen. All of which would require significant public and private investment in the Humber.

Since the HICP was released, there has been continued private ambition in the Humber but limited government support which has resulted in project delays. The impact of this is expected to be slower decarbonisation and uptake of key technologies, such as CCS and hydrogen.

This report examines the impacts that recent policy and project developments have on the scenarios and vision explored in the Humber Industrial Cluster Plan published in March 2023. Thanks to the IDRIC Funding and support from the University of Lincoln, CATCH and local stakeholder, ERM was able to re-run our modelling tools and provide a series of updated scenarios and analysis.

The impact is clear: delays to infrastructure are expected to result in 6-10 $MtCO_2$ additional emissions by 2030 compared to the original scenarios. However, the vision is not lost. The Humber can still reach net zero by 2040. It can still become a hub of CCS, hydrogen and low carbon technology which will support the UK to reach net zero by 2050. However, to ensure this can be achieved, the mandates from HICP need to be realised through Government support and continued private investment.

Silvian Baltac
Partner, ERM
Industrial Decarbonisation Lead

About this report

ABOUT ERM

Sustainability is our business. As the largest global pure play sustainability consultancy, ERM partners with the world's leading organizations, creating innovative solutions to sustainability challenges and unlocking commercial opportunities that meet the needs of today while preserving opportunity for future generations.

ERM's diverse team of 8,000+ world-class experts in over 150 offices in 40 countries and territories combine strategic transformation and technical delivery to help clients operationalize sustainability at pace and scale. ERM calls this capability its "boots to boardroom" approach - a comprehensive service model that helps organizations to accelerate the integration of sustainability into their strategy and operations.

ERM acquired Element Energy and E4tech in 2021, which are now fully integrated in ERM's Sustainable Energy Solutions (SES) team. The team consists of over 150 specialists bringing deep expertise in the development, commercialisation, and implementation of emerging low-carbon technologies across a wide range of sectors, including industrial decarbonisation (hydrogen, carbon capture utilisation and storage, electrification), low carbon fuels and chemicals, the built environment, smart energy systems, electricity and gas networks, low carbon transport and funded project management.

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A range of photos are used to enhance the visuals of this report including stock photos. While some Humber specific photos have been included, photos do not necessarily reflect the specific projects or locations discussed and are for aesthetic purposes only.

ABOUT THIS REPORT

One year on from the publication of the Humber Industrial Cluster Plan, ERM has re-run our modelling of the cluster to understand the impact of 2023 on the cluster plan scenarios. This report examines the impacts that recent policy and project developments have on the scenarios and vision for the region. It covers the following:

1. What is the Humber Industrial Cluster?
2. What happened in the Humber in 2023?
3. How does this impact the path to net zero?
4. Conclusions and recommendations

ACKNOWLEDGEMENTS

We would like to acknowledge that this work was supported by the UKRI ISCF Industrial Decarbonisation Challenge, through the UK Industrial Decarbonisation Research and Innovation Centre (IDRIC) award number: EP/V027050/1, under the Industrial Decarbonisation Challenge (IDC). We also thank the University of Lincoln, particularly Professor Joe Howe as academic cluster lead for the Humber, and Katie Hedges at CATCH for support co-ordinating the secondment.

1

What is the Humber Industrial Cluster?

The Humber is one of the UK's largest industrial clusters, supporting 360,000 jobs and contributing £18bn to the UK economy

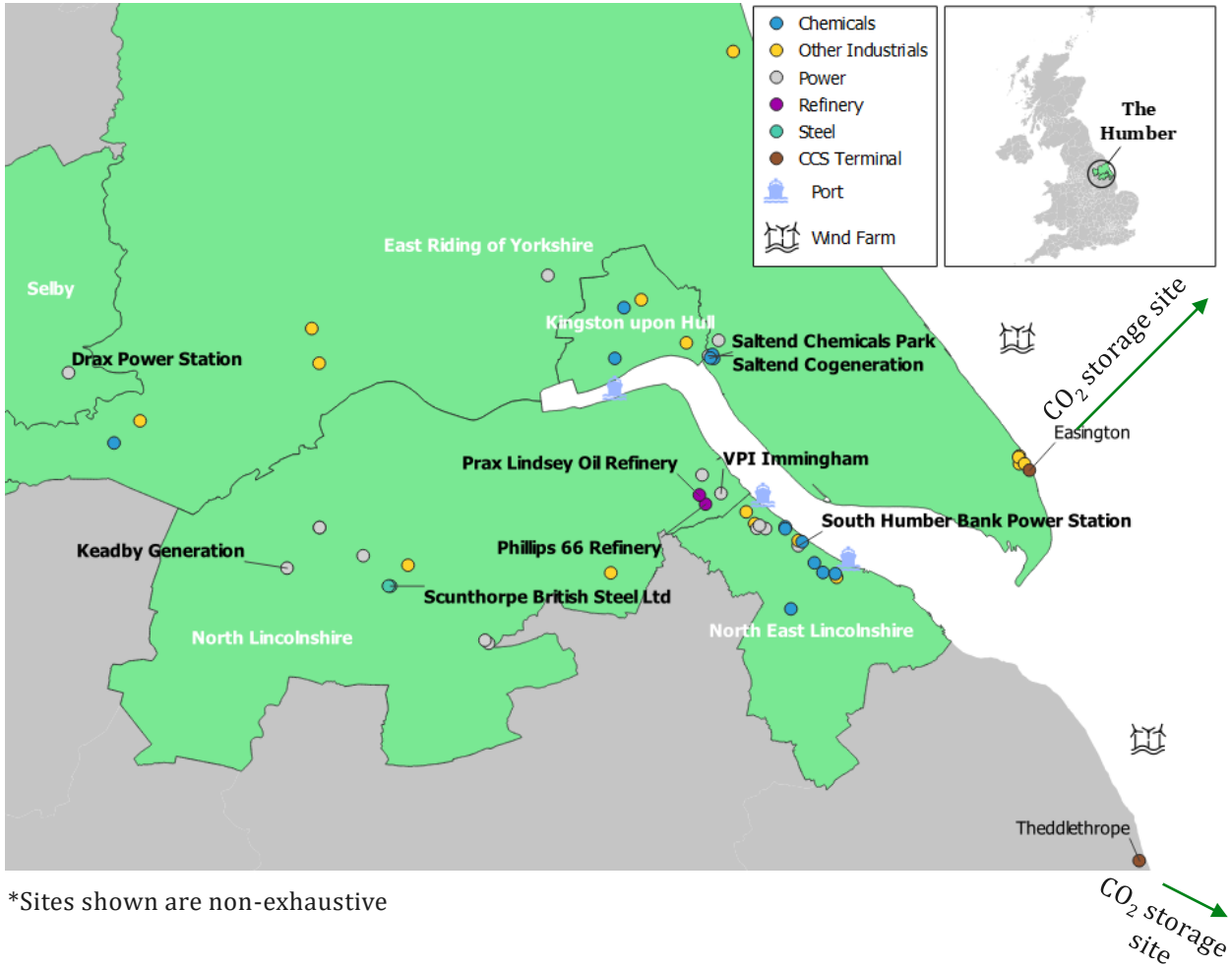
- The Humber is in Northeast England and is the largest industrial cluster in the UK by emissions, producing 20 $MtCO_2e$/year. It supports 360,000 jobs and is the home of many vital UK industries such as chemicals, concrete, steel, energy and other industrial facilities.
- Decarbonisation of the Humber will reduce more industrial emissions than any other region in the UK and will ensure that foundational industries and jobs remain in the UK. The Humber has unparalleled natural assets to enable decarbonisation, including an abundance of wind power, clustered industrial sites that can share infrastructure and access to significant offshore CO_2 storage in the North Sea.
- Utilising the Humber's assets is an opportunity of a generation and will enable it to become a world leading net zero industrial cluster and a hub of industrial decarbonisation.

The Humber is the largest industrial cluster in the UK by emissions

360,000+ people work in the Humber, and it is to home vital UK industries e.g., chemicals, concrete, steel and energy

Abundant renewable energy and storage sites for CO_2 and H_2 exist in the Humber

Map of the multiple industrial sites that are located in the Humber*

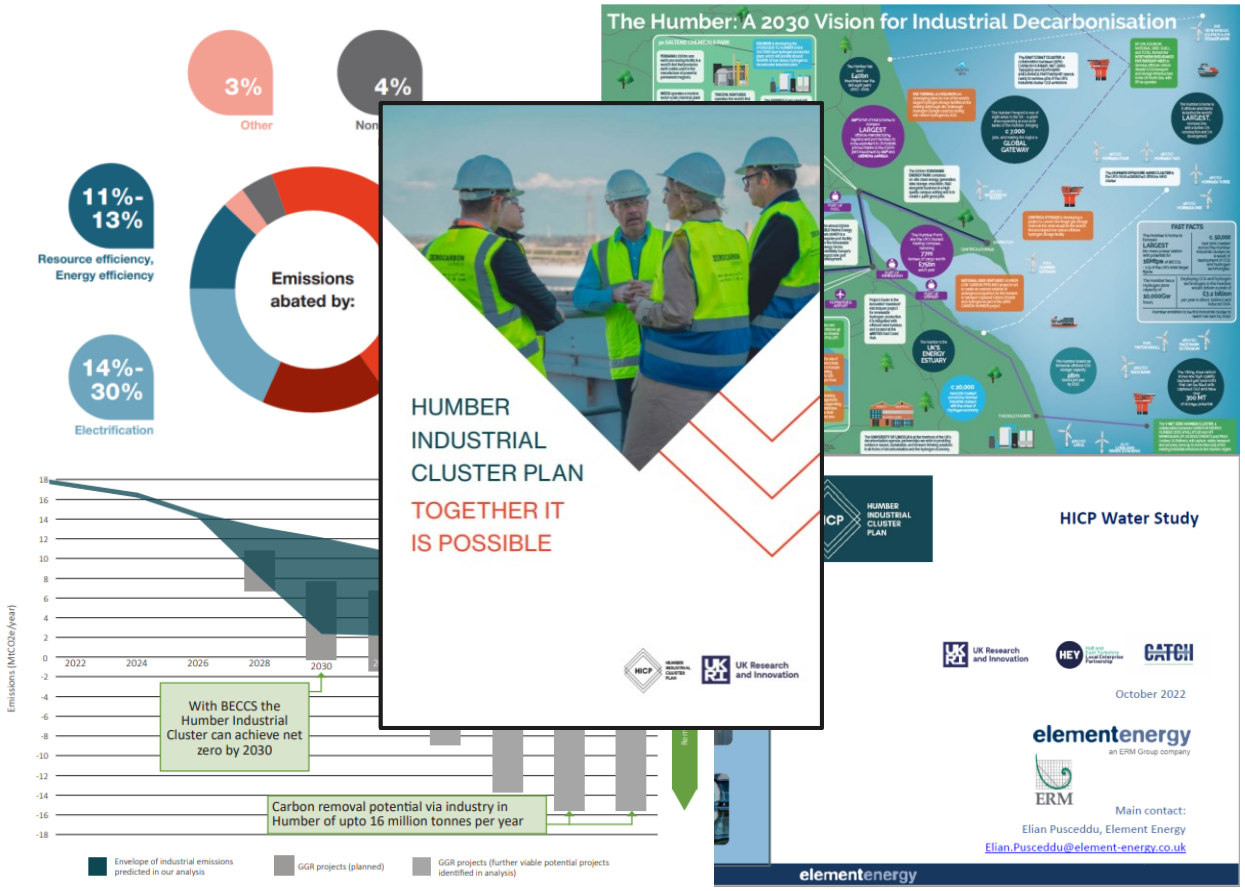


*Sites shown are non-exhaustive

In 2023 the Humber industrials published an ambitious plan to reach net-zero by 2040 while also enabling wider UK decarbonisation

The Humber Industrial Cluster Plan - in 2019 UKRI provided funding to The Hull and East Yorkshire (HEY) LEP and CATCH to produce a cluster decarbonisation roadmap for the Humber. HEY LEP and CATCH, with 8 industrial partners developed the HICP using this funding. The HICP was published in 2023 following wide-ranging research, in-depth analysis, scenario modelling and extensive consultation across 7 studies. The HICP provided a regional blueprint for achieving significant carbon reductions in the Humber by 2030 and net zero by 2040. Whilst also enabling wider UK decarbonisation by being a pioneer of low carbon technologies. It included 80+ recommendations and seven key mandates:

1. **Carbon Capture and Storage (CCS)** – to support CCS at scale with an ambition to implement between 16-18 $MtCO_2$ / year of CCS and greenhouse gas removals by 2040.
2. **Hydrogen -** to implement low carbon hydrogen at scale, with a target of 13-19 TWh/year of hydrogen to decarbonise heavy industry in the Humber.
3. **Electrification** - to adopt all optimal electrification measures, stimulating 2-7 TWh of renewable energy demand in the region.
4. **Efficiency** - to prioritise efficiency and circular economy measures, which could abate over 1 $MtCO_2$/year.
5. **Social value** - to generate social value through the industrial transition by retaining foundational UK industries in the Humber.
6. **Jobs and supply chains -** to further develop Humber skills and the supply chain, creating up to 22,800 job in the Humber.
7. **Collaboration** - to drive investment and collaboration to deliver the net zero Humber of tomorrow.



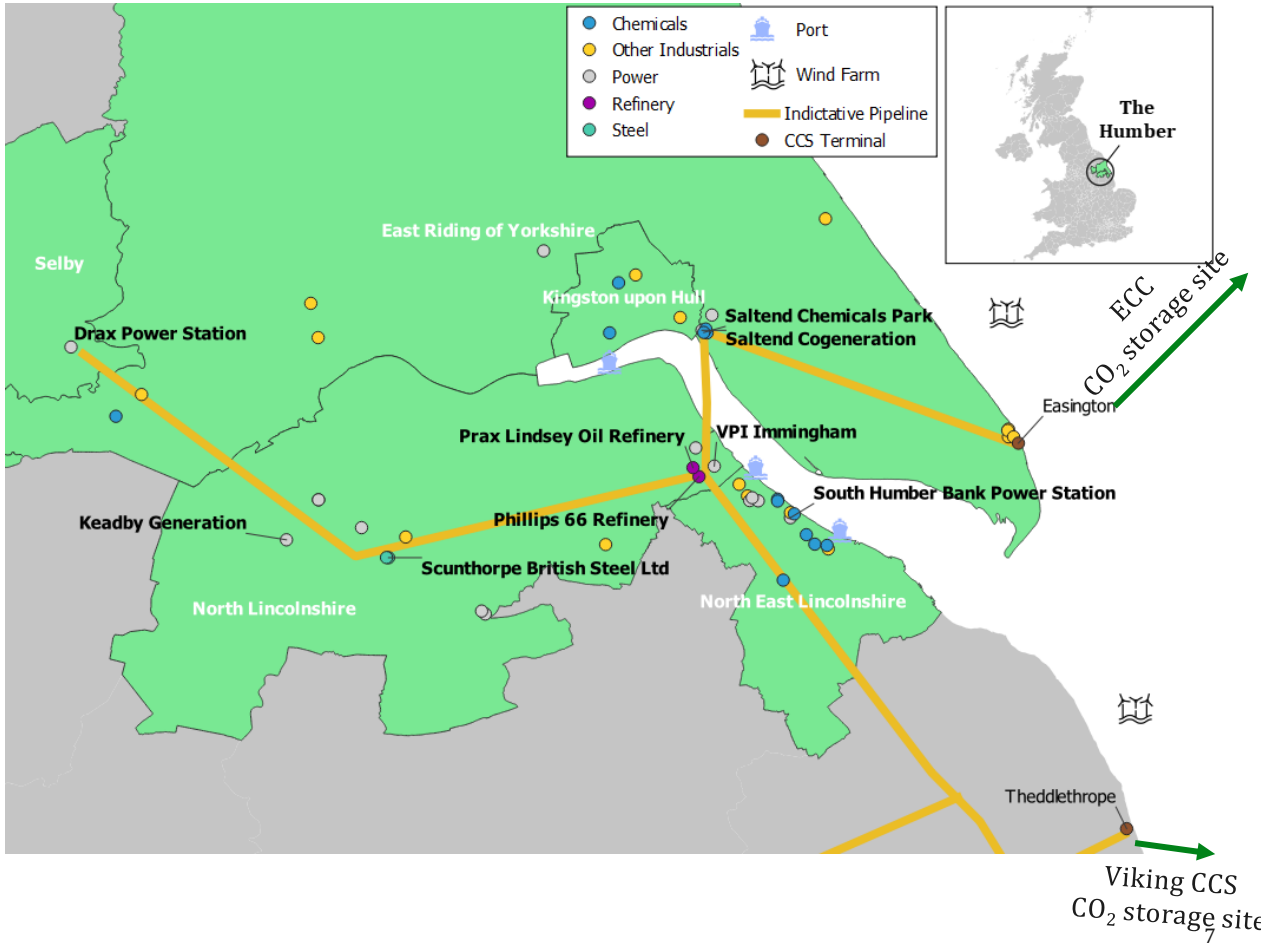
Development of CO_2 transport and storage infrastructure alongside low-carbon hydrogen production were key to the HICP

CO_2 and H_2 pipelines are a key part of the HICP – the HICP mandated for a large uptake of CCS and hydrogen. To deploy CCS a CO_2 pipeline is needed to transport captured CO_2 from industrial sites to offshore storage wells. Concurrently hydrogen uptake also requires a pipeline to transport locally produced and imported low carbon hydrogen to industrial sites where it can be used as a natural gas replacement. Together the CO_2 and H_2 pipelines represent a keystone item in the decarbonisation of the Humber by 2040. **At the time of HICP publication**, two consortiums had detailed plans for pipeline development both North and South of the Humber estuary:

The Humber Low Carbon Pipelines project proposed an onshore pipeline network (for both CO_2 and H_2) that would connect major industrial emitters and power stations across the Humber, including a tunnel under the Humber estuary. CO_2 collected via this network would then be transported via an offshore pipeline to CO_2 storage being developed by the Northern Endurance Partnership. These projects, together with Net Zero Teesside, formed the **East Coast Cluster (ECC) which was awarded priority (Track 1) status** by the government in November 2021, meaning it was **expected to be operational by 2027**.

The Viking CCS project led by Harbour Energy proposed an onshore CO_2 pipeline that would connect Immingham to Theddlethorpe, where CO_2 would be transported offshore via an existing offshore pipeline to the Viking and Victor fields in the North Sea. The **Viking CCS project was anticipated to achieve Track 2 status** from the government, meaning it was **expected to be operational by 2029**.

Map of the indicative CO_2 and H_2 pipeline route in the Humber.



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What happened in the Humber in 2023?

Since publication of the HICP, the Humber region has seen a wave of announcements influencing net-zero progress

The HICP mandated immediate action to ensure decarbonisation of the Humber by 2040. Therefore, actions taken in 2023 are key to ensure the HICP and Humber decarbonisation is on track. In 2023 there were several announcements made by both project developers and the government which impacted on the mandates of HICP.

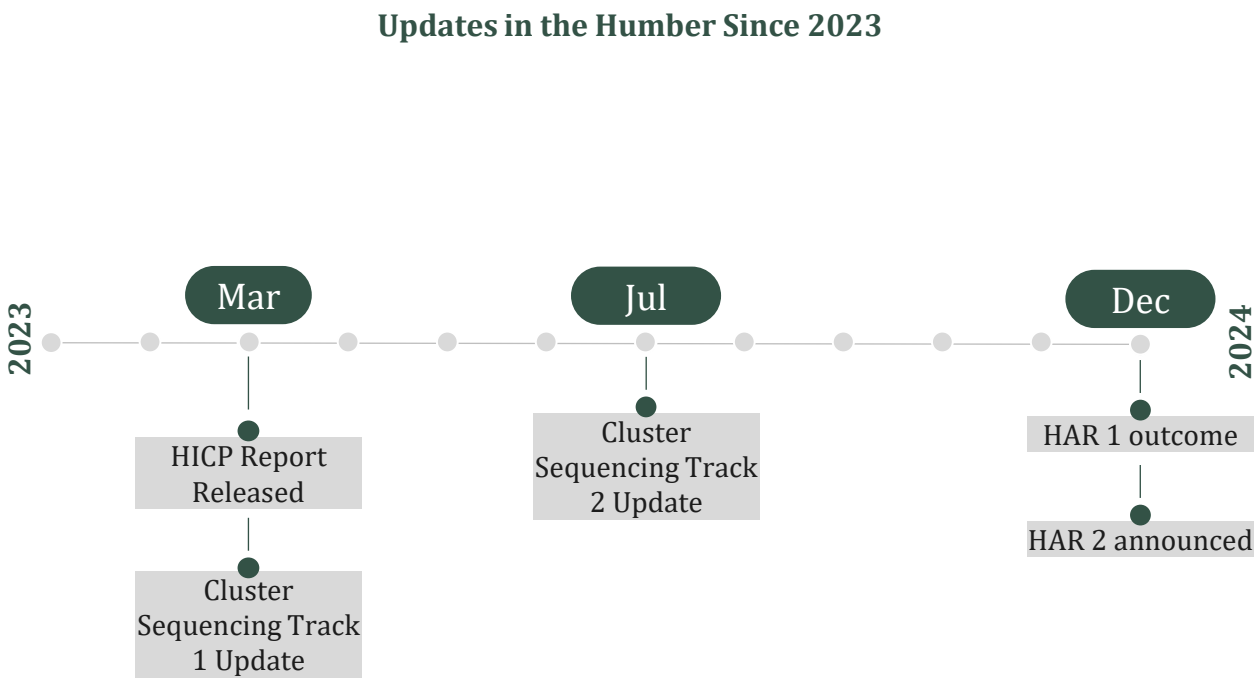
Project Updates

Achieving the mandates in HICP requires new project development for both CCS and hydrogen. During 2023 multiple developments for decarbonisation projects and initiatives in the Humber were announced.

Government Support

The success of the HICP mandates and achieving a net zero Humber by 2040 are heavily influenced by government support for the innovative projects developing the Humber. During 2023 there were announcements from the following government funding competitions:

- **Cluster Sequencing** – up to £1 billion of CAPEX and OPEX support for T&S networks and capture projects.
- **Net Zero Hydrogen Fund** – up to £276 million of CAPEX support for hydrogen projects
- **Hydrogen Allocation Rounds** – OPEX support for hydrogen projects



CCS ambition grew in 2023 with several new projects announced, but British Steel moved away from CCS

Staythorpe
RWE

RWE Staythorpe is a 1700MW power station that will be retrofit with CCS, the project was announced in May 2023.

RWE has entered a development partnership with Viking CCS. The partnership is expected to lead to the transport and storage of CO_2 capture from RWE Staythorpe, in Newark, Nottinghamshire. RWE Staythorpe has recently announced plans to apply for government funding in Cluster Sequencing to support the cost of the project.

1700 MW | **4 $MtCO_2/yr$**

Stallingborough
RWE

Stallingborough is a proposed, new build, power plant with CCS announced in May 2023.

RWE's strategic development partnership with Viking CCS also considers transporting captured CO_2 from Stallingborough in the Humber. RWE Stallingborough has announced its plan to apply for government funding in Cluster Sequencing to support the cost of the project.

800 MW | **2 $MtCO_2/yr$**

Ferrybridge
Enfinium

Enfinium is developing an energy from waste (EfW) CCS retrofit project in Knottingley, West Yorkshire.

The retrofit project is expected to apply CCS to two of the EfW plants at Ferrybridge. The expected cost will be £800m. The project would capture 1.2 $MtCO_2/yr$, including 50% carbon removals from biogenic feedstock. The project has recently announced plans to apply for Track 1 expansion funding.

90 MW | **1.2 $MtCO_2/yr$**

Steelworks
British Steel

British Steel has updated its decarbonisation plan to focus on Electric Arc Furnace (EAF) steelmaking rather than adopting CCS.

This is a recent development from the 2021 Low Carbon Roadmap which included the use of CCS alongside EAFs. The 2023 Decarbonisation Action Report sets out how British Steel will still achieve deep decarbonisation and an 82% reduction in emissions by 2035. The Action Plan details that one EAF will be deployed at the British Steel headquarters in Scunthorpe and another at British Steel's manufacturing site in Teesside by late 2025. British Steel state these two EAFs will combined be able to produce the volumes of steel required for its rolling mills in the Humber and Northeast. The proposed plan will require £1.25 billion in investment.

Both CCS-enabled and electrolytic hydrogen ambition in the Humber grew with three major new projects announced

NEW

East Yorkshire H_2 Hub

Centrica & Equinor

The East Yorkshire H2 Hub plans to develop up to 1000MW of hydrogen production in the Humber.

Centrica and Equinor have signed a co-operation agreement to explore developing a low-carbon hydrogen production hub at Easington in east Yorkshire. Currently a third of the UK's gas supply enters via Easington. Easington is likely to be the landing point for the East Coast Cluster CO_2 pipeline and connect to the Centrica's Rough hydrogen storage project. Centrica partnered with Wood in 2023 to further evaluate the feasibility of the hub.

1000 MW

Immingham Green Energy Terminal

Air Products

The Immingham Green Energy Terminal (IGET) was announced as a new multi-user liquid bulk facility. Air Products would be the first customer to use the new facility to import and produce green hydrogen.

IGET will be operated by Associated British Ports and is located on the eastern side of the Port of Immingham. Air Products' project would import green ammonia from Saudi Arabia and convert it to hydrogen. The project could eliminate up to 580 $ktCO_2$/year, and act as a CO_2 import terminal too. The project is progressing through planning and tendered for a lead contractor in December.

300 MW

H3

VPI & Air Products

The Humber Hydrogen Hub (H3) is newly announced large-scale low-carbon production facility in Immingham. The offtake will primarily power VPI's third gas turbine power train at Immingham.

H3 is being developed as joint development between Air Products and VPI. It is expected that excess hydrogen will be available to local industrials.

H3 submitted a "Strand 1" NZHF application but was unsuccessful.

800 MW

2 $MtCO_2$/yr

2022-2023 produced limited success for shared CO_2 infrastructure projects seeking government funding

Cluster Sequencing (ClSq)

ClSq competition overview - ClSq is a government funding program to provide up to £1bn of CAPEX and OPEX support for CCS T&S networks and capture projects. The aim of the competition is to enable capture and storage of 10MtCO_2/year by 2030. The competition selects a priority order of clusters, known as Tracks e.g., Track-1 is highest priority. Within each Track there are two phases of government funding, Phase-1 is funding for transport and storage projects and Phase-2 is for carbon capture projects.

When the HICP was published, Track-1 Phase-1 had already been announced, with HyNet in Merseyside and The East Coast Cluster in the Humber and Teesside selected for funding. This was encouraging news for the HICP as the East Coast Cluster is a vital part of the plan. Since HICP was published there has been the following updates:

Track-1

Track-1 Phase 2 – Track-1 Phase-2 was announced in 2023, detailing projects that were selected for funding and could connect to the Track-1 clusters. Despite multiple projects in the Humber applying, totalling 10MtCO_2/year, **all Humber projects that applied were unsuccessful.** Only projects located in Teesside were selected to receive funding to support projects connecting to the East Coast Cluster.

Track-1 Phase-2 Extension – in December 2023, the government announced it would be running a Track-1 Phase-2 extension funding competition to encourage more projects to connect to the T&S pipelines. However, **neither Humber or Teesside projects were invited to apply for the first round of Track 1 Extension**. Only HyNet can currently apply for Track-1 Extension.

Track-2

Track-2 Phase-1 – in July 2023 Viking CCS was selected for Track 2 status. This enables Viking CCS to move into front end engineering and design and discussions with the government over the terms of the economic licences, ahead of final investment decisions.

Track-2 Phase-2 – funding for capture projects wishing to connect to Track-2 clusters, including Viking CCS, has not been announced.

Overview of Humber CCS projects that applied for government support

Project	Project Type	Planned Scale ($MtCO_2$/year)	Competition Applied	Funding Status
Drax	Capture	8	Track-1 Phase-2	Unsuccessful
Keadby 3	Capture	1.5		
Prax Lindsey	Capture	1.2		
ZerCal250	Capture	0.25		
Humber Zero	Capture	3.8		
H2H Saltend	Capture	1.4		
H2ub	Capture	1.6		
Viking CCS	T&S	NA	Track-2 Phase-1	Successful

2022-2023 provided limited funding support for hydrogen projects

Net Zero Hydrogen Fund (NZHF)

NZHF Competition Overview – the NZHF is a government funding competition that is providing CAPEX to support the development of low carbon hydrogen in the UK. Both *CCS-enabled and electrolytic hydrogen* can be supported. The fund aims to develop projects that can realise the national target of 10GW by 2030. Up to £260 million is available to support innovative projects. The are multiple strands of the NZHF but all strands provide CAPEX or DEVEX support to developing hydrogen projects.

When HICP was published many Humber projects were waiting for the outcome of their application, demonstrating the ambition of the Humber.

NZHF Round 1 –The first round for both Strands 1 and 2 opened in April 2022. In March 2023, the government selected 15 projects and provided £37.9m but **none of the projects in the Humber were selected.**

NZHF Round 2 – This round opened in early April 2023 and ran until the start of June. Successful applicants have been notified, but the full funding allocation has not yet been made public.

Hydrogen Allocation Round (HAR)

HAR Competition Overview - OPEX support for *electrolytic hydrogen* production projects. The government fund also looks to support projects that can realise the national target of 1GW of electrolytic hydrogen by 2030. After HAR2 Government intends to transition to competitive annual allocation rounds called the Hydrogen Production Business Model.

When HICP was published many Humber projects were waiting for the outcome of their application, demonstrating the ambition of the Humber.

HAR 1 - The program closed in October 2022. DESNZ initially shortlisted 20 projects, 17 progressed to negotiations, and 11 projects (125MW) collectively secured £90m funding in December. **No projects in the Humber were successful.** Gigastack withdrew before negotiations and the Aldborough Hydrogen Pathfinder failed to secure a funding agreement.

HAR 2 – The application window opened in December 2023 and closes on the 19th April. Many Humber projects are expected to apply to HAR 2.

Overview of Humber hydrogen projects that applied for government support

Project	H_2 Capacity	Competition Applied	Funding Status
H2H Saltend	Unknown	NZHF	Unsuccessful
Gigastack	100MWe	HAR 1	Unsuccessful/ Withdrew
Aldborough Hydrogen Pathfinder	35MWe	HAR 1	Unsuccessful

These updates reflect both accelerated and delayed progress towards achieving the Humber industrials net zero plans

The decisions and developments in the last 12 months have impacted on progress towards decarbonisation in the Humber. The key impacts on the Humber achieving net zero are summarised below:

Delayed progress

- **Delayed pipeline deployment** – cluster sequencing announcements (Track 1 Phase 2) failed to select any anchor projects in the Humber to drive pipeline development, thus delaying development of the Low Carbon Hydrogen Pipelines project. This has significant knock-on impacts for other emitters and hydrogen producers wishing to connect to this hydrogen and CO_2 network. It is now uncertain when support will be received for this network development.
- **Delays in hydrogen production capacity** – the lack of government support for hydrogen projects in the Humber will impact on the hydrogen production capacity of the region in the short term. This impacts on the net-zero plans as it reduces the cluster's access to hydrogen for use as a low carbon fuel. Furthermore, it limits the export opportunities and the first mover advantage for companies who can provide abundant low-cost hydrogen earliest.

Accelerated progress:

- **CCS project updates** – several new CCS projects being announced in the region demonstrate the continued intent of the Humber cluster to become a CCS hub.
- **Firmed decarbonisation options** – sites such as British Steel have firmed a decarbonisation plan, showing progress in plans to deploy new technologies and deliver emission reductions.
- **New hydrogen projects** – the announcement of several new low carbon hydrogen project displays the ambition of the cluster to become a hub for low carbon fuels.

Overview of the impact on decarbonisation from recent updates in the Humber

Recent updates in the Humber	Impact on net zero Humber
Cluster Sequencing did not support rapid Humber deployment.	↓
HAR and NZHF did not select Humber H_2 projects.	↓
New CCS projects announced	↑
Sites firm abatement options E.g., British Steel selects EAF	↑
New hydrogen projects announced	↑

↓	Delayed decarbonisation progress
↑	Supports decarbonisation

3

How does this impact the path to net zero?

The N-ZIP Humber model was re-run to show the impact of 2022-2023 on the local industrial plans for net-zero

The HICP modelled a least-cost decarbonisation trajectory for the Humber – the HICP used the N-ZIP model, developed by ERM, which was designed using assumptions from 2021/22. The HICP modelled multiple different scenarios to consider future developments in the Humber. N-ZIP provided a quantitative basis for HICP's emissions reduction trajectories to reach net zero by 2040 and the associated CCS & H_2 demand.

Outdated assumptions and scenarios – ERM was funded by IDRIC to re-run the N-ZIP model considering recent developments in the Humber. The re-run considered new announcements such as new or modified CCS and hydrogen projects, and the impact of no Humber projects receiving government funding from Cluster Sequencing Phase-2, NZHF or the HAR-1. The two most ambitious scenarios in HICP were selected for re-run **i) CCUS Commitment and ii) Innovations and Incentives**. This is because they contained the most outdated assumptions e.g., rapid CO_2 pipeline deployment, large uptake of CCS and growth in H_2 production.

Updated assumptions and model re-run - to re-align the *CCUS Commitment* and *Innovations & Incentives* scenarios with recent developments in the Humber the scenarios were re-run with the following updated assumptions:

- **CO_2 and H_2 Pipeline Deployment Timeline** – the scenarios now assumed a delayed timeline.
- **H_2 Production Capacity** – reduced short-term hydrogen capacity as projects are delayed and/or cancelled.
- **Site Abatement Technology Preferences** – the re-run scenarios included a constraint on site technology choice e.g., EAFs at British Steel.

Assumption made in *CCUS Commitment* and *Innovation & Incentives* scenarios and updates made following announcements in 2023.

Assumption	Original Scenarios	2023 Impact	Refreshed Scenarios
CO_2 and H_2 Pipeline Deployment	Rapid pipeline deployment	Cluster Sequencing did not support rapid Humber pipeline deployment	Delayed timeline
H_2 Production Capacity	Ambitious growth	HAR and NZHF did not select Humber H_2 projects	Delayed H_2 growth and cancellation of some projects
Site CO_2 Abatement Preferences	Initial technology options	Sites firm abatement options E.g., British Steel selects EAF	New technology options for certain sites

Modelled delays to infrastructure development result in a slower uptake of CCS and hydrogen in the Humber

CCS demand update

Later CCS uptake – the earliest CCS deployments are not until 2029 in the re-run scenarios, compared to 2027 in the original scenarios.

More graduated CCS deployment – both refreshed scenarios have a more graduated uptake compared to the original scenarios. In the first 5 years the original scenarios reached ~17 Mt and the refresh reached 9 $MtCO_2$/year

Hydrogen demand update

Delayed H_2 uptake – both refreshed scenarios do not begin large scale H_2 production until 2029, compared to 2026 in the original scenarios.

Converged hydrogen demand – in the original scenarios the H_2 demand varied between *CCUS Commitment* and *Innovations & Incentives*, but the refreshed scenarios have converged to a similar H_2 demand in the Humber of ~10 TWh/year. This reflects a 14% higher in the refreshed *CCUS Commitment* and a 27% lower in the refreshed *Innovations & Incentives*.

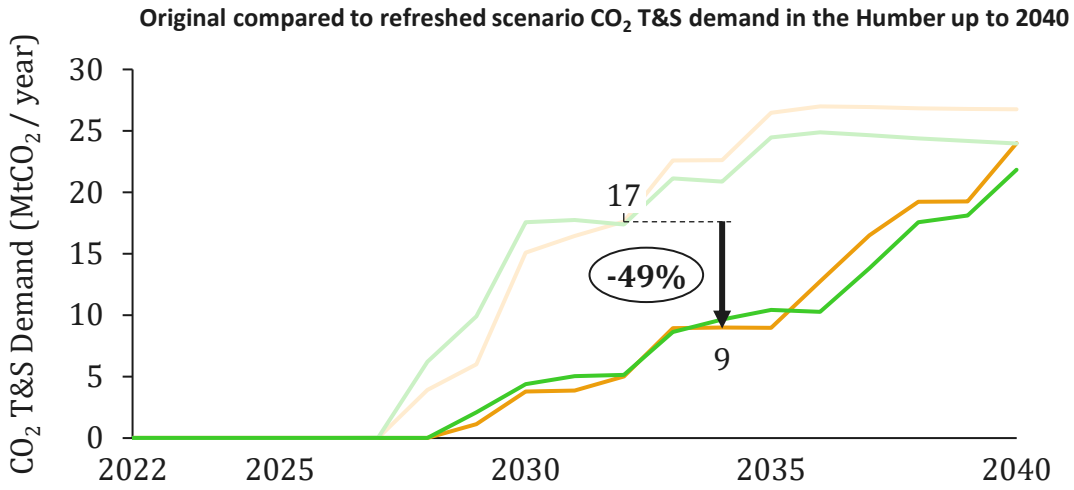


Chart reflects the scope included in original HICP Lot 1 analysis. This incorporates CO_2 captured from existing in-scope industrial and power facilities (including biogenic CO_2) as well as captured CO_2 associated with CCS-enabled hydrogen consumed by industrial emitters as a natural gas replacement.

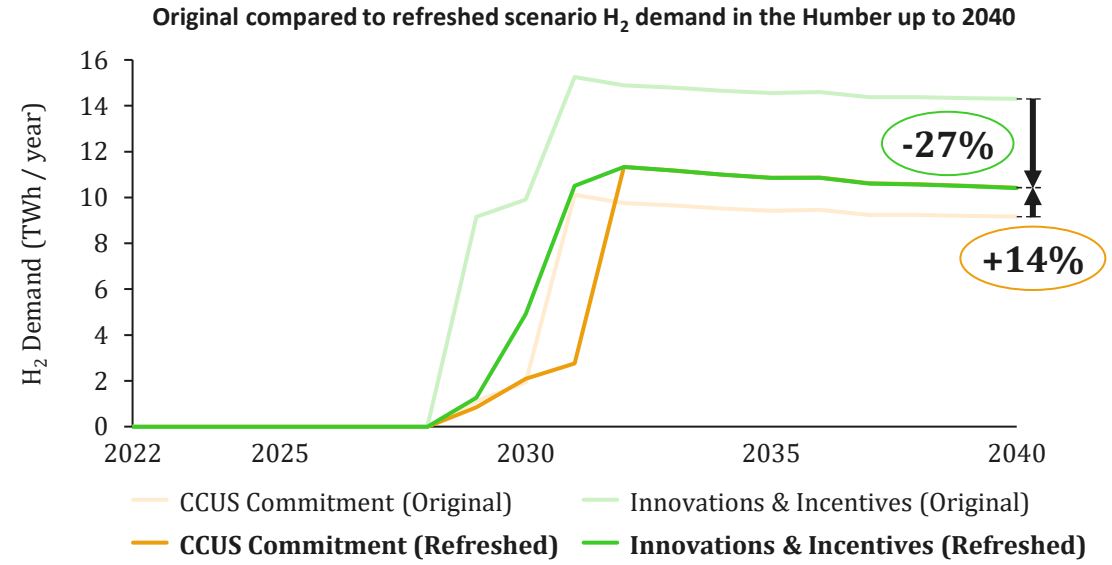


Chart reflects the scope included in original HICP Lot 1 analysis. This incorporates hydrogen demand consumed by (i) existing in-scope industrial facilities for the purpose of natural gas replacement and (ii) the planned Keadby hydrogen power project. It does not include that for other announced projects, wider hydrogen uptake, or e-fuels.

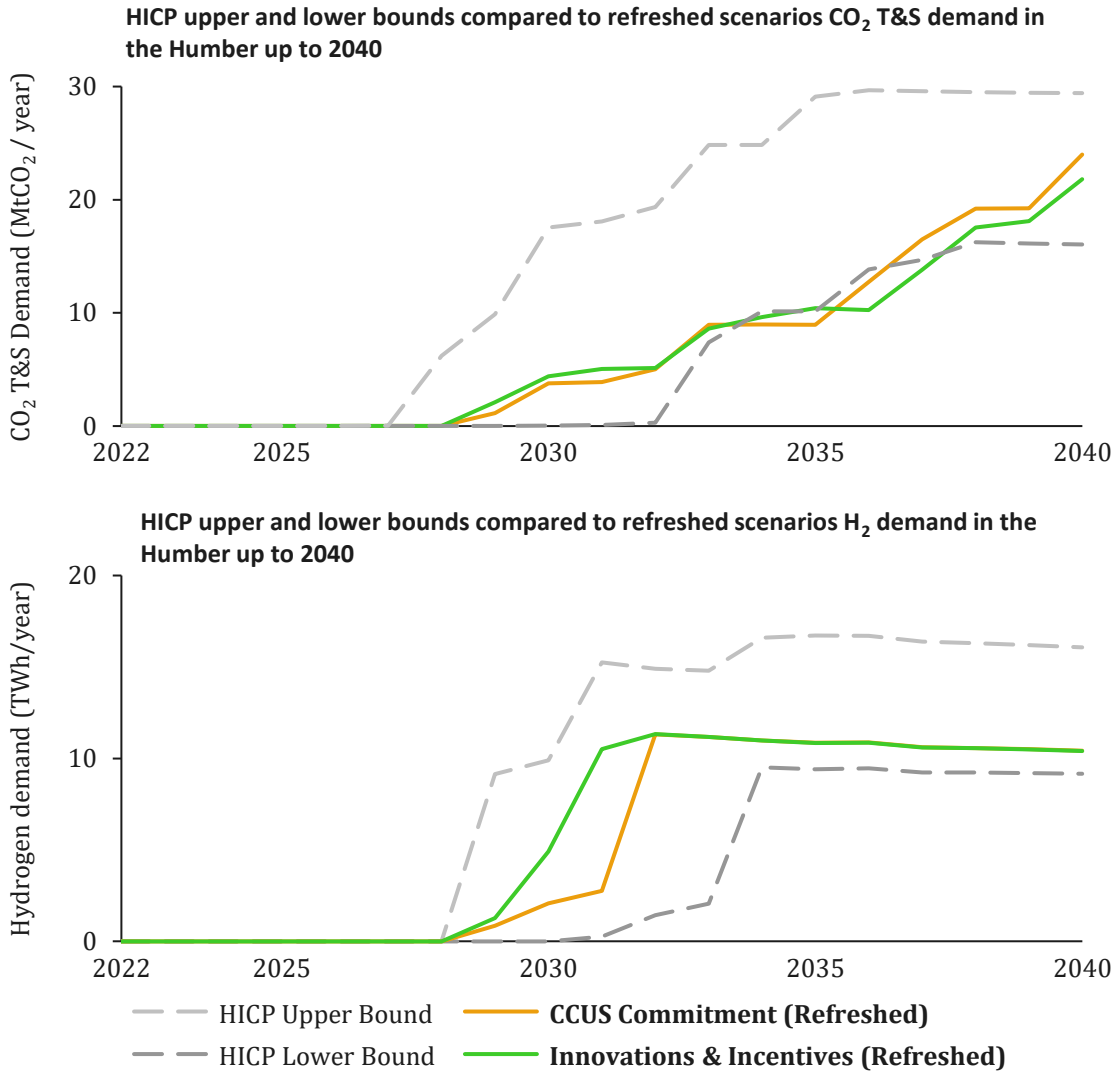
The modelled local requirements for CO_2 and hydrogen shared infrastructure remain significant, as originally estimated

CCS demand update

2040 CO_2 T&S demand is within the original model bounds – in both re-run scenarios the CO_2 T&S demand by 2040 is within the upper and lower bounds developed in the HICP. The CO_2 T&S demand briefly goes below the lower bound of expected CO_2 T&S demand between 2033 and 2035 but strong growth post 2035 brings both updated scenarios back within the bounds by 2040.

Hydrogen demand update

Hydrogen demand remains consistently within the expected demand modelled in the HICP – despite delays in pipeline development, which limits growth of CCS-enabled hydrogen production, the demand for hydrogen in the Humber remains within the bounds of the HICP. This demonstrates that hydrogen production can still play a key part of deep decarbonisation in the Humber.



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Modelled delays to infrastructure are expected to result in 6-10 $MtCO_2$ additional emissions by 2030 compared to the original scenarios

Humber scope 1 emissions update

Humber deep decarbonisation is still possible – despite the new assumptions, both refreshed scenarios still achieve deep decarbonisation in the Humber by 2040. This means the Humber can still support the government target of at least one net-zero cluster by 2040.

Slower decarbonisation – both refreshed scenarios still achieve deep decarbonisation but at a slower rate compared to the original scenarios. In 2030, *CCUS Commitment* and *Innovations & Incentives* have 15% and 78% more in-year emissions respectively compared to 2030 in the original scenarios.

Lower cumulative abatement – delayed decarbonisation in updated scenarios results in 6-10 Mt of additional cumulative emissions by 2030 compared to the original scenarios. Furthermore by 2040 additional cumulative emissions has risen to 18 $MtCO_2$ for *Innovations & Incentives* and 25 $MtCO_2$ for *CCUS Commitment*.

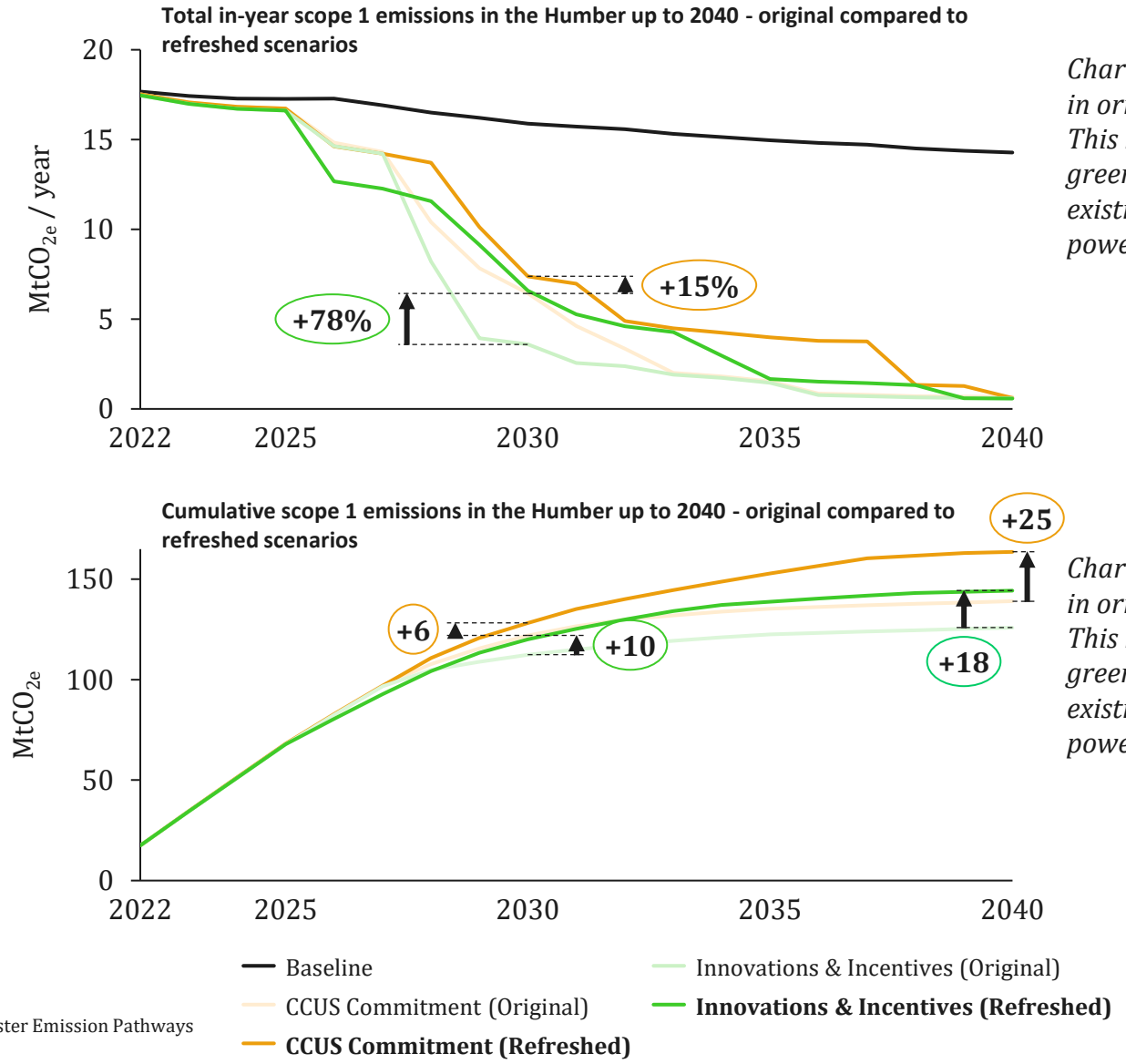

Chart reflects the scope included in original HICP Lot 1 analysis. This incorporates Scope 1 greenhouse gas emissions from existing in-scope industrial and power facilities in the Humber.

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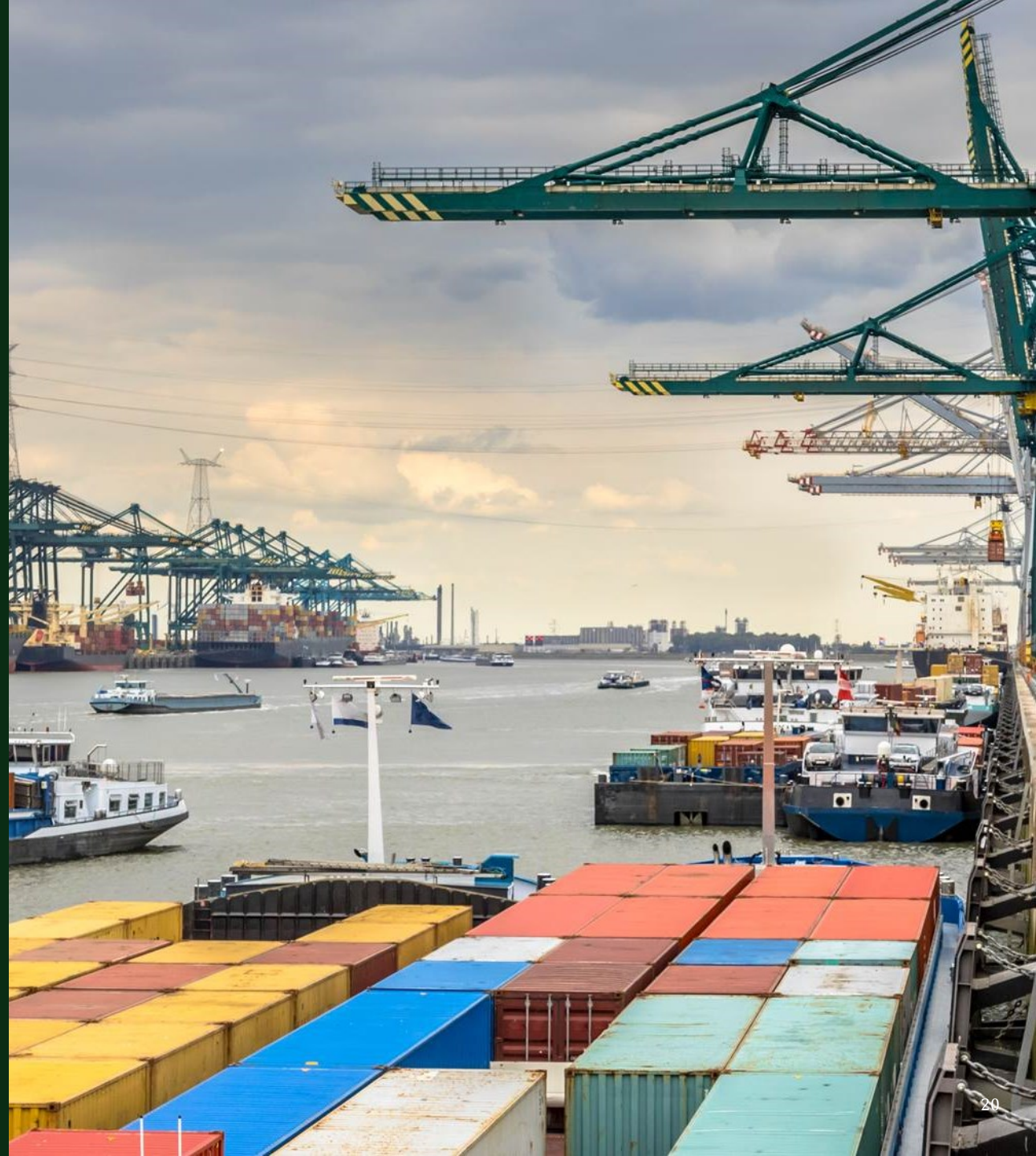
4

Conclusions and recommendations



The Humber needs government support to limit further delays to decarbonisation and avoid missing economic opportunities

Summary/Conclusions

HICP provided a blueprint for decarbonising the Humber – the HICP provided seven key mandates to enable decarbonisation in the Humber. Progress towards these mandates is vital to ensure the Humber is on track to decarbonise by 2040.

Mixed progress for decarbonisation in the Humber - decarbonisation in the Humber has been accelerated by the East Coast Cluster being selected as a priority cluster (Track-1) and new CCS and hydrogen project announcements. However, some progress has been stalled by limited government support for carbon capture and hydrogen projects.

Deep decarbonisation by 2040 is still possible – modelling showed that developments in the Humber result in slower decarbonisation for the industrial cluster but net zero by 2040 is still possible.

Reduced CCS and hydrogen uptake – modelling detailed that the impacts of developments in the Humber could result in a more graduated growth of CCS and hydrogen and an overall lower demand in the Humber. However, this opens more opportunities to use the Humber's world class port facilities to export hydrogen and support the wider UK to decarbonise.

Recommendations

Limit further delays for anchor CCS projects - in both the North and South Humber keystone CCS projects need to be deployed to drive development of two CCS pipelines. These play a key role in supporting the region to decarbonise by 2040 and facilitating large-scale hydrogen production. Local industrials have shown strong ambition by announcing several new projects but to realise the ambition government support is needed to establish business models for these projects.

Humber industrials and government collaboration to develop the large hydrogen export opportunity in the Humber – the Humber is an ideal location for hydrogen production due to its abundance of renewable power and CO_2 storage. The Humber's hydrogen production potential could exceed its demand, meaning its major ports can acts as distribution networks to provide hydrogen to other parts of the UK or Europe. To take advantage of this opportunity a roadmap for hydrogen export needs to be developed and sufficient funding distributed to key players in the supply chain.