

Appendix A11 – Delivery Plan

Only the Executive Summary has been included.

For the full report please go to: <https://www.eastcoasthydrogen.co.uk/east-coast-hydrogen-delivery-plan/>





East Coast
Hydrogen

East Coast Hydrogen Delivery Plan

November 2023



Northern
Gas Networks

Cadent
Your Gas Network

 national
gas



Disclaimer

This report provides a strategic outline for delivery of the East Coast Hydrogen (ECH₂) Programme and the opportunities and benefits it can bring. It builds upon the information published in the 2021 ECH₂ Feasibility Report and findings of Cadent, National Gas and Northern Gas Networks (NGN) Pre-FEED studies. ¹

Certain companies included within this report have provided Letters of Support to ECH₂. These Letters of Support are non-legally binding documents indicating early stage strategic support for the high level ambitions of the programme.

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External sources of data and analysis used within the report are cited and a complete list of sources used can be found in the Bibliography. Any data or analysis used in the report without specific citation to an external source is based on analysis conducted by Cadent, National Gas and NGN:

- Analysis of the current and potential future network configuration and capacities is based on the networks' own data.
- Analysis of the future system user's needs (forecasts of hydrogen demand, production, storage) is based on primary data collected directly from current and future network users for the purposes of supporting the development of the ECH₂ Programme.

Key assumptions used in analysis of the data and information presented within this report, along with a summary of the approach to primary data collection, can be found in Appendix 1: Methodology.

All data and information presented within this report should be considered a snapshot in time and subject to change. Due to the early-stage nature of many of third party projects referenced in the report, the plans for infrastructure developments are subject to change. The analysis and data outputs are based on the most recently available information from the networks and third parties, and are also subject to change.

ECH₂ reserves the right to continue to develop and amend pipeline routing options and the strategic business case throughout subsequent stages of project development. All plans within this report are indicative at this time and remain as proposals to be refined during FEED and other future stages of the Programme. They also remain subject to relevant regulatory oversight and approvals.

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Foreword

According to the Climate Change Committee, low-carbon hydrogen will play a critical role in enabling the UK to meet its Net-Zero target by 2050.² Complementing electrification and carbon capture, utilisation and storage (CCUS), hydrogen provides an alternative decarbonisation solution for hard-to-abate industrial processes, which account for 16% of the UK's total carbon emissions. Hydrogen also provides a decarbonisation solution for heavier forms of transport like aviation and shipping, and has the potential to play an important role in delivering low carbon-dispatchable power.

Recognising the important role of hydrogen in our future energy system, UK Government has set an ambitious target of deploying 10 GW of low-carbon hydrogen production by 2030, with at least half of this total coming from Green Hydrogen. The National Infrastructure Commission (NIC) has also recognised the important role of hydrogen and called for the development of a core network of hydrogen pipelines by 2035.³ The East Coast region will be vital to achieving this national ambition. The region is host to two of the UK's largest industrial centres, as well as two of the proposed CCUS clusters - East Coast Cluster and Viking – and is home to 8 hydrogen projects that were shortlisted for bilateral negotiations in multiple UK Government funding rounds (accounting for ~30% of successful production projects).

The Combined Authorities and the Local Enterprise Partnerships (LEPs) in the East Coast region are crucial partners in the UK reaching its Net-Zero goals, driving local plans to decarbonise and supporting businesses and communities to upskill to enable the low-carbon economy to grow.

We are fully supportive of the UK Government's ambitions for hydrogen and have reflected this in the commitments we have made within our local energy plans:

- Power emissions in the **Derby and Nottingham** areas will be reduced by transitioning coal-fired power stations at Ratcliffe-on-Soar and High Marham to produce energy from low-carbon technologies like hydrogen. Increasingly high-voltage power lines will import renewable electricity which can be used to make Green Hydrogen. This hydrogen will then be used to decarbonise aviation, and manufacturing.
- **Greater Lincolnshire** has plans to reduce emissions in the area by supporting the early adoption of hydrogen technologies, and strengthening local industrial productivity through the delivery of low-cost, low-carbon energy. The area will be home to several hydrogen production sites in the South Humber, and is home to an important access point to the Viking CCUS store. Low-carbon hydrogen will be vital to decarbonising the steel industry and power generation in Scunthorpe, as well as chemicals and building materials production in Immingham.⁴
- **Tees Valley** aims to be the world's first Net-Zero industrial cluster by 2040 along with the Humber region, with hydrogen acting as the centrepiece for achieving this. The region will produce more than 50% of the UK's hydrogen, and is home to the UK's first Hydrogen Transport Hub.⁵
- Leading by example **West Yorkshire** is aiming to be Net-Zero by 2038, with low-carbon hydrogen being a potential solution to achieving significant emission reductions in hard-to-decarbonise sectors such as heavy industry. The use case and value proposition of hydrogen to reduce emissions in those hard-to-decarbonise sectors in West Yorkshire is currently being assessed and modelled.⁶

ECH₂ will play a critical role in the development of a regional hydrogen market, providing the opportunity to connect up to 11 GW of hydrogen production capacity by 2030 (exceeding the UK Government's 10 GW by 2030 target in a single region) and up to 4 TWh of hydrogen storage by 2030. By providing the network infrastructure needed to transport low-carbon hydrogen, the Programme will connect producers and storage providers to a range of customers, who expect to need over 63 TWh/year of low-carbon hydrogen to decarbonise their operations and save up to 12 MtCO₂/year by 2037.

This Programme puts the East Coast region at the heart of the UK's industrial decarbonisation agenda, creating world leading hydrogen hubs in places like Teesside, the Humber region and East Midlands. This will support green jobs, skills and competitive supply chains levelling up the economy by bringing new investment, and preserving the industrial and commercial (I&C) value of the Midlands and North East.

We are proud to support this important initiative and look forward to witnessing the exciting developments yet to come in future phases of the ECH₂ Programme.



Lord Houchen
Major of Tees Valley



Chris Rowell
Chair of North East and Yorkshire Net Zero Hub



Ruth Carver
CEO of Greater Lincolnshire LEP



Tracy Brabin
Mayor of West Yorkshire



Will Morlidge
CEO of D2N2 Local Enterprise Partnership



Executive Summary

Executive Summary

ECH₂ is a 15-year programme which will play a critical role in creating a UK hydrogen economy and decarbonising a range of sectors in line with UK Government targets.

The UK Government has identified low-carbon hydrogen as a key solution for decarbonising the UK economy and has set ambitious targets for the deployment of hydrogen production. The National Infrastructure Commissions' second National Infrastructure Assessment has recommended the development of a core network of hydrogen pipelines by no later than 2035.³

ECH₂ was established by NGN, Cadent and National Gas with the objective of identifying and ultimately delivering the network infrastructure required to support the deployment of low-carbon hydrogen, facilitating the decarbonisation strategies of energy generators and users in the East Coast region. A Feasibility Study launched in December 2021, established the case for the Programme and set out the roadmap for completing further investigation and design of the infrastructure required. The Programme will provide a blueprint for deployment of low-carbon hydrogen and provide a starting point for the development of the core network that the UK needs to achieve its decarbonisation goals.¹

The Programme is being developed in close collaboration with network users, local authorities and national policy makers to ensure that the Networks are ready to provide the infrastructure required to facilitate decarbonisation plans of energy users and support the development of a low-carbon hydrogen economy in the East Coast region. 122 stakeholders across the energy value chain – from existing large industrial energy users, to power stations and to universities – have shown overwhelming support for ECH₂.

This Delivery Plan provides an update on the progress made since the Feasibility Study. It provides a detailed overview of the emerging hydrogen economy in the East Coast region and aims to provide UK Government and industry, visibility of the networks' plans. This supports UK Government's work on hydrogen and provides stakeholders with more certainty on the availability of infrastructure to help them progress business decisions.

This report sets out:

- 1) The progress made by ECH₂ since the Feasibility Study (Chapter 1)
- 2) Details of system users' decarbonisation plans with respect to hydrogen (Chapter 2)
- 3) Details of the initial infrastructure routing options based on system users' plans (Chapter 3)
- 4) Updated assessment of the benefits unlocked by ECH₂ (Chapter 4)
- 5) Next steps and enabling actions needed to successfully deliver the Programme (Chapter 5)



Progress since the Feasibility Study launch

Since the Feasibility Study was launched in December 2021, UK Government and wider industry have achieved significant progress in developing plans for a hydrogen economy across the UK.



Government progress

- ✓ **British Energy Security Strategy** was published setting out how Great Britain will accelerate homegrown power for greater energy independence ⁷
- ✓ **Jet Zero Strategy** was established to develop a roadmap to achieving Net-Zero aviation by 2050 ⁸
- ✓ **Minded to position on Hydrogen T&S Infrastructure** has been published ⁹
- ✓ **Powering Up Britain** plan was created to set out how the UK Government will enhance the country's energy security, seize the economic opportunities of the transition, and deliver on Net-Zero commitments ¹⁰
- ✓ 17 projects have been announced for the **first hydrogen electrolytic allocation round (HAR1)** ¹¹
- ✓ **UK Hydrogen Strategy** was updated to set out the approach to developing a thriving low-carbon hydrogen sector in the UK ¹²
- ✓ **Energy Bill** provisioned energy production and security and the regulation of the energy market
- ✓ **UK-German hydrogen cooperation partnership** announced aiming to accelerate innovation and deployment
- ✓ **Hydrogen blending consultation** launched seeking views in the case and options for implementation ¹³
- ✓ Response published on creating a **UK Low Carbon Hydrogen Certification Scheme** ⁸⁶
- ✓ Response published on **revenue support regulations for the Hydrogen Production and Industrial Carbon Capture Business Models** ⁸⁷



ECH₂ Programme actions

- ✓ World first **100% hydrogen programme** completed in Teesside as part of the H21 initiative to test the use of 100% hydrogen in an existing gas distribution network
- ✓ NGN has opened a **Hydrogen Hub in Redcar** to give customers the opportunity to learn more about hydrogen for heating
- ✓ **Project Union's Feasibility Stage Re-opener** was submitted, as part of the RII0-2 price control
- ✓ **H2NorthEast, Uniper Humber Hub Blue Project, bpH2Teesside and H2H Saltend** passed the eligibility criteria for Phase-2 of the government's cluster sequencing process
- ✓ **East Midlands Hydrogen**, a large scale inland hydrogen cluster, has been launched
- ✓ **The Viking CCUS cluster has been selected as part of the Track-2 UK Government cluster sequencing process**
- ✓ **Successful demonstration of HyDeploy**, providing vital evidence to support the safety case for blending up to 20% hydrogen into the grid across the UK and supporting UK Government's 2023 blending decision.

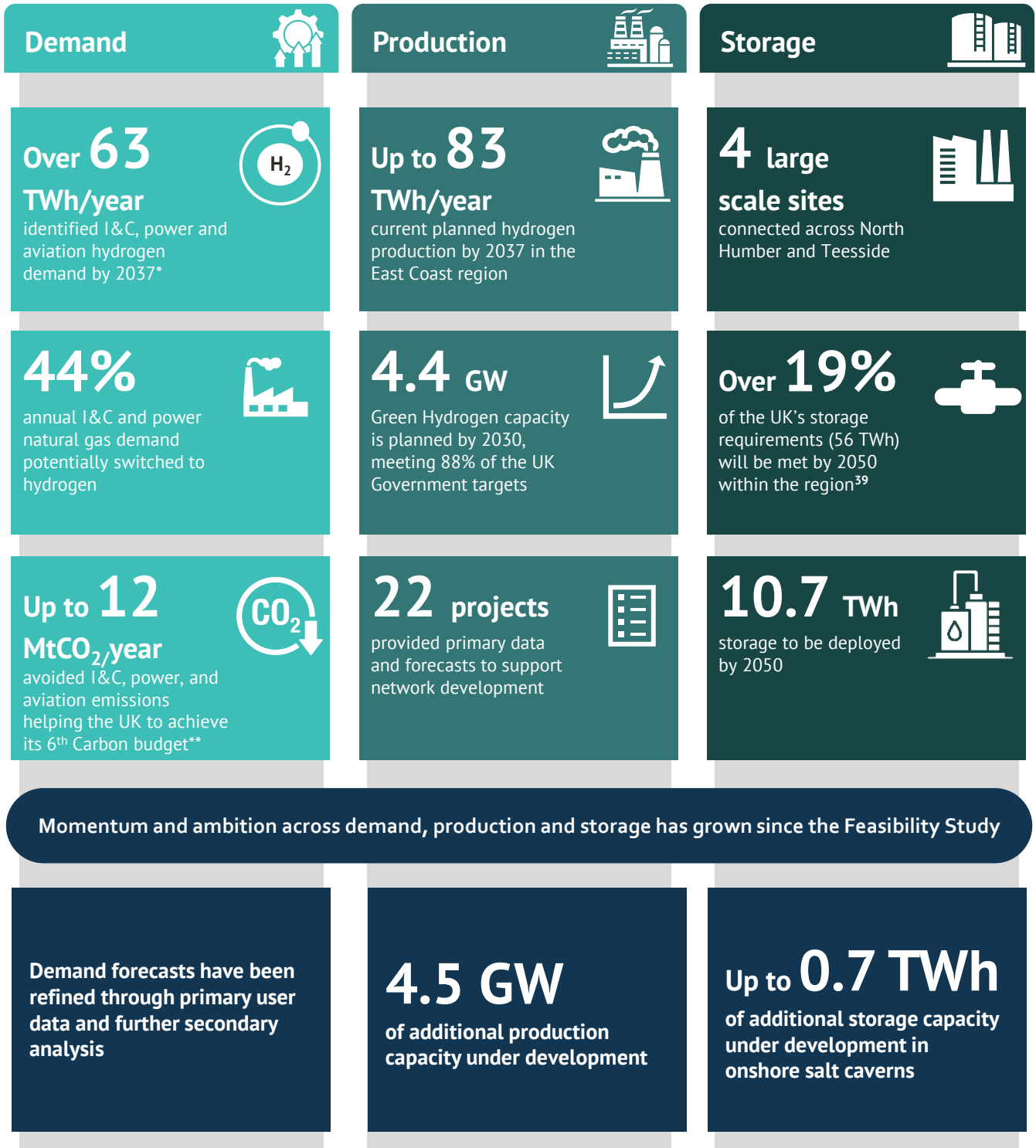
ECH₂ Programme achievements

- 🏆 5 external stakeholder events have been held, helping to ensure alignment of the ECH₂ infrastructure programme with stakeholders' needs. Since December 2021, **the number of Consortium Members increased from 37 to 122.**
- 🏆 **Primary and secondary data gathered and analysed** from key stakeholders in relation to 367 planned and potential production, demand and storage sites across the East Coast region.
- 🏆 Networks' **Pre-FEED Studies will be completed by the end of 2023** and provide greater understanding of the technical feasibility of the Programme, as well as routing design and potential routing options.
- 🏆 **Ongoing regulatory engagement** to ensure alignment of the programme with regulatory requirements, and develop the evidence base required to allow consideration of funding requirements for the next stage of work of FEED.
- 🏆 **This Delivery Plan has been prepared** to demonstrate the Programme's needs case and engage key stakeholders and decision makers in ECH₂.

ECH₂ is evolving in line with UK Government decisions and industry initiatives. Since the Feasibility Study, the Programme has made significant progress in defining the scope and scale of hydrogen infrastructure that may be required in the East Coast region.

The role of hydrogen in decarbonising the East Coast

The detail and ambition of the hydrogen plans set out by existing customers, prospective hydrogen producers and storage developers have advanced since the Feasibility Study.



*Total hydrogen demand includes (23.1 TWh) I&C demand, (34.5 TWh) power demand, (5.6 TWh) transport demand.

** Total decarbonisation potential from switching to low-carbon hydrogen includes (4.1 MtCO₂) I&C, (6.2 MtCO₂) power, and (1.4 MtCO₂) transport emissions.

Initial options for routing of ECH₂ hydrogen infrastructure













We have conducted a comprehensive analysis of the hydrogen infrastructure required for the East Coast region based on the data provided by the Programme’s stakeholders about their own plans. Initial routing options efficiently connect supply and demand through a mixture of repurposed and new build pipelines.



The routing options presented will be carried forward to the next phase of the Programme for further analysis through Front End Engineering Design (FEED). We will continuously optimise routing to ensure that Programme plans continue to align with both evolving UK Government policy and achieving value for money.

Unlocking the benefits of hydrogen for the East Coast Region

The ultimate goal of ECH₂ is to deliver the hydrogen transport infrastructure required to achieve the UK Government and industrial decarbonisation ambitions. Progressing to FEED now is critical to ensure deployment in time to unlock benefit and achieve 2030 and 2050 targets.

<p>UK Government's commitments</p> 	<ul style="list-style-type: none"> ECH₂ will be necessary for the UK Government's Net-Zero ambitions by enabling the scale up of a hydrogen economy The Programme informs future policy and investment decisions by showcasing how development and deployment challenges can be overcome 	 <p>11.6 GW Of planned hydrogen production capacity can potentially be connected within the region</p>	 <p>8 Projects selected through the NZHF, HAR1, and Cluster Sequencing can be supported by ECH₂</p>
<p>Decarbonisation of the East Coast region</p> 	<ul style="list-style-type: none"> ECH₂ will help I&C, power and transport enterprises within the East Coast region to decarbonise their operations The East Coast region is home to multiple pilots and research projects that require hydrogen infrastructure to test decarbonisation opportunities across a variety of sectors 	 <p>58 TWh Natural gas could be converted to hydrogen by 2037*</p>	 <p>up to 12 MtCO₂/year Abated across I&C, power and transport sectors**</p>
<p>Hydrogen value chain development</p> 	<ul style="list-style-type: none"> ECH₂ supports value chain development and growth of a hydrogen market through its Consortium Group The Programme is based on hydrogen forecasts received directly from users, providing certainty on the volume and timing of need 	 <p>122 Number of stakeholders across the value chain who support ECH₂</p>	 <p>53 Customers who provided primary hydrogen forecasts</p>
<p>Wider system benefits</p> 	<ul style="list-style-type: none"> ECH₂ can help to provide whole system resilience and flexibility providing access to storage and reducing curtailment via Green Hydrogen facilities. The programme additionally supports regional jobs and economic growth, potentially safeguarding £208bn/year GVA (based on 2021 figures) by avoiding business closures and providing an additional £27bn GVA and across the North East, East Midlands, Yorkshire and Humber region up to 2050. 	 <p>21GW offshore wind capacity is due online by 2030 with 17 Green Hydrogen facilities expected</p>	 <p>£27bn GVA and 360k jobs through the development of a full hydrogen value chain ***</p>

ECH₂ will unlock a number of benefits from deploying hydrogen in the East Coast region, however further work is needed to confirm locations and timing for delivering this infrastructure. This in-depth analysis will be carried out during the FEED phase.

* Total natural gas (58 TWh) to switch to low-carbon hydrogen excludes aviation sector transport demand because it is additional that comes from aviation turbine fuel, not natural gas.

** Total decarbonisation potential from switching to low-carbon hydrogen includes (4.1 MtCO₂) I&C, (6.2 MtCO₂) power, and (1.4 MtCO₂) transport emissions.

*** Independent analysis, completed by PWC on behalf of Cadent. See pp 81 for more information on economic benefits.

Delivering the ECH₂ Programme

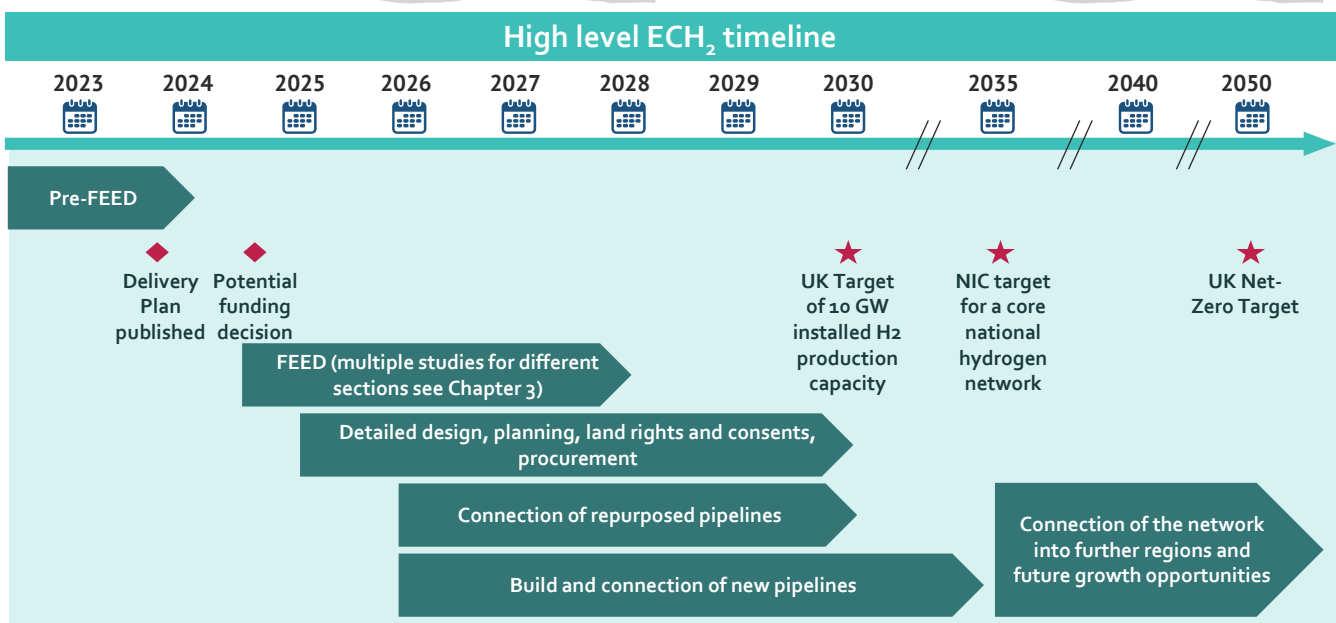
To successfully deliver ECH₂ and capture the anticipated benefits across the region, a number of enabling actions are needed. Progressing these now is essential not just to ECH₂ but to the core network of hydrogen pipelines needed nationally by 2035.

UK Government and wider industry actions

- Make a decision on hydrogen blending
- Finalise T&S Business Models that provide the right incentives for investment
- Make a decision on the role of hydrogen in residential heating
- Assess technical requirements for safe hydrogen transportation
- Establish standardised procedure for hydrogen safety case approval
- Support the development of hydrogen storage facilities
- Support development of hydrogen offtake agreements
- Engage with different stakeholders to understand and better support the need for hydrogen in specific businesses
- Ensure HSE & Ofgem have enabling mandates and sufficient resource to undertake all necessary licensing activities (e.g. safety case, economic license)
- Support projects through further rounds of the cluster sequencing and hydrogen allocation process aiding them achieve CAPEX or DEVEX support.

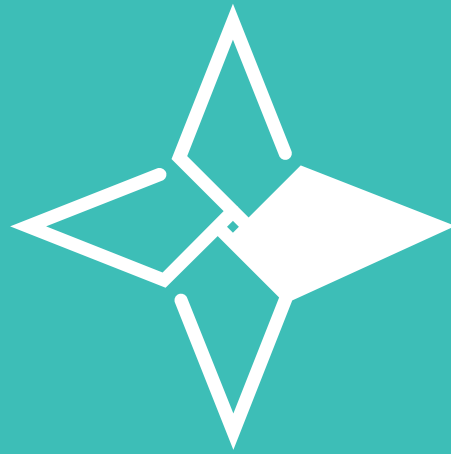
ECH₂ Programme actions

- Provide evidence to the UK Government and regulators through trials and technical assessment results to support policy decisions
- Ensure sufficient engagement with Ofgem & DESNZ to share key Programme insights and be aware of any policy changes
- Engage with potential customers and provide them input to support decisions on their own hydrogen and decarbonisation plans
- Conduct Consortium activities to continue to ensure alignment of ECH₂ with stakeholder plans
- Ensure that the Programme meets the requirements of hydrogen users, production and storage facilities
- Ensure optionality to adapt the routing design to an evolving environment
- Engage with cross supply-chain stakeholders, ensuring resourcing and procurement risks are addressed
- Support initiatives which unlock further investment into the wider hydrogen economy and stakeholders decarbonisation plans



To ensure the progress of ECH₂ and the development of a hydrogen economy in the East Coast region and across the UK, continued momentum and commitment from Programme Partners, the UK Government and wider industry is required.





East Coast Hydrogen

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