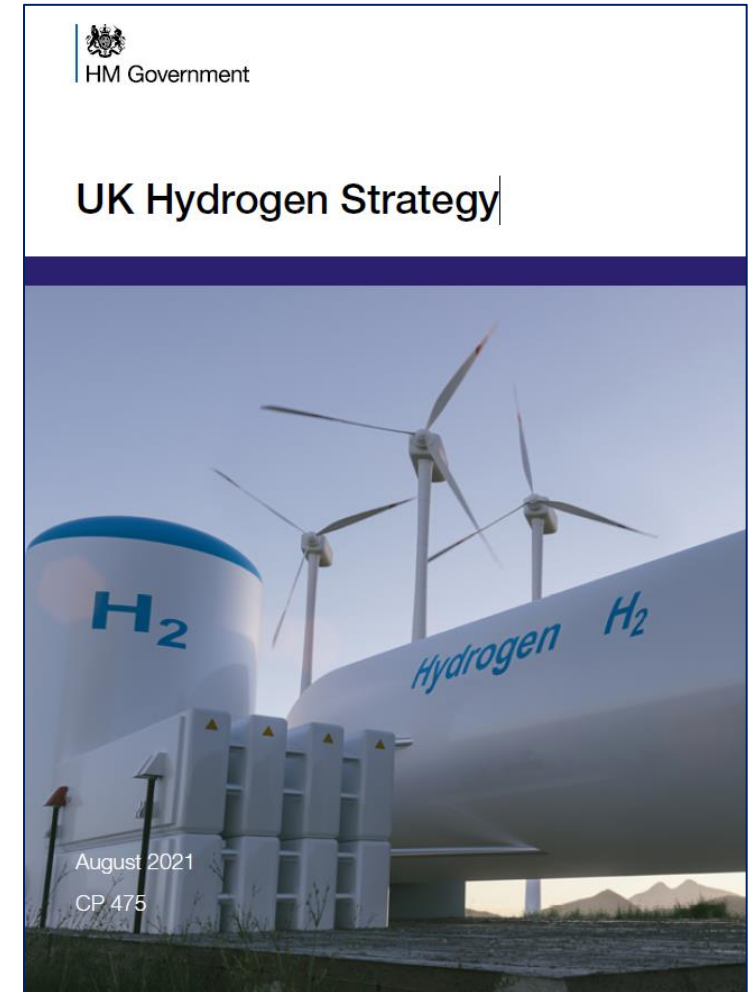


UK Hydrogen Strategy

Climate Change Solutions event:
“Hydrogen and Fuel Cells – the Time is Now”

16 November 2021



Why hydrogen? The role of hydrogen in net zero & the UK's energy transition

The case for hydrogen in the UK context



Low carbon hydrogen will be **critical for achieving net zero**, particularly in “hard to electrify” **UK industrial sectors**, and can provide flexible energy deployment across **heat, power and transport**.



The UK's geography, geology, infrastructure, innovation and expertise make it **well suited to rapidly developing a low carbon hydrogen economy** – with the secure **economic opportunities** across the UK.

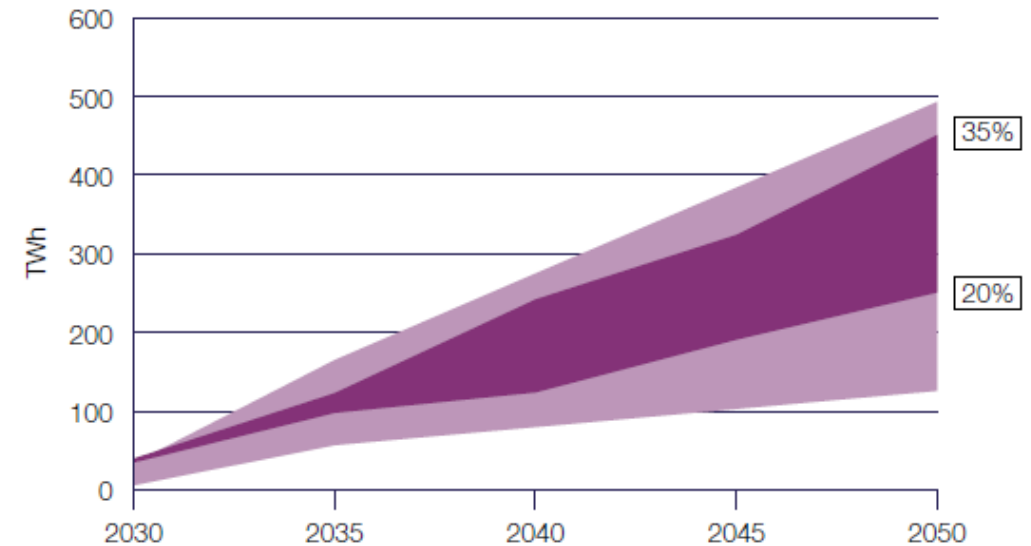


The Government's ambition is for **5GW of low carbon hydrogen production capacity by 2030** (c. 42TWh). This could deliver **total emissions savings of around 41MtCO₂e** between 2023 and 2032, equivalent to the carbon captured by 700 million trees over the same period.

Why do we need to act now?

By 2050, low carbon hydrogen will be comparable in scale to existing electricity use in the UK – but there is **virtually no low carbon hydrogen production or use** today.

Figure 1.2: Hydrogen demand and proportion of final energy consumption in 2050



% = hydrogen as proportion of total energy consumption in 2050

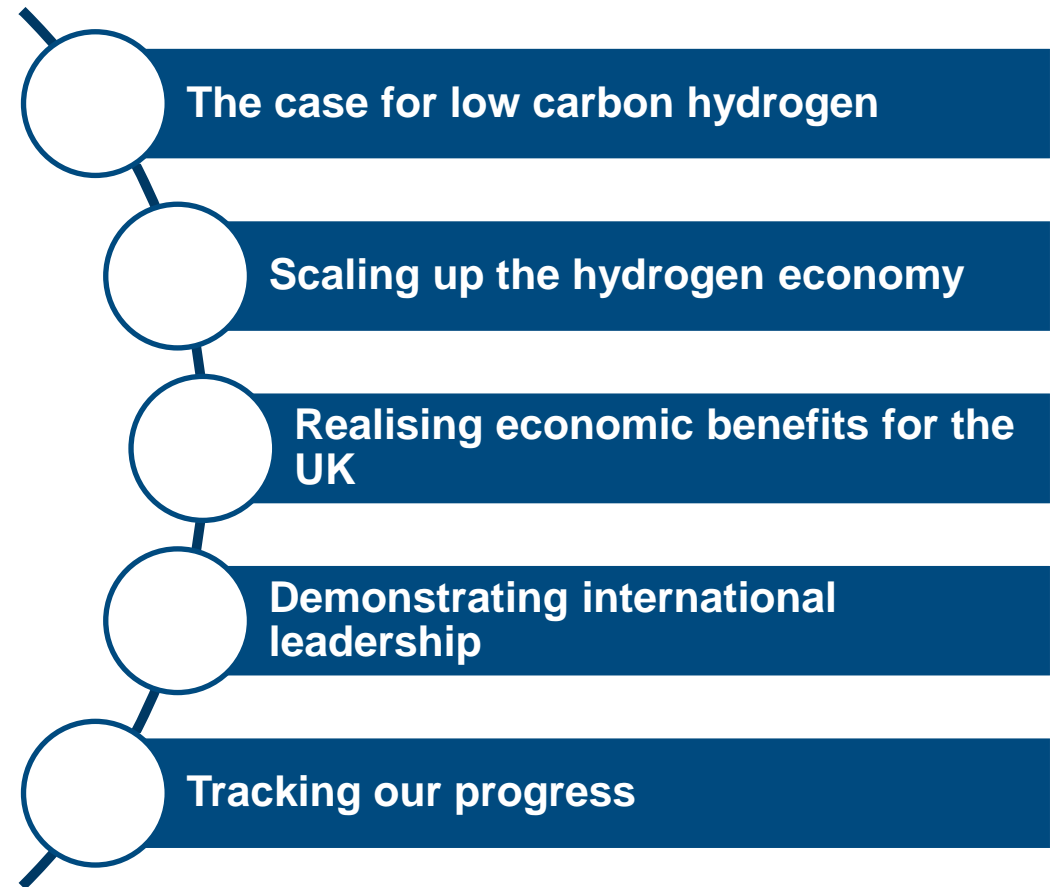
Source: Central range – illustrative net zero consistent scenarios in CB6 Impact Assessment. Full range – based on whole range from UK Hydrogen Strategy Analytical Annex. Final energy consumption from ECUK (2019).

UK Hydrogen Strategy: developing & scaling up a UK hydrogen economy over the 2020s

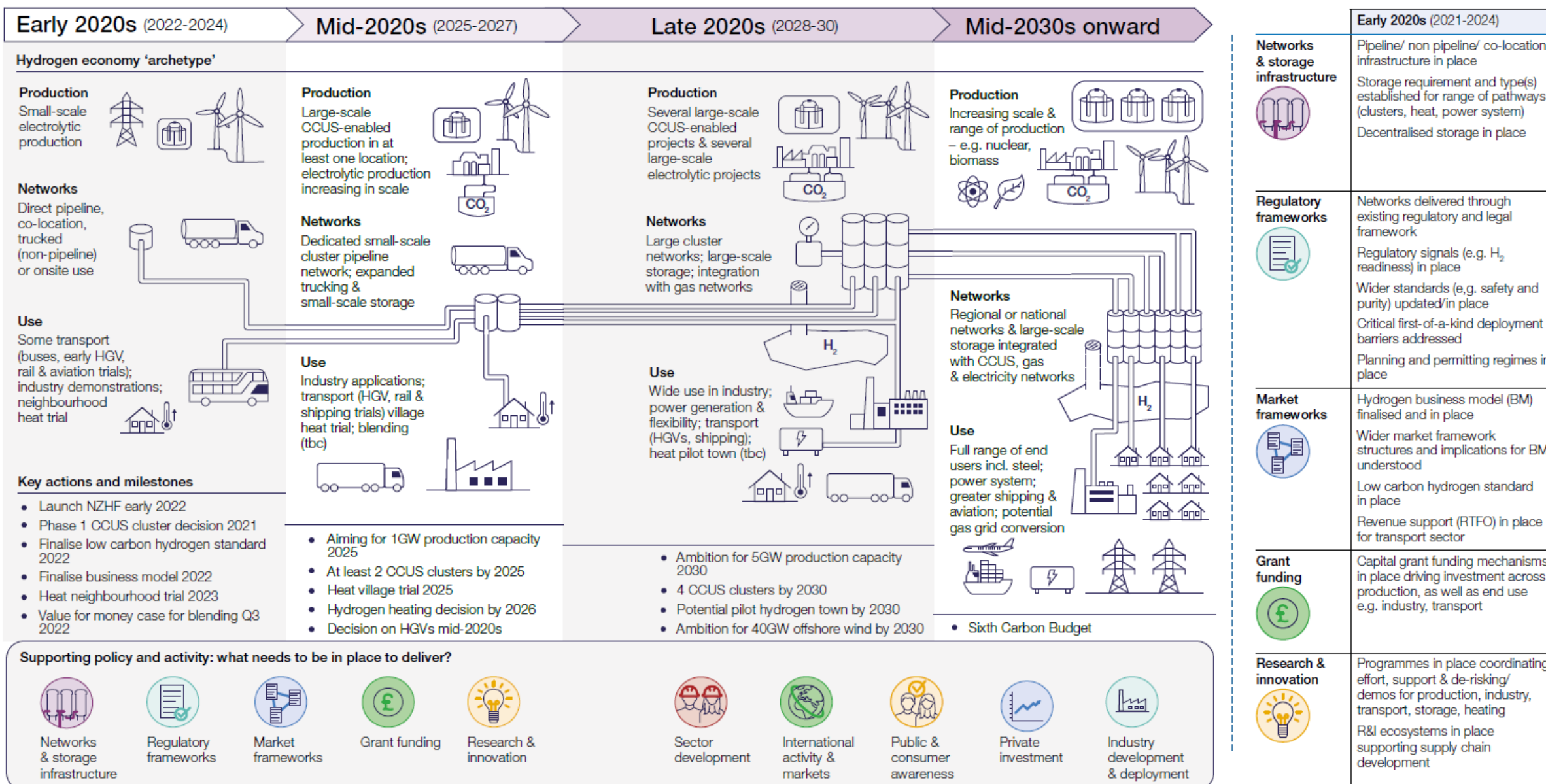
*First ever UK Hydrogen Strategy focuses on **driving progress to scale up hydrogen economy in 2020s**, to deliver 5GW production ambition by 2030 and position low carbon hydrogen to help meet Carbon Budget 6 and Net Zero commitments.*

Key elements:

- Sets out up to **£1bn in UK Govt support** for hydrogen and other low carbon technologies, including **over £400m for hydrogen** specifically.
- **Consultations** on support for **hydrogen production (closed 25 October)**:
 - **Hydrogen Business Model** to provide revenue support
 - **£240m Net Zero Hydrogen Fund** for capital co-investment
 - A **UK standard for low carbon hydrogen**.
- Sets out innovation and demonstration funding for hydrogen applications across **industry, power, heat and transport**.
- Seeks to secure **economic opportunities** from outset – **9,000 UK jobs & £900m GVA by 2030**, unlocking **£4bn investment**.



UK hydrogen economy roadmap: government & industry taking a whole-system approach

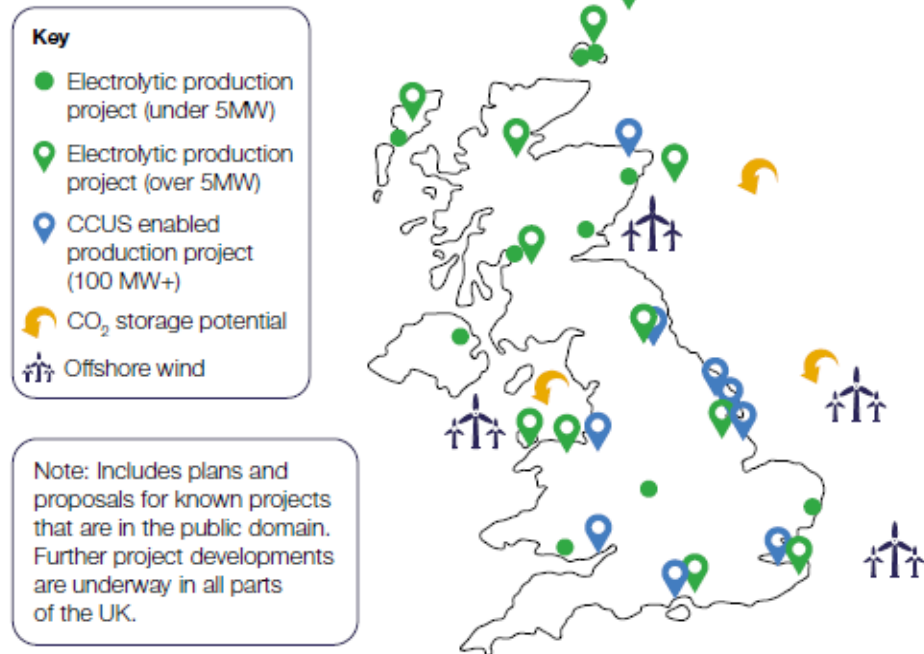


Production: a ‘twin-track’ approach to rapidly scale up low carbon hydrogen

Twin track approach

The UK is taking a ‘**twin track**’ approach, supporting a variety of production methods incl. both electrolytic & CCUS-enabled hydrogen.

Figure 1.3: Proposed UK electrolytic and CCUS-enabled hydrogen production projects



Key commitments

- ✓ Ambition for **5GW of low carbon hydrogen production capacity by 2030**.
- ✓ We will launch the **£240m Net Zero Hydrogen Fund** in early 2022 for co-investment in early hydrogen production projects.
- ✓ We will deliver the **£60m Low Carbon Hydrogen Supply 2** innovation competition.
- ✓ We will finalise design of **UK standard for low carbon hydrogen** by early 2022.
- ✓ We will finalise **hydrogen business model** in 2022, enabling first contracts to be allocated from Q1 2023.
- ✓ We will provide further detail on our **production strategy and twin track approach** by early 2022.

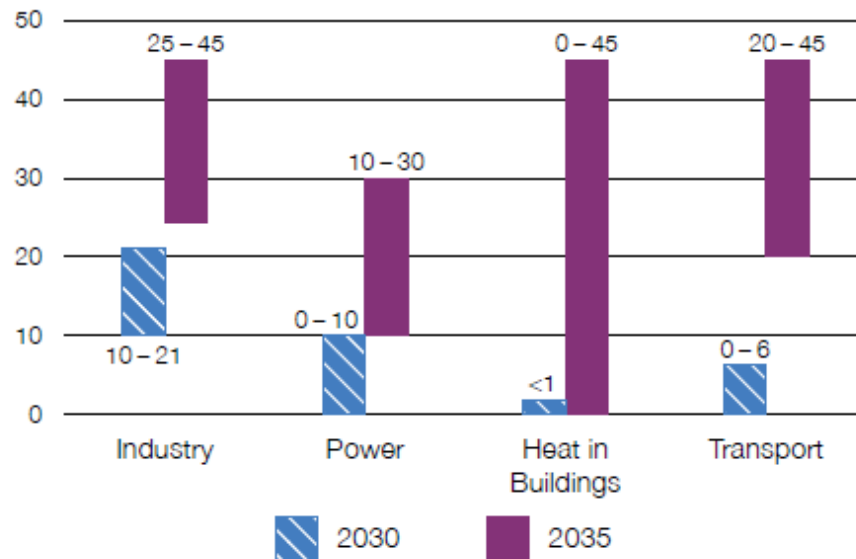
Use of hydrogen: decarbonisation & flexibility across industry, power, heat & transport

Hydrogen demand

Our analysis suggest **potential hydrogen demand of up to 38TWh by 2030** split across sectors (not incl. gas blending).

This could rise to **55-165TWh** by 2035 under CB6.

Figure 2.4: Illustrative hydrogen demand in 2030 and 2035



Source: BEIS analysis (see analytical annex). Note: figures do not include blending into the gas grid.

Key commitments

- ✓ We will launch a call for evidence on **'hydrogen-ready' industrial equipment** by the end of 2021.
- ✓ We will launch a call for evidence on **phase out of carbon intensive hydrogen production in industry** within a year.
- ✓ We will deliver Phase 2 of the **£315m Industrial Energy Transformation Fund**.
- ✓ We will launch a **£55 million Industrial Fuel Switching 2** innovation competition in 2021 (now live)
- ✓ We will prepare for hydrogen for heat trials – a **hydrogen neighbourhood by 2023, hydrogen village by 2025** and **potential pilot hydrogen town by 2030**.
- ✓ We aim to consult in 2021 on the case for **'hydrogen-ready' domestic boilers** by 2026.
- ✓ We will continue our **multi-million pound support for transport decarbonisation**, including for deployment, trials and demonstration of hydrogen buses, HGVs, shipping, aviation and multi-modal transport hubs.

Networks & markets: developing underpinning infrastructure, policy & regulation

Hydrogen networks & storage

Need to see significant development and scale up of hydrogen **network and storage infrastructure** over the 2020s (*even if* hydrogen is not widely used for heat in buildings). Needs to be **integrated** into evolving gas, electricity and CCUS networks.

Key commitments

- ✓ We will launch a **call for evidence on the future of the gas system** in 2021.
- ✓ We will **review systemic hydrogen network and storage requirements** in the 2020s and beyond, including need for economic regulation and funding, with update in early 2022.
- ✓ We will deliver the **£68 million Longer Duration Energy Storage Demonstration** competition.
- ✓ We will deliver the **£60 million Low Carbon Hydrogen Supply 2** innovation competition.



Creating a low carbon hydrogen market

The development and scaling up of a hydrogen economy will also rest on **market & regulatory frameworks** to support the early expansion and later evolution of a low carbon hydrogen market.

Key commitments

- ✓ We will set out further detail on the **revenue mechanism** which will provide funding for the Business Model in 2021.
- ✓ We will **assess market frameworks** to drive investment and deployment of hydrogen, with an update in early 2022.
- ✓ We will establish a **Hydrogen Regulators Forum** in 2021.
- ✓ We will **assess regulatory barriers** facing hydrogen projects, with an update in early 2022.
- ✓ We will complete an indicative assessment of the value for money case for **blending up to 20 per cent hydrogen into the existing gas network** by late 2022, and aim to make a final policy decision in late 2023.

Sector development: securing supply chains, jobs & skills, R&I, investment & exports

Promoting economic opportunities

Low carbon hydrogen economy could **support 9,000 UK jobs & £900m GVA by 2030, unlocking £4bn in investment** – helping the UK build back greener.

UK Hydrogen Strategy sets out how we will:

- Build world class, sustainable **supply chains** across the full hydrogen value chain.
- Create **good quality jobs** and **upskill industry** to drive regional growth and ensure that we have the right skills in the right place at the right time.
- Maximise our **R&I strengths** to accelerate cost reduction and technology deployment, and to capitalise on the UK's world-leading expertise.
- Create an attractive environment to secure the right **investment** in UK projects while maximising future **export opportunities**.

Key commitments

- ✓ We will prepare a **Sector Development Action Plan**, including for UK supply chains, by early 2022.
- ✓ We will establish an **Early Career Professionals Forum** under the Hydrogen Advisory Council.
- ✓ We will support hydrogen innovation as one of the ten key priority areas in the **£1bn Net Zero Innovation Portfolio**.
- ✓ We will work with the Hydrogen Advisory Council Research & Innovation Working Group to develop a **UK hydrogen technology R&I roadmap**.
- ✓ We will deliver as one of the co-leads of Mission Innovation's new **Clean Hydrogen Mission**.



Partnership & progress: international collaboration, monitoring & implementation

Promoting international partnership

- The Hydrogen Strategy sets out how UK will support hydrogen collaboration & cooperation – to accelerate innovation & deployment of technologies to **increase supply** ‘push’ & **incentivise demand** ‘pull’.
- The strategy outlines the UK’s active role in **multilateral collaboration** on hydrogen, including through the **MI Clean Hydrogen Mission, CEM Hydrogen Initiative & IPHE**.
- It also sets out opportunities for **bilateral & regional collaboration** to spur development of thriving domestic, regional & international markets.



Tracking our progress: implementation & monitoring

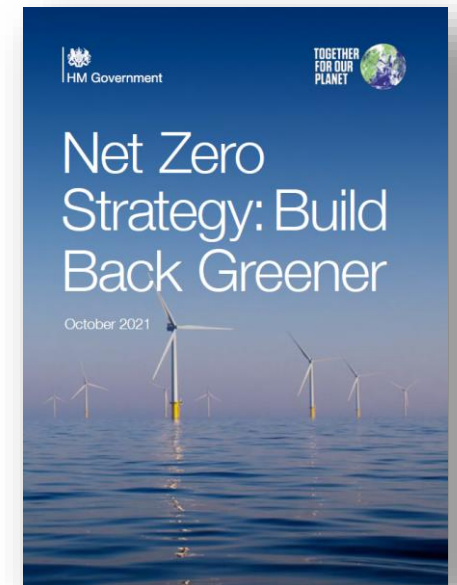
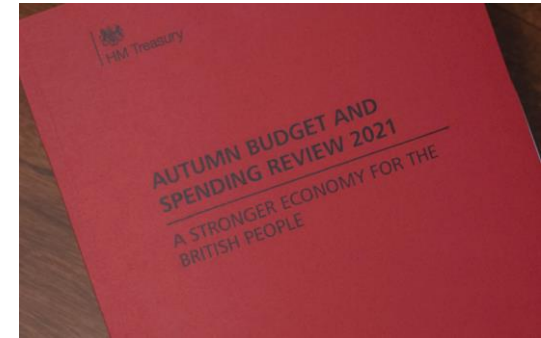
- We will provide **regular updates to the market** as our policy progresses, with the first expected in early 2022.
- We will also **track progress** against our 2030 outcomes:

Strategy outcome	Potential indicators and metrics
Progress towards 2030 ambition	<ul style="list-style-type: none"> • Low carbon hydrogen capacity installed (GW) • Volume of hydrogen produced (TWh) • Breakdown by technology (such as electrolysis and methane reformation)
Decarbonisation of existing UK hydrogen economy	<ul style="list-style-type: none"> • Remaining volume of fossil fuel hydrogen produced (TWh)
Lower cost of hydrogen production	<ul style="list-style-type: none"> • Levelised cost (£/MWh)
End to end hydrogen system with diverse range of users	<ul style="list-style-type: none"> • Estimated volume of hydrogen used in the UK (TWh by sector)
Increased public awareness	<ul style="list-style-type: none"> • Percentage of people aware of/familiar with hydrogen
Promote UK economic growth and opportunities (including jobs)	<ul style="list-style-type: none"> • We are exploring using metrics such as: <ul style="list-style-type: none"> • Number of low carbon hydrogen jobs available in different regions of UK and/or percentage of people trained or retrained into ‘green’ jobs within the sector • R&D spend and patents • Gross Value Added (GVA)
Emissions reduction under Carbon Budgets 4 and 5	<ul style="list-style-type: none"> • CO₂ emissions reduction from hydrogen
Evidence-based policy making	<ul style="list-style-type: none"> • Quantitative and qualitative data collected • Engagement with stakeholders and expert advice

Autumn Announcements: Net Zero Strategy and Spending Review

Key elements :

- ✓ Up to **£140m** to establish the **Industrial Decarbonisation and Hydrogen Revenue Support scheme (IDHRS)** and **£240m Net Zero Hydrogen Fund**, supporting both electrolytic and CCUS enabled hydrogen production.
- ✓ Funding confirmed for **£1bn Net Zero Innovation Portfolio** in which hydrogen is a priority area.
- ✓ Following the Phase 1 of the Cluster Sequencing process, the **Hynet and East Coast Clusters**, will act as **economic hubs for green jobs** in line with our ambition to capture 20-30 MtCO₂ per year by 2030. This puts Teesside and the Humber, Merseyside and North Wales, along with the North East of Scotland as a reserve cluster, among the potential early **SuperPlaces** which will be transformed over the next decade.
- ✓ We will initially be providing **up to £100 million to award contracts of up to 250MW electrolytic hydrogen production capacity in 2023**, with further allocation in 2024, meaning 500MW of electrolytic hydrogen production projects will be operational or in construction by 2025.
- ✓ We will also announce a **funding envelope for CCUS-enabled hydrogen and industrial carbon capture in 2022**, allowing us to award CCUS-enabled hydrogen projects and deliver up to 1.5GW of total hydrogen production capacity by the mid-2020s
- ✓ Subject to costs falling, **we will hold future allocation rounds for all types of low carbon hydrogen production** to help meet our deployment ambitions of 5GW of hydrogen production capacity.
- ✓ **From 2025, revenue support for hydrogen production will be funded by a levy**, subject to consultation and legislation being in place. We will work to ensure fairness and affordability in developing the levy.



Policy consultations (closed 25 October 2021) and analysis: at a glance

Hydrogen Business Model

- Consulting on a hydrogen business model to provide **revenue support to low carbon hydrogen production plants**. Sets out the case for why ongoing revenue support is needed, the approach to business model design, and ‘minded-to’ positions for key design features such as the payment mechanism.

Net Zero Hydrogen Fund

- Consulting on the proposed scope and design of the **£240 million Net Zero Hydrogen Fund (NZHF)**, a deployment fund intended to support the development and construction of new low carbon hydrogen production projects.

Low carbon hydrogen standard

- Consulting on the **design options for a UK low carbon hydrogen standard**, which we would expect to provide clear criteria for businesses seeking government support for hydrogen production, such as through the NZHF and/or Hydrogen Business Model.

Analytical annex

- A single analytical annex setting out **evidence** underpinning all of the documents, including **analysis** on hydrogen demand and supply, barriers to uptake of hydrogen, and rationale for policy proposals.

Hydrogen production costs report

- The first report by BEIS to set out the estimated **levelised cost of producing hydrogen (LCOH)** using different production technologies. It includes sensitivity analysis looking at the impact on levelised costs of varying fuel prices, electricity prices, capex, opex, efficiency, and electrolyser load factor.



Thanks!

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