

Hydrogen Net Zero Investment Roadmap

Leading the way to net zero

February 2024



The UK is leading the charge towards a net zero, nature-positive future



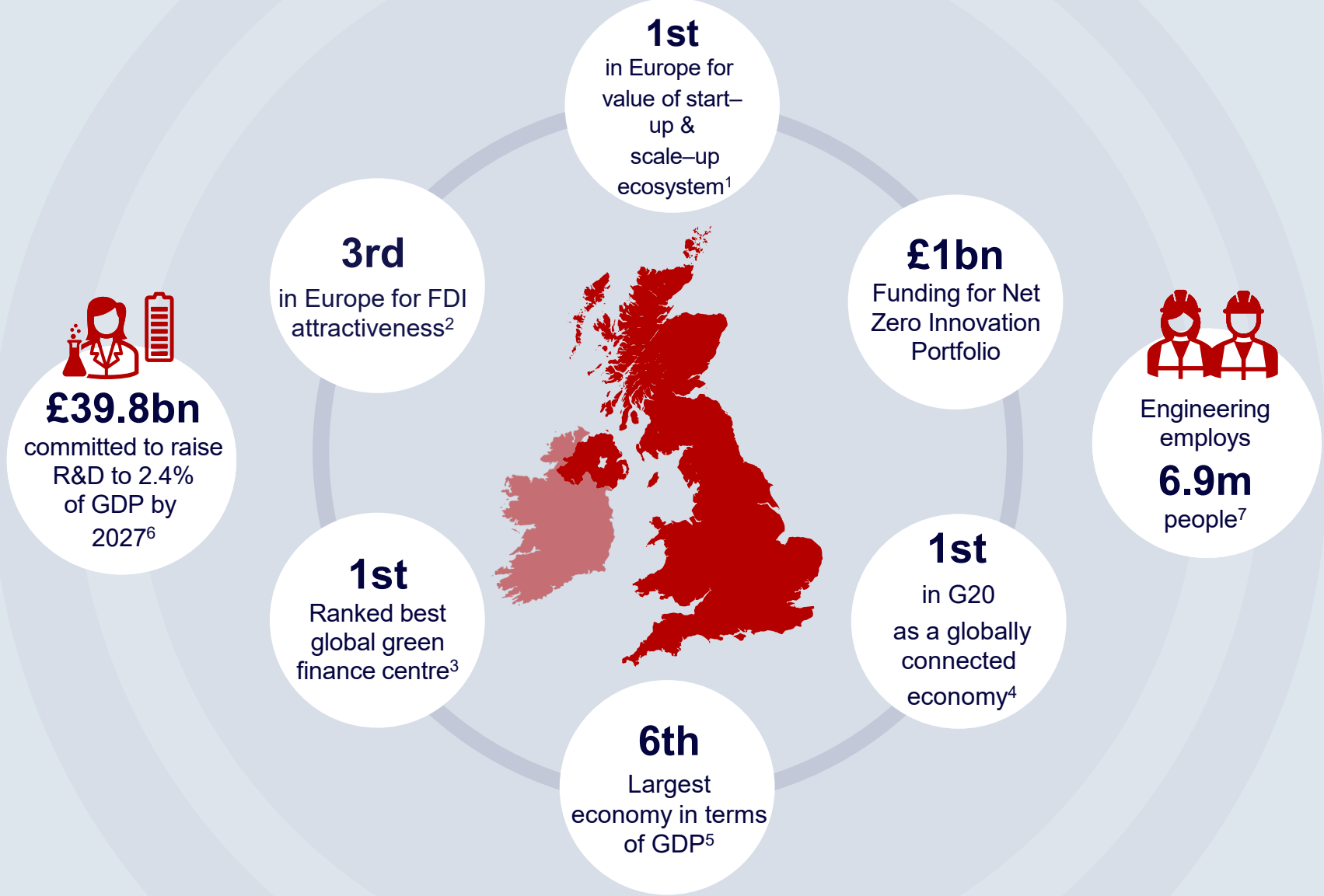
We are now entering a period of unprecedented growth for the UK hydrogen economy. With the largest number of commercial scale electrolytic hydrogen production projects announced at once anywhere in Europe, the UK is a world leading place to invest in hydrogen.



Rt Hon Claire Coutinho MP – Secretary of State for Energy Security and Net Zero

- In the two and a half years since the publication of the UK Hydrogen Strategy we have made rapid progress and are now firmly in delivery mode, supporting projects to move us closer to our hydrogen ambitions.
- In December 2023, we announced the largest number of commercial scale green hydrogen production projects at once anywhere in Europe, awarding support to projects representing 125MW of production capacity through the first Hydrogen Allocation Round (HAR1).
- At the same time, we opened the second Hydrogen Allocation Round (HAR2) with a capacity aim of up to 875MW, closing for applications on 19 April 2024.
- We also made a range of exciting announcements and publications on our growing hydrogen economy.
- We announced plans for the first allocation rounds of the hydrogen transport and storage business models in 2024, a major step forward in the delivery of critical hydrogen infrastructure.
- We also published a consultation on the need for and design of potential hydrogen to power market intervention and sought views on enabling hydrogen to power plants to compete in the Capacity Market.
- To support the expansion of strong, home-grown, clean energy supply chains, in November 2023 we announced the £960m Green Industries Growth Accelerator (GIGA) fund for UK sectors including hydrogen and CCUS, to seize growth opportunities through the transition to net zero.
- This rapid progress demonstrates our commitment to hydrogen, and proves that the UK is a world leading destination for investment in low carbon hydrogen.

The UK has one of the world's most attractive business and investment environments



- Open, liberal economy
- Stable regulatory regime with independent legal system
- Globally competitive and transparent tax regime
- Generous R&D and patent tax relief
- The UK-EU Trade and Cooperation Agreement allows zero tariff market access with the EU
- Flexible labour market
- World class professional services sector supporting businesses with insurance and finance

References: ¹Dealroom; ²EY Attractiveness Survey November 2023; ³Z/Yen Global Green Finance Index 2023 (GGFI 12); ⁴DHL Global Connectedness Index 2022; ⁵Official statistics converted at market exchange rates as a source; ⁶UK Innovation Strategy (2022); ⁷Trends in the Engineering Workforce in the UK (2022)

Why invest in UK Hydrogen?

A sector with striving ambitions and major opportunities for growth

Up to
10GW
ambition by 2030,
up to 6GW from
electrolytic
hydrogen

£960m
Green Industries
Growth Accelerator
(GIGA) fund

Up to
35%
of UK's energy
consumption could
be hydrogen by
2050

27GW
of potential hydrogen
projects identified in
the UK pipeline
(through to 2037*)

More than
£170m
will be spent from the
Net Zero Innovation
Portfolio on hydrogen
innovation

Up to
£18bn
private financial capacity
available from UK
Infrastructure Bank for
sectors including H2

Opportunities in an
advanced & growing
sector

*Source: DESNZ Low Carbon Hydrogen production pipeline. Note that all figures here are based on potential deployment and capacity scale up according to the projects themselves, and does not relate to decisions on individual projects or volume support through specific funding allocation windows.

Why invest in UK Hydrogen?

A sector with striving ambitions and major opportunities for growth

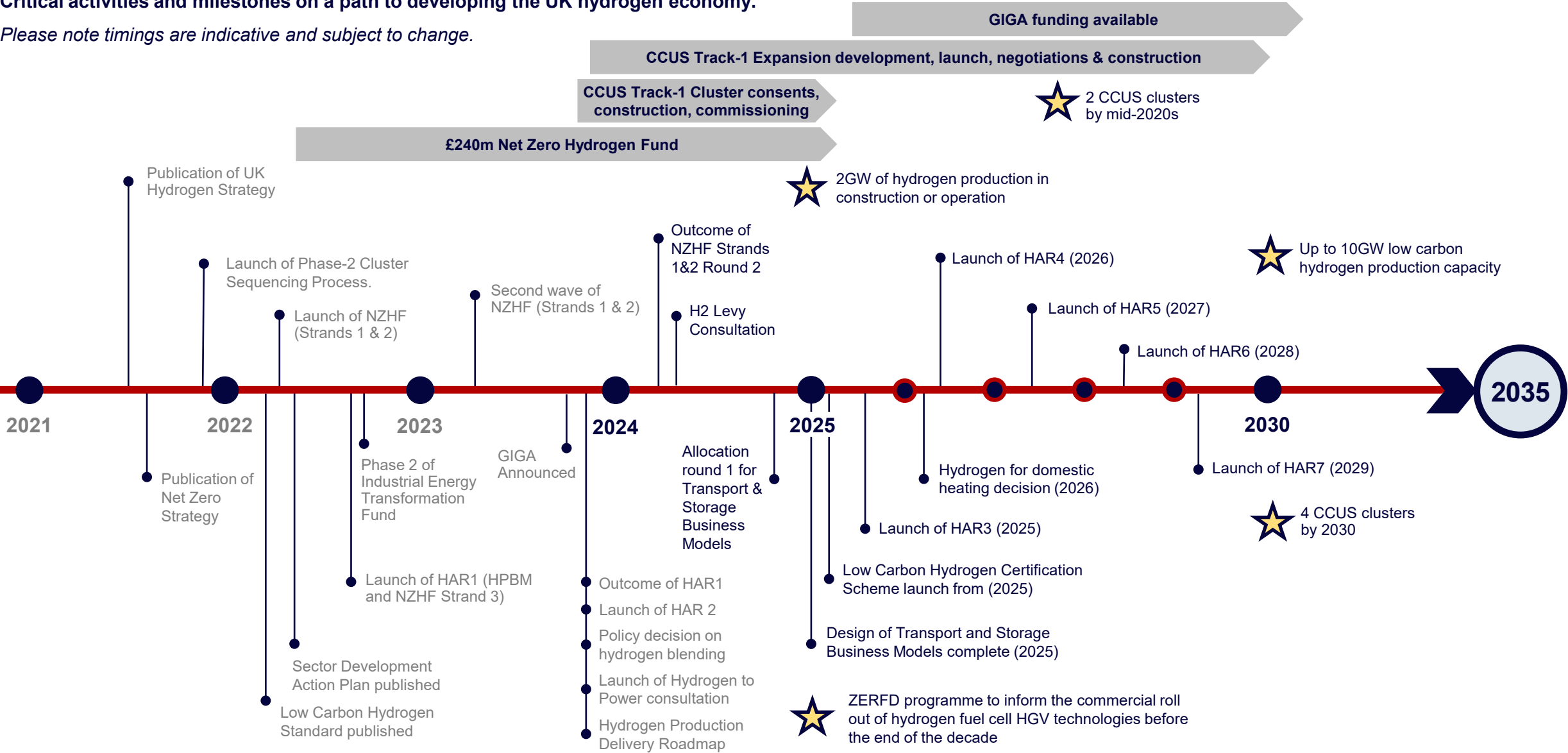
Opportunities in an advanced & growing sector:

- **First Hydrogen Allocation Round:** 125MW of production capacity were offered contracts from the first allocation round (HAR1) in December 2023, with over £400m of private capital investment being committed by the projects upfront between 2024-2026, and over 700 direct jobs created.
- **Second Hydrogen Allocation Round:** We also launched the second Hydrogen Allocation Round (HAR2), which will aim to award contracts of up to 875MW. The application window will close on April 19. The EOI data shows a significant increase in interest from HAR1 and confirms our confidence in a healthy pipeline of non-CCUS-enabled projects in the UK.
- **Future Hydrogen Allocation Rounds:** Government has set its ambition to allocate up to 1.5GW across HARs 3&4, launching in 2025 and 2026 respectively.
- **Green Industries Growth Accelerator:** In November 2023, we announced the £960m Green Industries Growth Accelerator (GIGA) fund to support private sector investment in clean energy supply chains across the UK. Part of a wider £4.5bn package for manufacturing, GIGA, will enable the UK to seize growth opportunities of the net zero transition by supporting the expansion of strategically important sectors including hydrogen; carbon capture, utilisation and storage; electricity networks; nuclear; and offshore wind.
- **Hydrogen Transport & Storage Business Models:** We set our intention for the first allocation round to open in 2024 with an initial ambition to support up to two geological storage projects at scale and associated regional pipeline infrastructure to be in construction or operation by 2030.
- **Hydrogen to Power (H2P):** Government is consulting on the need and design for potential market intervention to accelerate the deployment of H2P.
- **Projects under development:** There are up to 27GW known projects in the pipeline, in all countries and regions of UK including CCUS enabled (blue) and electrolytic hydrogen.

Our 2035 Delivery Plan

Critical activities and milestones on a path to developing the UK hydrogen economy.

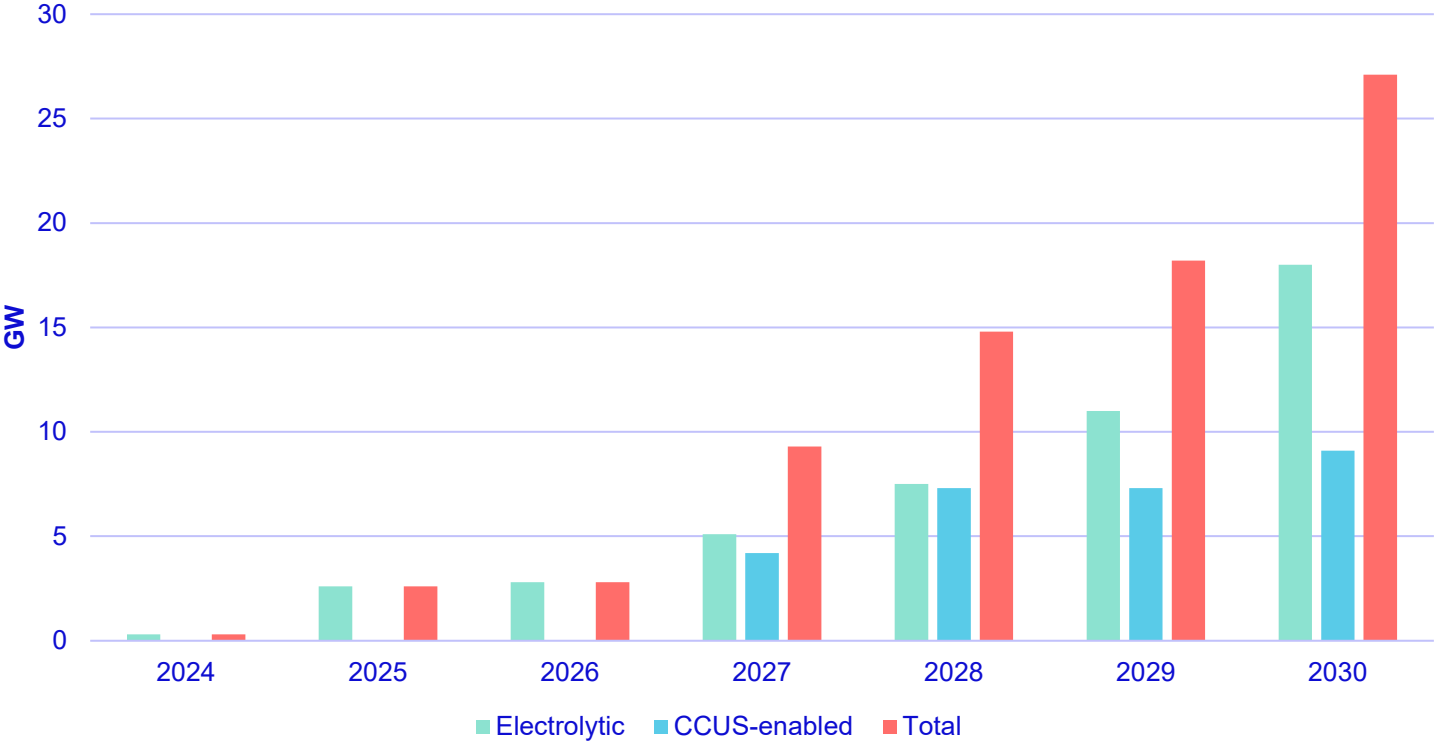
Please note timings are indicative and subject to change.



HAR – Hydrogen Allocation Round; NZHF – Net Zero Hydrogen Fund; GIGA – Green Industries Growth Accelerator.

The known pipeline of hydrogen projects shows potential for growth and investment

Cumulative potential total GW low carbon hydrogen production capacity



Source: DESNZ Low Carbon Hydrogen production pipeline. Note that all figures here are based on potential deployment and capacity scale up according to the projects themselves, and does **not** relate to decisions on individual projects or volume support through specific funding allocation windows.

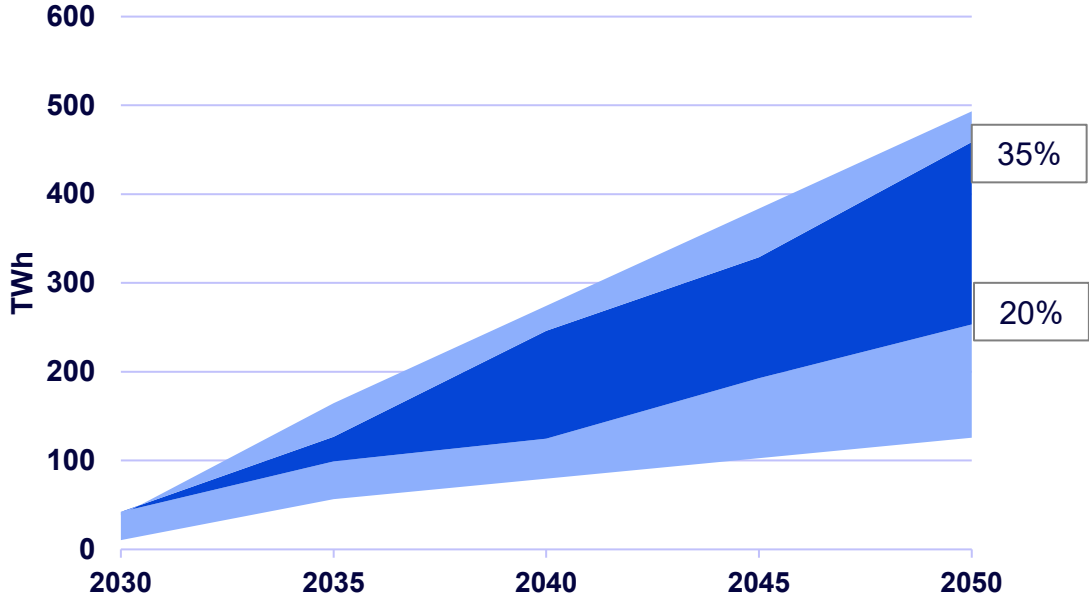
Hydrogen Production

- A growing pipeline of over 250 projects across a range of low carbon hydrogen production pathways provides confidence in the future development of the UK hydrogen economy.
- The first electrolytic allocation round offered contracts totalling 125MW of capacity across 11 projects, with the first projects operational in 2025, kickstarting the UK low carbon hydrogen production sector.
- The second Hydrogen Allocation Round (HAR2) launched in December 2023, and will aim to award up to 875MW of capacity in early 2025, to deliver up to 1GW of electrolytic hydrogen production capacity in construction or operation by 2025.
- Announced two CCUS-enabled hydrogen projects as part of the Track-1 Cluster Sequencing process, plans to establish two further CCUS clusters in Track-2, as well as enable further expansion of the Track-1 clusters.

Hydrogen will play a crucial role in future of the UK's energy system

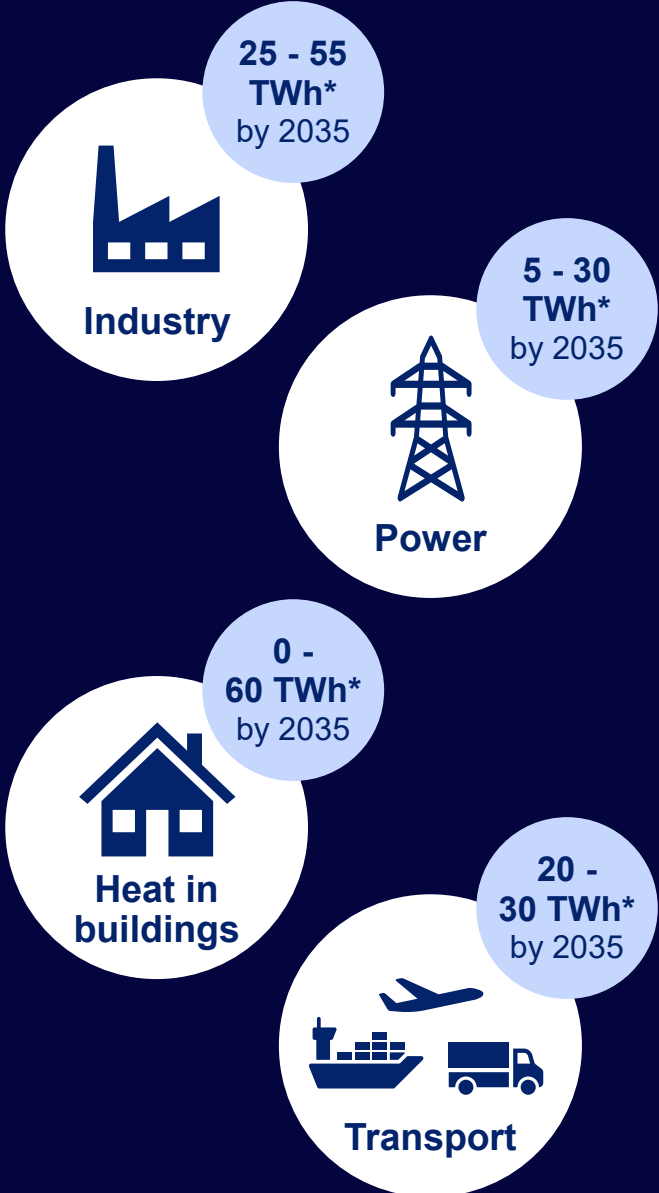
- Our ambition for up to 10GW of low carbon hydrogen production capacity by 2030 will help to create a thriving hydrogen economy in the UK, supporting the deep decarbonisation of key UK sectors, particularly in 'hard to electrify' industries, and can provide greener, flexible energy across power, heat, transport, and potentially heat in buildings.
- Our drive for renewables makes hydrogen especially valuable for energy security and independence by providing flexibility and energy storage: excess renewable electricity can be used to produce hydrogen, which can be stored over time and used to generate electricity when there is less sun or wind to power the grid.
- Analysis for the UK Hydrogen Strategy shows that low carbon hydrogen could play a key role in UK energy system potentially becoming comparable in scale to existing electricity use by 2050.

Hydrogen demand could be 20-35% of UK final energy consumption by 2050



% = hydrogen as proportion of total energy consumption in 2050.

Source: Central range – illustrative net zero consistent scenarios in CB6 Impact Assessment. Full range – based on whole range from UK Hydrogen Strategy Analytical Annex. Final energy consumption from ECUK (2019).



*Illustrative demand based on analysis for the Hydrogen Transport and Storage Networks pathway (2023) <https://www.gov.uk/government/publications/hydrogen-transport-and-storage-networks-pathway>

Recent UK H₂ Developments

The **Hydrogen Strategy Delivery Update (December 2023)** sets out the approach to developing a thriving low carbon hydrogen sector in the UK to meet our increased ambition for up to 10GW of low carbon hydrogen production capacity by 2030.

The **Hydrogen Production Delivery Roadmap (December 2023)** sets out how we expect the hydrogen production landscape to evolve towards 2035, and the key opportunities and challenges that we may face.

The **Hydrogen Transport and Storage (T&S) Networks Pathway (December 2023)** sets out the next steps in our vision for the strategic development of UK hydrogen T&S infrastructure.

The **Government Response to a consultation on hydrogen blending (December 2023)** sets out a strategic policy decision to support blending of up to 20% hydrogen by volume into the GB gas distribution networks, if enabled.

The **Hydrogen to power need and design for market intervention consultation (December 2023)** seeks views on our position that market intervention could be required to support hydrogen to power to deploy, including design options.

The **CCUS Vision (December 2023)** sets out government's vision for the UK CCUS sector in the 2030s.

The UK has developed a supportive policy and regulatory environment

Supportive Policy & Regulatory Environment

Hydrogen Blending

- In December 2023 we announced a positive strategic decision to support the blending up to 20% hydrogen by volume into the GB gas distribution networks in certain circumstances and scenarios that align with blending's strategic role.

Hydrogen Infrastructure

- In December 2023, we set out our ambition to support up to two storage projects at scale and associated regional pipelines in construction or operation by 2030. This is a major step forward in the delivery of the transport and storage we will need, building on the legislative powers created in the Energy Act in October 2023.
- Following the recommendation of the National Infrastructure Commission, we have announced support in principle for a hydrogen core network. Government agreed that a core hydrogen network could bring benefits to security of energy supply and help build a competitive hydrogen market, subject to further work on the optimal scale, location and pace of network development.

Power

- In December 2023, we published a consultation seeking views on our minded-to position that market intervention could be required to mitigate our identified barriers to hydrogen to power (H2P) deployment. Our analysis indicates that a market intervention based on elements of the CCUS Dispatchable Power Agreement (DPA) but adapted for H2P could be the most suitable for mitigating the identified deployment barriers. H2P faces potentially higher investment costs from being a first of a kind technology, and H2P developers may not be able to effectively manage delays or outages in the hydrogen value chain in a nascent hydrogen economy. We intend to publish a response to the consultation in Q2 2024.
- To maximise the deployment potential for a wide range of potential H2P projects, we also sought views on enabling participation of H2P in the Capacity Market (CM) as soon as practical.
- In March 2023, we consulted on proposals for updated Decarbonisation Readiness requirements to require new build and substantially refurbishing combustion power plants to be built in such a way that they can decarbonise through either 100% hydrogen-firing or by retrofitting CCUS within the plant's lifetime. We intend to publish a response soon.

Supportive Policy & Regulatory Environment

CCUS Enabled Hydrogen

- The Cluster Sequencing process maps a logical sequence for CCUS deployment in the UK. CCUS-enabled clusters will be the starting point for a new carbon capture industry.
- We have now published the Track-1 Project Negotiation List which includes 8 projects which we have selected through the Cluster Sequencing Process to progress to negotiations to form the first two CCUS clusters, based in HyNet and the East Coast Cluster.
- We have begun launching a process to enable the expansion of Track-1 clusters: we launched Track-1 expansion in HyNet in December 2023 and will launch Track-1 expansion in the East Coast Cluster this year.
- We have launched Track-2 of the CCUS cluster sequencing process to establish two further CCUS clusters.

Regulation

- In December 2023 we published the Low Carbon Hydrogen Standard V3.
- We are developing a Low Carbon Hydrogen Certification Scheme (by 2025) to provide a reliable method for producers to demonstrate the sustainability credentials of low carbon hydrogen, promoting confidence in the early hydrogen market and facilitating future trade.
- As committed to in the Hydrogen Strategy, we established the Hydrogen Regulators Forum in January 2022 to determine current and future non-economic regulatory responsibilities across the hydrogen value chain.
- The Forum has facilitated knowledge sharing on multiple legislative and regulatory changes to help develop the hydrogen economy.
- There is also an ambition for the new National Energy System Operator (NESO) to take on strategic planning activities for hydrogen transport and storage infrastructure from 2026, subject to further scoping work.
- In the absence of an overarching consenting framework for offshore hydrogen pipelines and storage, in September 2023, DESNZ introduced secondary legislation to extend existing offshore oil and gas pipeline and storage regulatory frameworks to cover offshore hydrogen pipelines and storage. Our legislation changes ensure that this infrastructure is brought within pre-existing environmental assessment and decommissioning frameworks. Therefore, the relevant oil and gas responsibilities for OPRED and the NSTA now extend to hydrogen pipelines and storage infrastructure. This legislation came into effect on 27 September 2023.

Visibility of Policy Direction

- DESNZ provides regular updates on hydrogen production policy development, including the production pipeline, in Hydrogen Strategy updates to the market.
- The Hydrogen Production Delivery Roadmap sets out how we expect the hydrogen landscape to evolve out to 2035.

Business Models

- CAPEX and OPEX supporting mechanisms such as the NZHF, HPBM, future Transport & Storage Business Models (expected 2025).

Skills & Supply Chain

Skills

- We are giving employers a stronger voice in the system through Local Skills Improvement Plans, which set out employers' views on the key skills priorities for an area. The £165 million Local Skills Improvement Fund (LSIF) enables collaborations of FE providers across an area to respond to the skills needs set out in the LSIPs.
- In England, DfE is investing an additional £3.8 billion in skills throughout this parliament. This includes funding for programmes to support green skills, including apprenticeships, T levels and Skills Bootcamps.
- Free Courses for Jobs gives adults the chance to access free level 3 (A level equivalent) qualifications. Many eligible courses are in subjects linked with green careers.
- To tackle emerging and future workforce demands, the Government, working with the Green Jobs Delivery Group, is focused on the creation of a Green Jobs Plan for publication in the first half of 2024. This plan will provide the actions needed to ensure we have the sufficiently skilled workforce to deliver on the Government's targets.
- As part of the Tees Valley Hydrogen Transport Hub, the Tees Valley Combined Authority will utilise £300,000 of government funding to run competitions for Tees Valley colleges and training institutions to purchase hydrogen training equipment to upskill the local workforce.

Supply Chain

- We announced the £960 million Green Industries Growth Accelerator (GIGA) in November 2023 to support the expansion of strong, home-grown, clean energy supply chains across the UK, for carbon capture utilisation and storage and hydrogen as well as electricity networks, nuclear and offshore wind. This is part of a wider £4.5 billion package of funding for manufacturing to support private investment in eight strategic sectors across the UK. Funding will be available from 2025/26.
- The advanced manufacturing plan sets out the actions we are taking to be the best place in the world to start and grow a manufacturing business.
- The North Sea Transition Deal (March 2021) will support workers, businesses, and the supply chain through a transition to a net zero future by harnessing the industry's existing capabilities, infrastructure and private investment potential to exploit new and emerging technologies, including hydrogen production and CCUS.
- The North Sea Transition Deal has developed an integrated People and Skills Plan to ensure the highly skilled oil and gas workforce can be deployed to adjacent energy sectors including developing our hydrogen industry. Skills body OPITO are currently working with stakeholders to align qualifications and develop a digital skills passport which will support workers to transfer their skills and move more easily between offshore oil and gas and other sectors, starting with offshore wind.
- We are working with industry to develop a supply chain strategy for hydrogen.

Demand & Use

Industry

- The £500 million Industrial Energy Transformation Fund supports the deployment of fuel switching technologies, with Phase 3 launched in January 2024. Various innovation programmes for hydrogen end-use funded through the £1 billion Net Zero Innovation Portfolio.
- We are sponsoring the British Standards Institute to develop a publicly available specification for hydrogen firing and conversion of large gas-fired equipment, supporting faster and cheaper fuel switching to hydrogen.

Exports

- We are exploring opportunities to export hydrogen, including from the UK to continental Europe, where we see increasing hydrogen demand alongside established energy trading and interconnection with the UK.
- We have agreed a partnership between the UK and Germany to help secure safe, affordable and clean energy for consumers in both nations for the long term and bolster energy security.

Transport

- Spring 2023 guidance enhanced the flexibility of the Renewable Transport Fuel Obligation (RTFO) for electrolytic hydrogen allowing suppliers to blend additional and non-additional renewable energy in order to reach the GHG threshold and qualify for support. Suppliers of hydrogen to aviation can now potentially claim Renewable Transport Fuel Certificates (RTFCs).
- £13m for the Tees Valley Hydrogen Transport Hub will fund both hydrogen fuel cell vehicles and new refuelling infrastructure to co-locate supply and demand in the region, building an evidence base and experience to support its future use and investment decisions.
- New zero emission HGV demonstrators will deploy up to 60 new hydrogen fuel cell HGVs on UK roads and up to 7 publicly accessible hydrogen refuelling stations.
- The £206m UK Shipping Office for Reducing Emissions (UK SHORE) programme, launched in March 2022, is focused on accelerating the development of technologies necessary to decarbonise our maritime sector, including hydrogen and hydrogen-derived fuels. UK SHORE is delivering R&D funding through a wide range of interventions until March 2025, including the Clean Maritime Demonstration Competition and the Zero Emission Vessels and Infrastructure scheme.
- In July 2022, Government confirmed that a sustainable aviation fuel (SAF) mandate will be introduced in 2025. Last March, a specific reward for hydrogen used directly as a fuel for aviation, was proposed, as well as where hydrogen is used as a feedstock in SAF production. The final design will be confirmed in Spring 2024.

Heat

The proposed hydrogen heating village trial in Redcar cannot go ahead as designed, as the main source of hydrogen supply will not be available. The government still plans to take a decision in 2026 on whether, and if so how, hydrogen will contribute to heating decarbonisation. This will be supported by SGN's H100 neighbourhood trial in Fife, a wide range of trials across Europe, and our broader research, development and testing programme. The Hydrogen Skills and Standards for Heat programme is developing standards for hydrogen gas installations as well as training frameworks for installers. These will support future trials and conversion of the existing gas system for hydrogen heating.

Innovation and Incentives

Innovation

- Public funders like the Department for Energy Security and Net Zero, the Department for Business and Trade, and UK Research and Innovation continue to fund hydrogen innovation including through the flagship £1 billion Net Zero Innovation Portfolio (NZIP), which has allocated over £170 million to hydrogen innovation projects.
- Contracts have been awarded from the £60 million NZIP Low Carbon Hydrogen Supply 2 to ongoing projects to demonstrate novel technologies and move them closer to commercial deployment, with testing due to start in some projects in early 2024.
- The 2023 Biomass Strategy outlined the role biomass could play in the hydrogen sector, supported by the NZIP £31 million Hydrogen BECCS Innovation programme.
- UKRI's Engineering and Physical Sciences Research Council (EPSRC) invested £20 million in June 2023 in two hydrogen research hubs that deliver options to integrate low carbon hydrogen into the domestic, industrial and transport energy systems.

Incentives

- Up to £18 billion private financial capacity available from UK Infrastructure Bank (UKIB) for sectors including hydrogen, which has been identified as an investment opportunity. The bank recently published a hydrogen sector update which sets out how the bank will tackle financing problems in the sector over the next 12-24 months.
- Freeports are special areas within the UK offering a comprehensive package of measures, such as tax reliefs, customs, business rates retention, planning, regeneration, innovation and trade and investment support. Since 2021, the government has announced 12 Freeports, which are projected to create over 200,000 future jobs, many of which will be in the high-innovation, low-carbon technologies of the future. To date, Freeports have already attracted a remarkable £2.9 billion of investment, creating over 6,000 jobs.
- The Government has established Investment Zones which aim to boost economic activity by offering tax and customs incentives to businesses, encouraging investment, innovation and growth in key industries. The zones provide a supportive planning environment to facilitate collaboration between local leaders and regulators. There are currently 12 Investment Zones, including areas like the West Midlands, Greater Manchester and Teeside.

Stimulating hydrogen production investment



Deployment investment needed by 2030 to deliver up to 10GW of hydrogen production capacity.

Potential investment opportunities:

- Debt and equity finance opportunities through life cycle for 'first of a kind' electrolytic and CCUS-enabled hydrogen production projects awarded NZHF and HPBM support.
- **From 2024 - 2025** investment is needed in R&D, feasibility, FEED and construction. Opportunities for equity as well as debt investors such as existing manufacturers, oil & gas majors, private equity firms, sovereign wealth funds, commercial banks and sector incumbents.
- **From 2025 - 2030** investment needed for full project development cycle from inception to operations (excluding R&D) from equity investors including electrolyser manufacturers, oil & gas majors, asset managers and private equity firms. Based on the existing pipeline of projects we see significant demand and potential investment opportunities for the following areas of the supply chain:
 - Services such as engineering, construction management and commissioning.
 - Manufacturing materials such as reformers, compressors, piping, instrumentation & controls equipment, civil & structural materials, electrolyser packages, water treatment and cooling packages and electrical equipment and materials.

Examples of planned projects:

Electrolytic

Carlton Power: developing three successful HAR1 projects (Barrow Green, Trafford Green, and Langage Green), totalling 45MW of electrolytic hydrogen production. Read more [here](#).

H2 Energy and Trafigura West Wales Hydrogen: Located in the South Wales Industrial Cluster, project successful in HAR1 and progressing plans to scale up electrolytic hydrogen production. Read more [here](#).

EDF and Hynamics Tees Green: project successful in HAR1 and looking to scale up to a potential 500MW of electrolytic hydrogen to supply industry and decarbonise local port operations. Read more [here](#).

CCUS-enabled hydrogen

Essar Energy Transition (EETH) HPP1: Up to 350MW of low carbon CCUS-enabled hydrogen production within the CCUS Hynet cluster. Read more [here](#).

bp H2Teesside: Up to 708MW of low carbon CCUS-enabled hydrogen production within the CCUS East Coast Cluster. Read more [here](#).

PLEASE NOTE: Any hydrogen projects cited as examples in this Roadmap are indicative only. Any reference to such projects has no bearing on their likelihood of selection under current or future subsidy schemes

Stimulating transport & storage investment



Investment needed by 2030 in infrastructure to enable growth of the UK hydrogen economy.

Potential investment opportunities:

- **By 2025** Business models for Transport & Storage are being designed to unlock/de-risk investment. First hydrogen projects are expected to be developed close to end-users with specified off-takers, though as demand grows hydrogen infrastructure will be vital to connecting and balancing supply and demand.
- **From 2024 - 2025** Investment required in feasibility studies, pre-FEED and FEED from equity investors such as manufacturers, energy companies and storage specialists. Plus opportunities for debt investors such as commercial banks and sector incumbents.
- **From 2025 - 2030** Storage developments: investment required in feasibility studies, pre-FEED and FEED, as well as construction from natural gas network operators, H2 producers/off-takers, H2 storage operators, private equity firms, infrastructure funds. Potential supply chain investment opportunities include:
 - Pressure vessels, control valves and instrumentation, leveraging existing UK capabilities servicing petrochemicals and oil & gas industries.
 - Short/medium/long range storage provision to balance across seasons and provide resilience to broader market.
 - Inter-cluster transmission pipelines to connect industrial centres and provide resilience as well as facilitate inland market.
 - Tube trailers as a form of both small-scale storage and non-pipeline distribution to support initial hydrogen economy.

Examples of projects:

Hydrogen Transport Projects

East Coast Hydrogen: Project led by NGN, Cadent, and NGG to build off Project Union to provide a hydrogen delivery network connecting producers to end-users in northeast England. Read more [here](#).

Cadent, HyNet: Project to construct and operate an onshore pipeline transporting hydrogen from CCUS-enabled production in northwest England to end users. Read more [here](#).

National Gas Transmission, Project Union: Proposed hydrogen national transmission system, or hydrogen “backbone”, repurposing around 25% of current gas transmission pipelines. Read more [here](#)

Hydrogen Storage Projects

Inovyn, Storengy: Proposed new and repurposing of salt caverns in Cheshire, currently used for natural gas storage, to store 1.3TWh of hydrogen. Read more [here](#).

SSE Thermal/Equinor: Proposed 0.32TWh salt cavern to store low-carbon hydrogen produced and used in the Humber region, potentially from 2028. Read more [here](#).

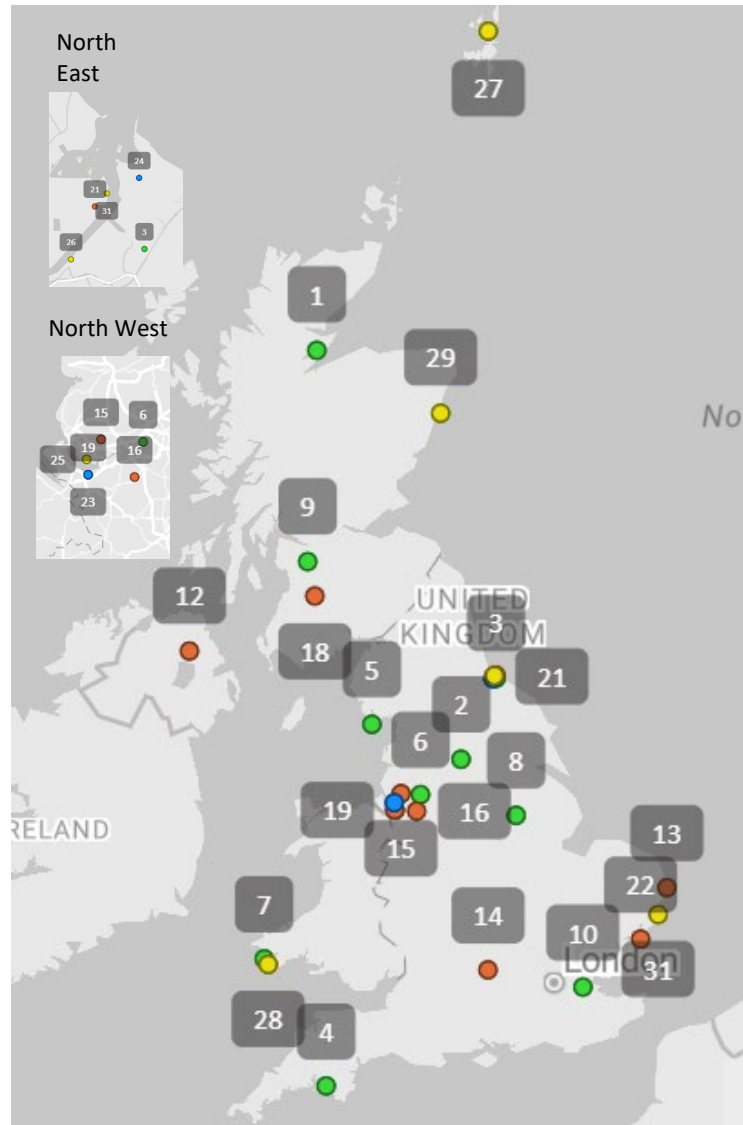
Centrica Rough: Following re-opening in 2022, Centrica aims to redevelop Rough storage facility (depleted gas field) into a 10TWh hydrogen store. The hydrogen storage capacity is set to be developed in ~3TWh phases. Read more [here](#).

PLEASE NOTE: Any hydrogen projects cited as examples in this Roadmap are indicative only. Any reference to such projects has no bearing on their likelihood of selection under current or future subsidy schemes

Successful Projects

| HAR1 | | |
|-------------------------|-----------------------|----|
| Project name | Developer | No |
| Cromarty | Storegga | 1 |
| Bradford Hydrogen | Hygen | 2 |
| Tees Green | EDF | 3 |
| Lange Green Hydrogen | Carlton Power | 4 |
| Barrow Green Hydrogen | Carlton Power | 5 |
| Trafford Green Hydrogen | Carlton Power | 6 |
| West Wales Hydrogen | H2 Energy & Trafigura | 7 |
| HyMarnham | JG Pears | 8 |
| Whitelee Green Hydrogen | Scottish Power | 9 |
| Green Hydrogen 3 | HYRO | 10 |
| Hybont | Marubeni | 11 |

| NZHF Window 2 | | |
|--|-------------------------------------|----|
| Project name | Developer | No |
| Grenian Hydrogen Speke | Grenian Hydrogen | 25 |
| Tees Green Methanol | EDF | 26 |
| Sullom Voe Terminal Green Hydrogen Project | Enquest Hydrogen | 27 |
| Pembroke 200 MW Green Hydrogen Electrolyser Phase II | RWE Generation | 28 |
| Aberdeen Hydrogen Hub | Bp Aberdeen Hydrogen Energy Limited | 29 |
| Tees Valley Hydrogen Vehicle Ecosystem (HYVE) | Exolum International UK | 30 |
| Suffolk Hydrogen | Hydrab Power | 31 |



| NZHF window 1 | | |
|--|--------------------|----|
| Project name | Developer | No |
| Ballymena Hydrogen | Ballymena Hydrogen | 12 |
| Conrad Energy Hydrogen Lowestoft | Conrad Energy | 13 |
| Didcot Green Hydrogen Electrolyser | RWE | 14 |
| Green Hydrogen St Helens | Progressive Energy | 15 |
| Green Hydrogen Winnington and Middlewich | Progressive Energy | 16 |
| Mannok Green Hydrogen Valley | Mannok | 17 |
| Knockshinnoch Green Hydrogen Hub Project | Renantis | 18 |
| Hynet HPP2 | Vertex | 19 |
| Kintore Hydrogen | Statera | 20 |
| H2 NorthEast | Kellas | 21 |
| Felixstowe Port Green Hydrogen | Scottish Power | 22 |

| CCUS Sequencing | | |
|-----------------|----------------------------------|----|
| Project name | Developer | No |
| Hynet HPP1 | Essar Energy Transition Hydrogen | 23 |
| bpH2Teesside | bp | 24 |

Projects offered support through windows 1 and 2 of the NZHF and HAR 1, and the CCUS enabled hydrogen projects in the latest stage of the Track-1 cluster sequencing process

Further ways we help you invest and develop in the UK

The UK's commitment to support global investment is unparalleled

The Department for Business and Trade (DBT)

DBT supports businesses to invest, grow and export, creating jobs and opportunities across the country, with teams based in over 100 countries.

Office for Investment (OFI)

OFI is a joint DBT and No.10 team that provides a single front door to Government for high-value and high-impact investors, facilitating with access and insights through a concierge offer. The OFI works across departments to drive increased investment in line with the Government's Net Zero agenda.

UK Export Finance (UKEF)

The UK's export credit agency, has enhanced its support to attract investment into supply chains and building export capability.

UK infrastructure Bank (UKIB)

The UKIB can invest across the capital structure (senior debt, mezzanine, first loss, debt guarantees and equity) to help crowd private finance into net zero infrastructure. Projects are encouraged to contact UKIB about their financing needs.

Support moving a tech business

The Global Entrepreneur Programme (GEP) helps high-growth overseas companies relocate to the UK.

Economic development agencies

There are a number of organisations with significant experience in delivering public sector investment packages. For example, Scottish National Investment Bank is a mission-led development bank that provides patient capital to build a stronger, fairer, more sustainable Scotland.

Helpful guides

Guidance on expanding to the UK, including visas and migration; tax and incentives; regulatory and business planning; staff recruitment, retention and training; and immigration.

Links to key organisations

In addition to centres of excellence and industry clusters, we will facilitate introductions to universities, Local Enterprise Partnerships (LEPS) and Enterprise Zones.

Find a UK specialist

The UK Investment Support Directory allows you to find companies with skills and experience in helping overseas businesses set up or expand in the UK.

Visit [great.gov.uk](https://www.great.gov.uk)

Appendix A – Notes and Definitions

Investment needs are defined as the total sum of capital contributions required to deliver the necessary projects to achieve the current deployment pathway assumed in the Net Zero Growth Plan.

The investment needs data is calculated to 2030 to align with the Nationally Determined Contribution (NDC) agreement to revisit and strengthen Net Zero 2030 targets.

Methodology used to estimate the investment need:

Hydrogen production investment is based on the capital costs required to meet our ambition for up to 10 GW of hydrogen production capacity by 2030. Transport & Storage investment is an estimate of the capital costs needed to build the large-scale hydrogen transport and storage infrastructure projects identified as priority infrastructure projects in the growth plan in September 2022*.

Data Caveats:

- The profile of deployment, and therefore investment, in the 2020s is highly uncertain and dependent on the capacities allocated through funding rounds for the Hydrogen Production Business Model and the mix of hydrogen supply technologies deployed. The figures only cover the cost of projects deploying up to 2030, so in reality we would expect additional investment for projects commissioning after 2030.
- Capex costs are estimated based on published costs from the Hydrogen Production Costs Report 2021 and assume capex costs are spread over 3 years before the plant comes online. Capex costs are highly uncertain, and costs for actual projects may differ from the generic assumptions used.
- Like production, the T&S investment figures are highly uncertain, and we anticipate higher investment after 2030. Investment needs will be dependent on the types of production and demand deployed and their location.
- The T&S investment figures, as well as the production investment figures, do not include investment in small scale T&S infrastructure. This is because there is insufficient evidence currently to split out CAPEX costs from total levelized costs for small-scale T&S infrastructure.

*Inclusion in these figures does not guarantee, where applicable, funding, planning consent or approval for other regulatory or permitting processes.

Appendix B.1 – Summary of government funding schemes

| Fund/competition | Capex | Devex | Opex | Funding allocated/available through policy/competition | Status |
|---|-------|-------|------|---|--|
| Production | | | | | |
| Net Zero Hydrogen Fund | X | X | | £240 million total funding available | Ongoing to March 2025 |
| Hydrogen Allocation Rounds/ Hydrogen Production Business Model | | | X | Funding available across lifetime of contracts dependent on negotiations with individual projects | Successful HAR1 projects announced See Hydrogen Economy Roadmap for timelines of future HARs and cluster sequencing process |
| NZIP Low Carbon Hydrogen Supply 2 competition | X | X | | £62 million allocated | Ongoing, running to March 2025 |
| NZIP Direct Air Capture and Greenhouse Gas removal programme | X | X | | £10 million; hydrogen spend only | Ongoing, running to March 2025 |
| NZIP Hydrogen BECCS Innovation programme | X | X | | £31 million allocated | Ongoing, running to March 2025 |
| Networks and storage | | | | | |
| NZIP Longer Duration Energy Storage competition | X | X | | £9 million; hydrogen spend only | Ongoing, running to March 2025 |

Appendix B.2 – Summary of government funding schemes

| Fund/competition | Capex | Devex | Opex | Funding allocated/available through policy/competition | Status |
|---|-------|-------|------|---|--|
| Use of hydrogen | | | | | |
| Industrial Energy Transformation Fund | X | X | | £289 million available across all technologies, plus potentially another £185 million | Ongoing, Phase 3 running to 2028 subject to business case approval |
| NZIP Red Diesel Replacement competition | | X | | £26 million; hydrogen spend only | Ongoing, running to March 2025 |
| NZIP Industrial Hydrogen Accelerator | X | X | | £13 million allocated | Ongoing, running to March 2025 |
| NZIP Industrial Fuel Switching 2 competition | X | X | | £23 million; hydrogen spend only | Ongoing, running to March 2025 |
| NZIP Green Distilleries competition | X | X | | £6 million; hydrogen spend only | Ongoing, running to September 2024 |
| Local Industrial Decarbonisation Plans competition | | X | | £5 million available | Ongoing, completing in December 2024 |
| Clean Maritime Demonstration Competition (CMDC) Rounds 1-4 | | X | | Rounds 1-3: £95million allocated Round 4: £34 million available | Rounds 1 and 2 completed, Rounds 3 and 4 running to March 2025 |

Appendix B.3 – Summary of government funding schemes

| Fund/competition | Capex | Devex | Opex | Funding allocated/available through policy/competition | Status |
|--|-------|-------|------|--|--|
| Use of hydrogen | | | | | |
| Zero emission HGV and infrastructure demonstrators | X | X | | Up to £85 million allocated for hydrogen HGVs/infrastructure; £140 million available | Ongoing, running to 2030 |
| Advanced Fuels Fund | | X | | £135 million allocated | Ongoing, running to March 2025 |
| APC's collaborative R&D competition – Round 22 | | X | | £77.1 million joint government and industry funding allocated | Ongoing, running to late 2026 |
| Zero Emission Vessels and Infrastructure (ZEVI) competition | X | X | | £80 million available | Ongoing, running to March 2028 |
| Tees Valley Hydrogen Transport Hub Fund | | X | | Phase 1: £2.6 million allocated Phase 2: up to £15 million available | Ongoing, running to March 2025 |
| Zero Emission Flight Infrastructure Project | X | | | £4.2 million allocated | Completed March 2023 |
| Supply Chains | | | | | |
| Green Industries Growth Accelerator | TBA | TBA | TBA | £960m Green Industries Growth Accelerator (GIGA) fund | Funding available from Q1 2025 - Q1 2030 |



Disclaimer

The Department for Energy Security and Net Zero is the department for delivering security of energy supply, ensuring properly functioning markets, greater energy efficiency and seizing the opportunities of net zero to lead the world in new green industries. **The Department for Business and Trade** is the department for economic growth. We support businesses to invest, grow and export, creating jobs and opportunities across the country.

Legal disclaimer

Whereas every effort has been made to ensure that the information in this document is accurate, the Department for Business and Trade and Department for Energy Security and Net Zero do not accept liability for any errors, omissions or misleading statements, and no warranty is given, or responsibility accepted as to the standing of any individual, firm, company or other organisation mentioned.

© Crown copyright 2024

You may re-use this publication (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence.

To view this licence, visit nationalarchives.gov.uk/doc/open-government-licence/version/3

Where we have identified any third-party copyright information in the material that you wish to use, you will need to obtain permission from the copyright holder(s) concerned.

Published by

Department for Energy Security and Net Zero
and Department for Business and Trade
27 February 2024

great.gov.uk