The hydrogen investment package

Update to REA

30 May

BEIS

Agenda

Item	Presenter
Introductions	REA
Recent Hydrogen announcements	Alison Conboy, Deputy Director, Hydrogen Production Team
NZHF overview	Charlie Clay, BEIS Hydrogen Production Team
Hydrogen Business Model overview	Carolyn Campbell, BEIS Hydrogen Business Model team
Low Carbon Hydrogen Standard overview	Hydrogen Standards and CertificationTeam, BEIS Hydrogen Production Team
Investor Roadmap	Richard Sargent, BEIS Hydrogen Production Team
Q&A	REA
Closing comments from REA	REA

The hydrogen roadmap to 2030:

Hydrogen Policy update

Alison Conboy, Deputy Director, Hydrogen Production

Department for Business, Energy & Industrial Strategy

Hydrogen in the Energy Security Strategy (7 April)

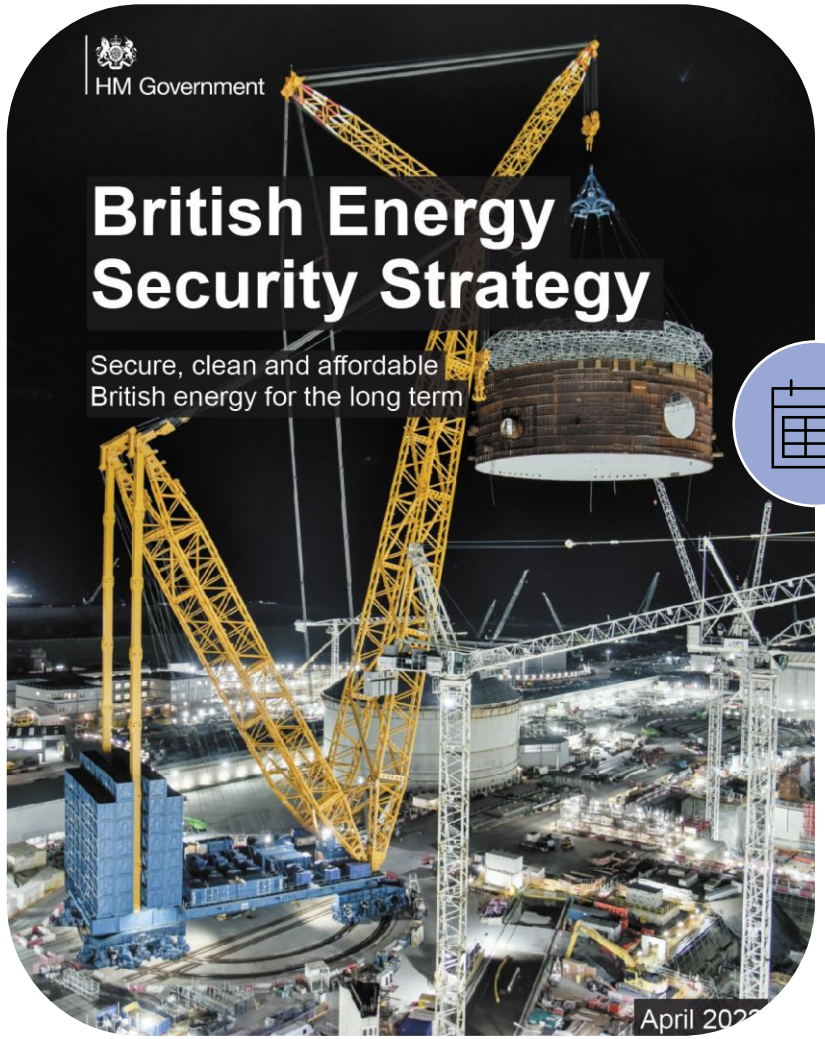
'We're going to produce vastly more hydrogen, which is easy to store, ready to go whenever we need it, and is a low carbon superfuel of the future' **The Rt Hon Boris Johnson MP, Prime Minister**.

Doubling our ambition to **up to 10GW** of low carbon hydrogen production capacity by 2030, subject to affordability and value for money.

We expect **up to 2GW** of low carbon hydrogen production capacity to be **operational or in construction by 2025.**

At least half of the 10GW 2030 production capacity to come from **electrolytic hydrogen production**.

Hydrogen in the Energy Security Strategy (7 April)

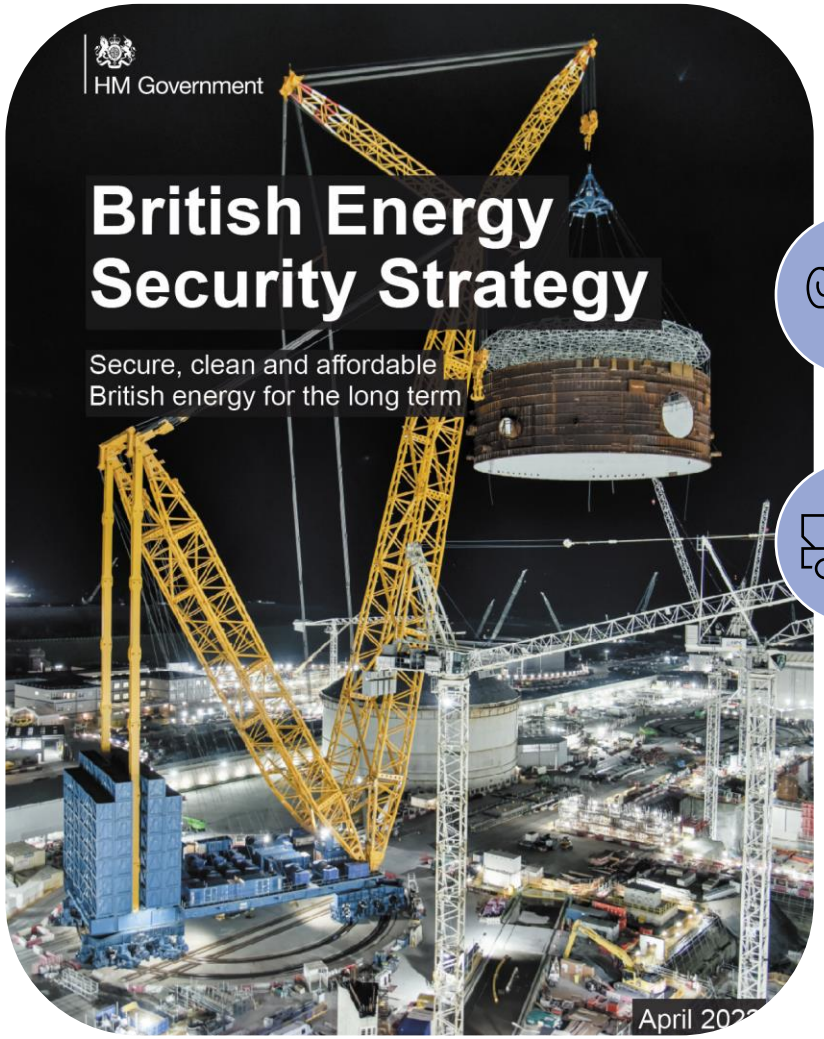


Aiming to hold **annual allocation rounds for electrolytic hydrogen**, with the first launched in 2022.

Increased ambition for the first two rounds (up to **1GW** electrolytic in construction or operation by 2025).

Aim to move to price competitive allocation from 2025 as soon as legislation and market conditions allow.

Hydrogen in the Energy Security Strategy (7 April)



Setting up a hydrogen certification scheme by 2025 to demonstrate high-grade British hydrogen for export and ensure any imported hydrogen meets the same high standards that UK companies expect..

Designing, by 2025, **new business models for hydrogen transport and storage** infrastructure.

Hydrogen Investment Package (8 April)

On 8 April, Government launched the **Hydrogen Investment Package.**

The announcement includes:

Responses to our consultations alongside supporting documentation to facilitate the launch of the Net Zero Hydrogen Fund on 25 April and the joint allocation window with revenue support later this year.

The Hydrogen Investor Roadmap which illustrates the huge investment potential in the UK hydrogen economy.

Hydrogen Investment Package (8 April)

On 8 April, Government launched the **Hydrogen Investment Package.**

The announcement includes:

The **£240 million Net Zero Hydrogen Fund** will fund low carbon hydrogen production projects, with the aim of awarding funding from the end of 2022.

Open for applications on 25 April.

The **Hydrogen Business Model** supporting further investment in hydrogen production with **£100 million for electrolytic projects** to cover the difference between the cost of production (strike price) and the sale price for hydrogen (reference price).

Open for applications summer 2022.

The **Industrial Hydrogen Accelerator**, a **£26 million innovation funding programme** to support UK industry in adopting hydrogen as a clean, affordable fuel source for sectors like manufacturing.

Funding opportunities

Strand	Opening date	Closing date	Further information
1 - DEVEX	25 April 2022	22 June 2022	Now open – please visit the UKRI website for the competition briefs and application portal and further support. **Strand 1:** https://apply-for-innovation-funding.service.gov.uk/competition/1150/overview#summary **Strand 2:** https://apply-for-innovation-funding.service.gov.uk/competition/1151/overview#summary **For support on both:** https://apply-for-innovation-funding.service.gov.uk/info/contact **For FAQs on NZHF strands 1 and 2:** https://www.gov.uk/government/publications/net-zero-hydrogen-fund-strand-1-and-strand-2
2 – CAPEX without a Hydrogen Business Model	25 April 2022	6 July 2022	
3 – joint allocation for Hydrogen Business Model and Capex	July 2022	To be confirmed	See Hydrogen business model and Net Zero Hydrogen Fund: Market Engagement on Electrolytic Allocation, published 8 April 2022. Electrolytic projects that wish to apply for revenue support through the Hydrogen Business Model, in addition to Net Zero Hydrogen Fund funding, will need to apply through the joint allocation round. Responses to the electrolytic allocation on GOV.UK are now closed https://www.gov.uk/government/consultations/hydrogen-business-model-and-net-zero-hydrogen-fund-market-engagement-on-electrolytic-allocation
4 – CAPEX for P2 cluster projects	EOI: Summer 2022 Full application: 2023	To be confirmed	An EOI form will be sent to shortlisted P2-projects in summer 2022.

Stakeholder engagement during this period

With BEIS funds beginning to opening for applications, it is important that we manage stakeholder engagement transparently.

- **Funding for NZHF is now open.** UKRI and KTN will handle questions related to applications, including:
  - Eligibility
  - Approach to making an application
  - Assessment criteria
  - Other questions
- BEIS will not be able to answer any questions that are specific to your projects and applications, in order to ensure competition fairness. If your question is judged to be of wider relevance, the response will be made available in a public FAQ document, which is available on the NZHF Competition Page
- Funding for the joint allocation window (Hydrogen Business Model/NZHF) is **not yet open**, we have consulted on the final design of this allocation window. We welcomed views from industry on the Market Engagement exercise through the Market Engagement session and by written submission. We intend to open the Joint Allocation Window for applications in summer, after which all project-related communications must be directed through the Funding application process.
- If you have broader questions, not related to a funding application (for example, questions on the consultations themselves, or ongoing work on the Hydrogen Business Model) BEIS teams are happy to speak through the usual channels.

Hydrogen Investment Package: NZHF Government Response to consultation

Charlie Clay, Hydrogen Production Team

NZHF Consultation Response

- The consultation had **106 responses** → **57** from potential Hydrogen Production Projects
  49 from other respondents

- We ran and were involved in a series of engagement events:

Summary of Views:

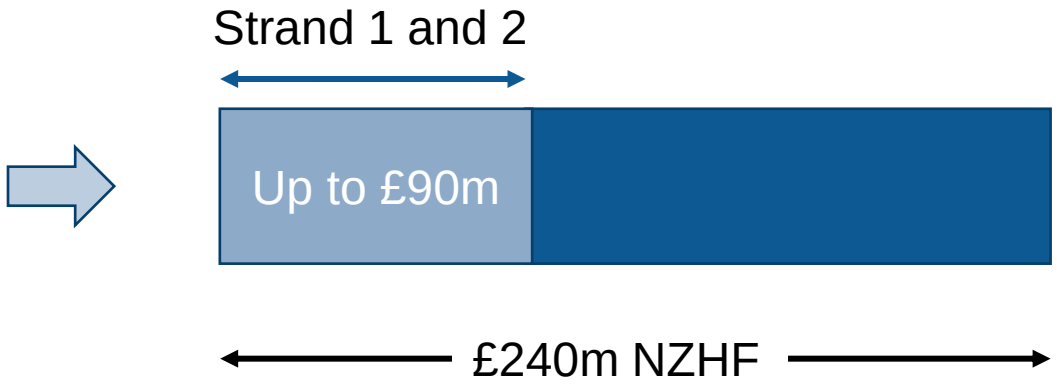
- There is a need for further hydrogen transport infrastructure and storage support.
- Mixed views on the stages on a project's lifecycle that the NZHF should target, with slightly more support for the later stages of project development.
- There is a need for a phased approach to delivering the NZHF due to the varied needs of hydrogen production projects across the UK.

NZHF Phased Delivery

	Scope
Strand 1 – **now open for application**	Development Expenditure for Front End Engineering Design (FEED) studies and post FEED costs.
Strand 2 – **now open for application**	CAPEX (capital expenditure) for projects that do not require revenue support through the hydrogen business model.
Strand 3	CAPEX for non-Carbon Capture, Usage and Storage (CCUS) enabled projects that also require revenue support through the hydrogen specific business model.
Strand 4	CAPEX for CCUS-enabled projects that require revenue support through the hydrogen business model.

NZHF Strand 1 and 2 Overview 1/2

- Strand 1&2 is expected to have a budget of up to £90m and could be flexed as the Fund evolves over its lifetime from 2022-2025.



- Core requirements for Strand 1:
  - Minimum award threshold of £80,000 and maximum award threshold of £15m.
  - Max grant requested no more than 50% of eligible costs.
  - Projects must complete all co-funded activities by Q1 2024 (first wave of funding only).

- Core requirements for Strand 2:
  - Minimum award threshold of £200,000 and maximum award threshold of £30m.
  - Max grant requested no more than 30% of eligible costs.
  - Projects must complete all co-funded activities by Q1 2025.

- The Fund will be run on a UK-wide basis, with any funding from Devolved Administrations being complementary rather than duplicative.

NZHF Strand 1 and 2 Overview 2/2

Eligibility criteria:

- ✓ Projects must produce new low carbon hydrogen, as defined by the LCHS.
- ✓ Projects must be based in the UK and led by a business registered in the UK.
- ✓ Projects must use hydrogen production routes that have a technology readiness level (TRL) of 7 or above.
- ✓ Projects must have the required private sector financial backing.
- ✓ Projects must be able to demonstrate demand for the hydrogen they produce – including evidence of an agreement in principle with an offtaker for strand 2 projects

Assessment questions:

1. Project Delivery
2. Risk
3. Project governance and stakeholder management
4. Project significance and economic benefits
5. Knowledge sharing and hydrogen market development
6. Commercial
7. Emissions and wider environmental impacts

Hydrogen Investment Package: Hydrogen Business Model Government Response to consultation

Carolyn Campbell, Hydrogen Business Model team

Hydrogen business model summary – following consultation

The hydrogen business model is being designed to **incentivise the production and use of low carbon hydrogen,** to deliver the government's ambition of up to 10 GW of low carbon hydrogen production capacity by 2030, subject to affordability and value for money. The business model will provide producers with revenue support to overcome the operating cost gap between low carbon hydrogen and fossil fuels in order to unlock private investment in hydrogen projects.

Adjustments to subsidy

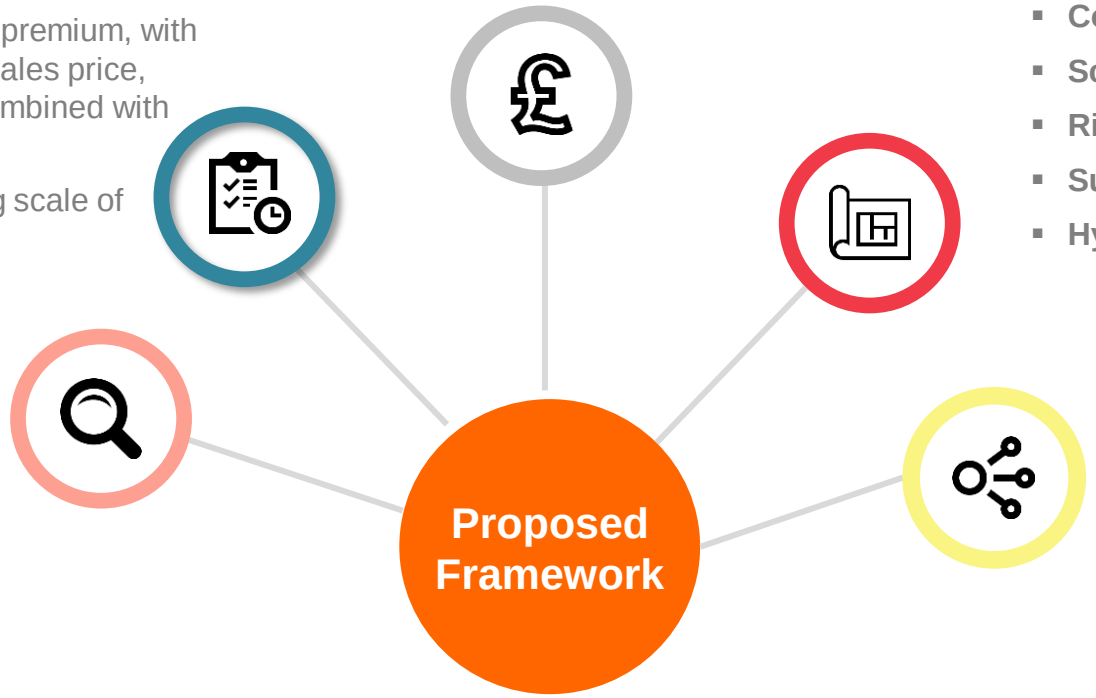
- **Strike price indexation,** vary by cost category
- **Feedstock users and own consumption**, under consideration

Mitigation of two main risks

- Manage **price risk** through variable premium, with reference price based on achieved sales price, with floor at the natural gas price, combined with price discovery mechanism
- Manage **volume risk** through sliding scale of strike price

Additional considerations

- **Contract duration** between 10-15 years
- **Scaling of volumes**, under consideration
- **Risk allocation,** outlined
- **Subsidy cumulation**, under consideration
- **Hydrogen transport and storage**, small-scale



Scope and delivery mechanism

- Applicable on a UK-wide basis
- Producers as recipients of subsidy
- New production that meets the Low Carbon Hydrogen Standard
- Open to range of end users
- Private law contract

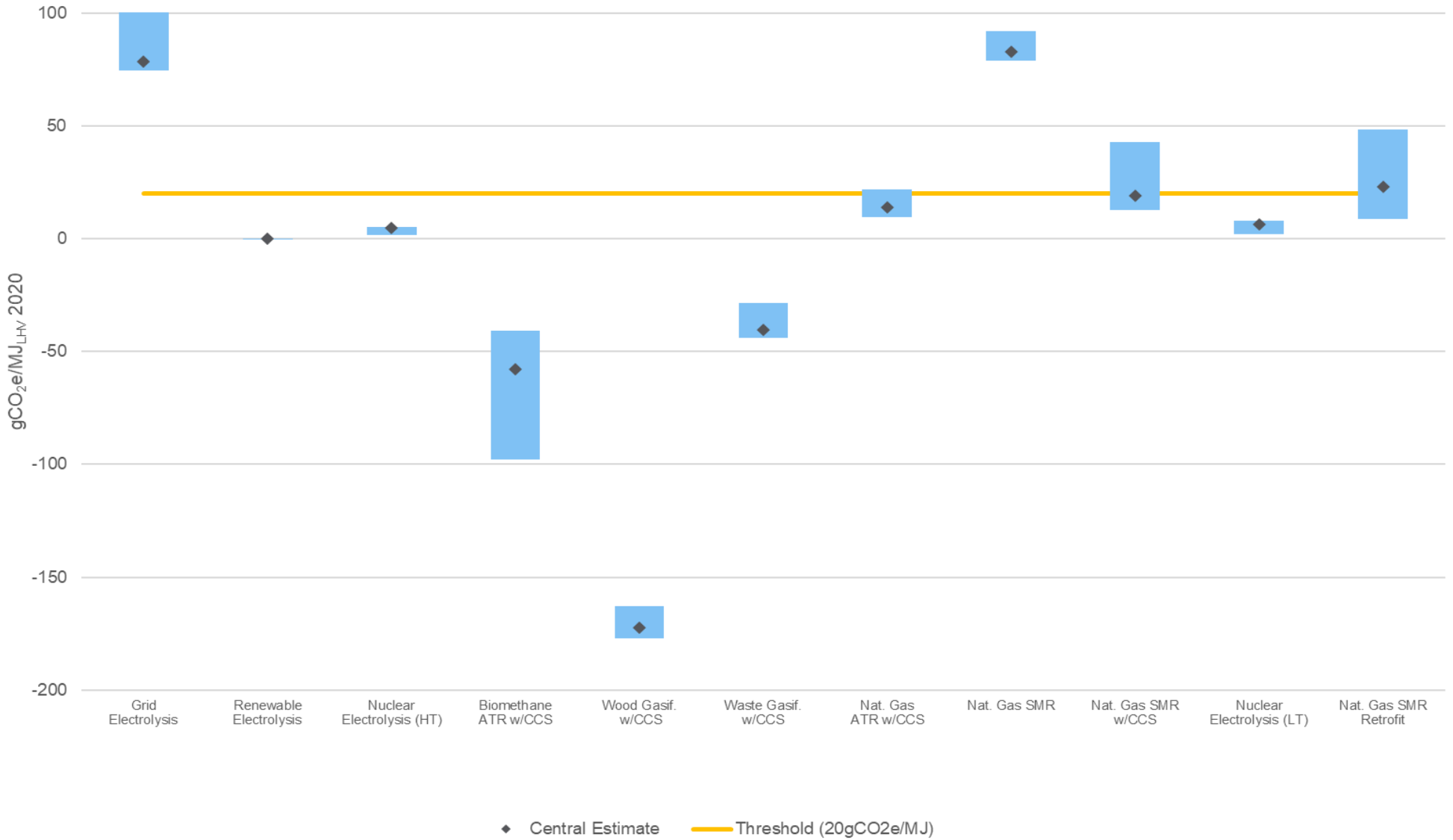
Allocation

- **CCUS-enabled**, Phase-2 evaluation ongoing
- **Electrolytic**, market engagement exercise
- Ambition for annual electrolytic allocation rounds
- Price-competitive allocation by 2025 as soon as legislation and market conditions allow

Hydrogen Investment Package: UK Low Carbon Hydrogen Standard Government Response to consultation

Hydrogen Standards and Certification Team

UK Low Carbon Hydrogen Standard



20gCO_2e threshold ensures significant carbon savings consistent with CB6 / net zero

Provides clarity to investors on production routes and projects

Production routes not considered in the standard guidance document should submit evidence to show likely compliance with the LCHS, for BEIS to consider

Department for Business, Energy & Industrial Strategy

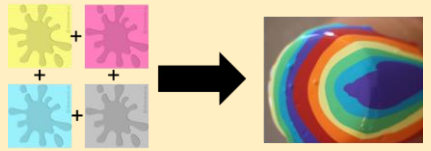
UK Low Carbon Hydrogen Standard: Consignment approach

Consignments options for mixed inputs

Two options exist for consignments of hydrogen: *discrete* or *averaged*. A consignment is volume of hydrogen produced over a set time with a certain set of environmental characteristics.

Discrete consignments – **from a single measurable input**

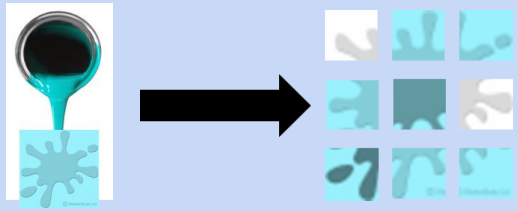
Discrete consignments – **from mixed inputs**



Averaged consignments – **from multiple discrete consignments**

Consignments for of CO_2 capture T&S

Two options exist: discrete or averaged



A discrete consignment can be:

- 1 day where the CCS infrastructure & electricity input is consistent
- 30 mins if there is variability in capture rate due to capture process or T&S outages
- These 30 min consignments can be averaged

Consignment size

Discrete consignments:

- If based on low carbon electricity use **30 min** to align with metering
- If based on natural gas or biogas **1 day**
- If based on capture or T&S variability **30 min**

Averaged consignments:

- Maximum **1 month** production
- Volume weighted average
- The entire month's production doesn't need to be included

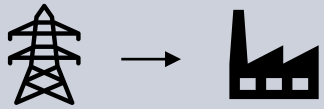
UK Low Carbon Hydrogen Standard: electrolytic hydrogen

High Level Standard Compliance Criteria – you must…

- Meet the threshold on a monthly basis (averaging allowed)
- Account for all electricity input (no double counting)
- Use actual data for all electricity input per 30 minutes (once hydrogen production facility is operational)

Technical Requirements for Low Carbon Electricity Input

1. Energy Attribute Information
2. Low Carbon Electricity Generation Sourcing Attributes (if proving links to a specific generator on 'as produced' basis)
3. Temporal Correlation Between Generation & Consumption

Description of Electricity Input	Evidence Required	Expected GHG Intensity of H2 produced
1. Physical Links: Off-grid 	• Exclusive ownership of energy attributes of electricity consumed (annual) • Links to the generator being claimed e.g. PPA or other contractual information • Temporal correlation matching generation and consumption per 30 minutes	0 gCO2e/ MJLHV
2. Sourcing from specific low carbon generator on 'as produced' basis (direct PPA, wholesale purchase) 	• Exclusive ownership of energy attributes of electricity consumed (annual) • Links to the generator being claimed e.g. PPA or other contractual information • Temporal correlation matching generation and consumption per 30 minutes • Must account for transmission and distribution losses where grid used	Low or 0 gCO2e/ MJLHV
3. Wholesale or retail grid purchase (no links to a specific generator) 	• Exclusive ownership of energy attributes of electricity consumed (annual) • Links to the generator proven e.g. PPA or other contractual information • Temporal correlation matching generation and consumption per 30 minutes	National grid average per 30 mins
4. Curtailed electricity (from specific generator or evidenced through balancing mechanism) 	• Exclusive ownership of energy attributes of electricity consumed (annual) • Links to the generator proven e.g. PPA or other contractual information • Evidence includes balancing mechanism or emergency instruction • Temporal correlation matching generation and consumption per 30 minutes	0 gCO2e/ MJLHV

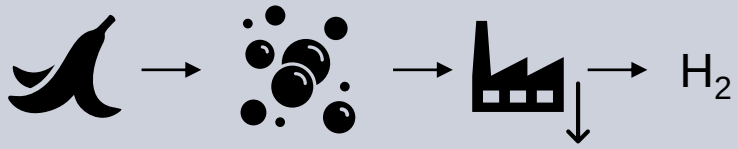
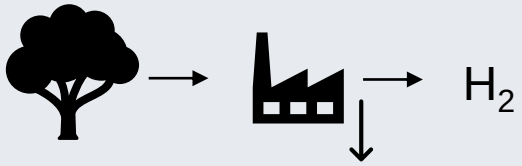
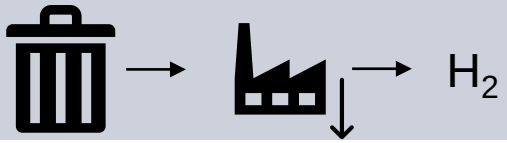
UK Low Carbon Hydrogen Standard: hydrogen from biomass and waste

High Level Standard Compliance Criteria – you must….

- Comply with land, soil carbon and forest criteria
- Satisfy minimum waste and residue requirement
- Note, offsetting and waste counterfactuals not available
- Report on estimated indirect land-use change (ILUC) GHG emissions - though not accounted for in GHG calculation)

Feedstock emissions

1. **Biomass:** cultivation, harvesting, pre-processing, storage and transport, and where relevant, biomethane production and transport and direct land-use change
2. **Waste (with fossil or biogenic content):** collection, sorting, pre-processing and transport to the point of hydrogen production

Description of Bio / Waste Process (not exhaustive) With / without CCUS	Evidence Required	Expected GHG Intensity of H2 produced
1.Biomethane reformation 	• Compliance with sustainability criteria – approved voluntary schemes • Min waste requirement evidence – letter of intent, contract, etc • Evidence of biomethane contact/ownership and transport (without gas grid use) • With CCS – contract/letter of intent with T&S operator	**No CCS - low** **CCS – CO2 -ve**
2. Biomass gasification 	• Compliance with sustainability criteria – approved voluntary schemes • Min waste requirement evidence – letter of intent, contract, etc • With CCS – contract/letter of intent with T&S operator	**No CCS - low** **CCS – CO2 -ve**
3. Waste (fossil + biogenic) gasification 	• Compliance with sustainability criteria – approved voluntary schemes • Discrete consignments for biogenic and fossil waste inputs • Evidence of compliance with waste hierarchy • With CCS – contract/letter of intent with T&S operator	**No CCS** **CCS – low?**

UK Low Carbon Hydrogen Standard: CCUS enabled hydrogen (SMR, ATR, POX)

Options for natural gas upstream emissions:

- Use default data provided by BEIS if connected to the gas grid
- Use own data if direct connection to a facility
- Use foreign grid average if direct connection to another country's grid

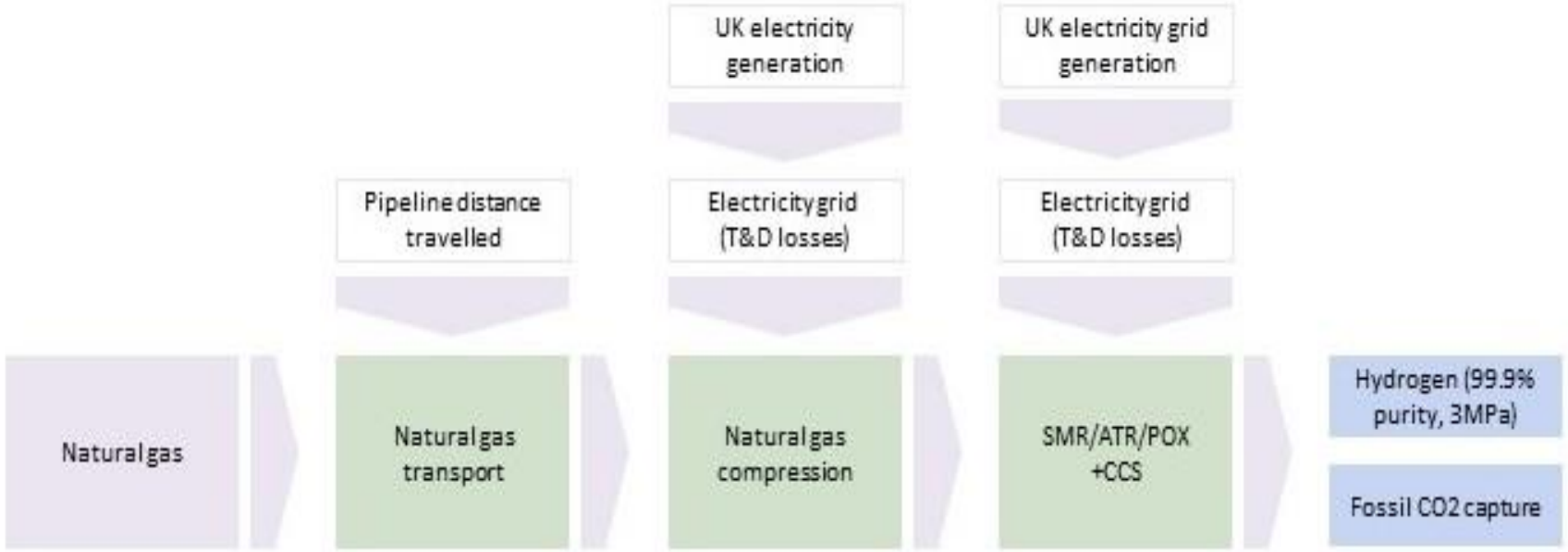
Option of using other fossil feedstocks.

CO2 capture and underground storage

- Only CO2 permanently stored in geologic structures is considered as stored rather than utilised.
- CO2 captured and utilised is considered as being emitted (to be reviewed).
- CO2 vented because of T&S outages will be considered as not having been captured for the purpose of calculating emissions.

Where capture rate varies or emissions are vented due to outages in the CO2 T&S network, the outputs from this process can be considered in two ways:

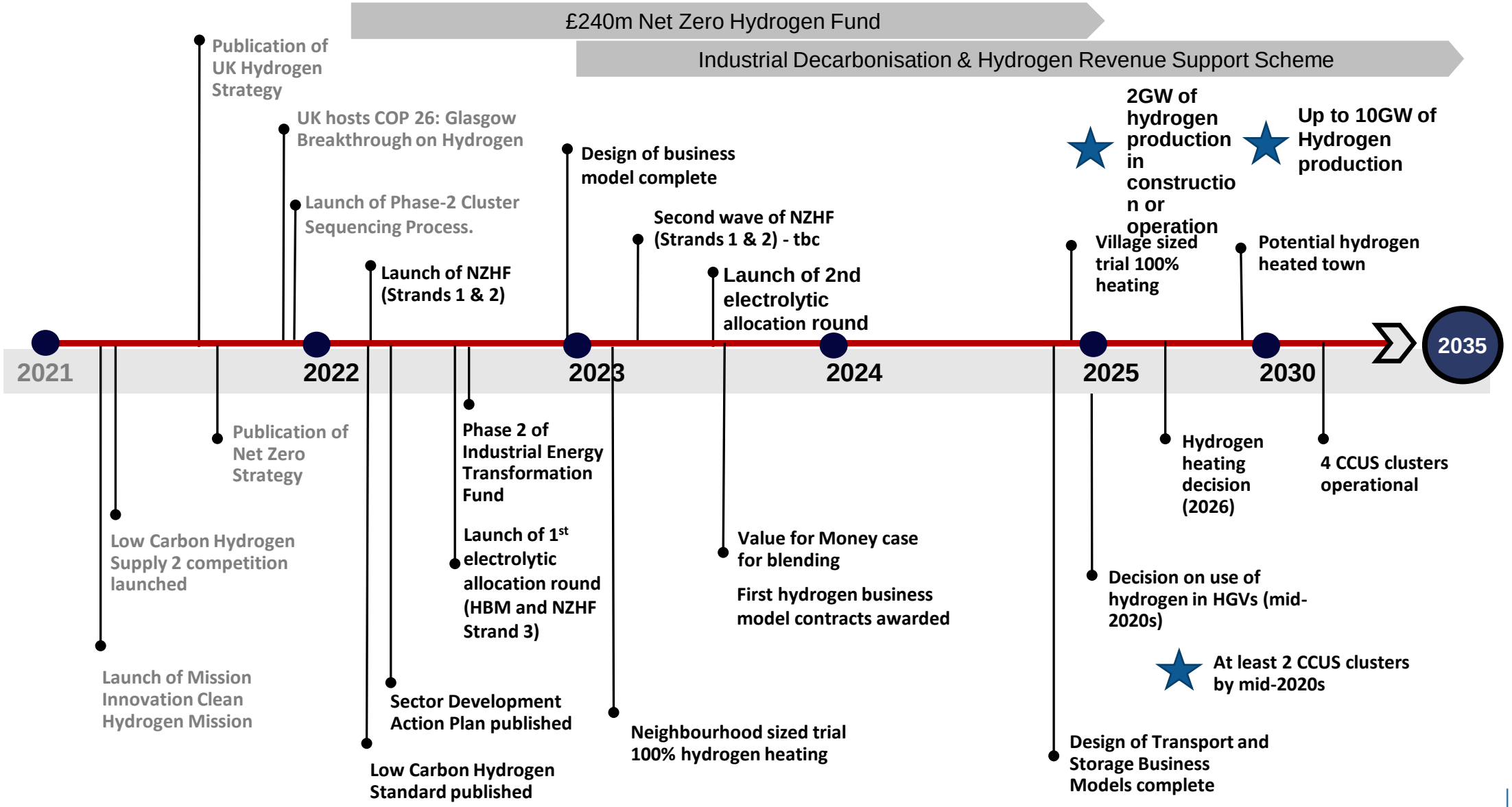
- Discrete consignments:
- Averaged consignments: 2 or more discrete consignments with averaged emissions.



Hydrogen Investment Package: Hydrogen and CCUS Investor Roadmaps

Richard Sargent, Hydrogen Production Team

Item 3: Hydrogen Investment Package - Investor Roadmap



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Item 3: Hydrogen Investment Package - Investor Roadmap

Scotland

1. Fife Hydrogen Hub
2. Acorn Hydrogen
3. BEIS & Ofgem: H100 Heat Trial
4. CNES
5. EMEC
6. ERM (Dolphyn)
7. ERM (Salamander)
8. H2 Green
9. Hy2GO
10. Cromarty Firth Green Hydrogen
11. Repsol Sinopec
12. Scottish Power (Whitelee)
13. Shetlands Island Council
14. Octopus Hydrogen
15. Kittybrewster HRS
16. Aberdeen Hydrogen Hub
17. BayoTech

North West England

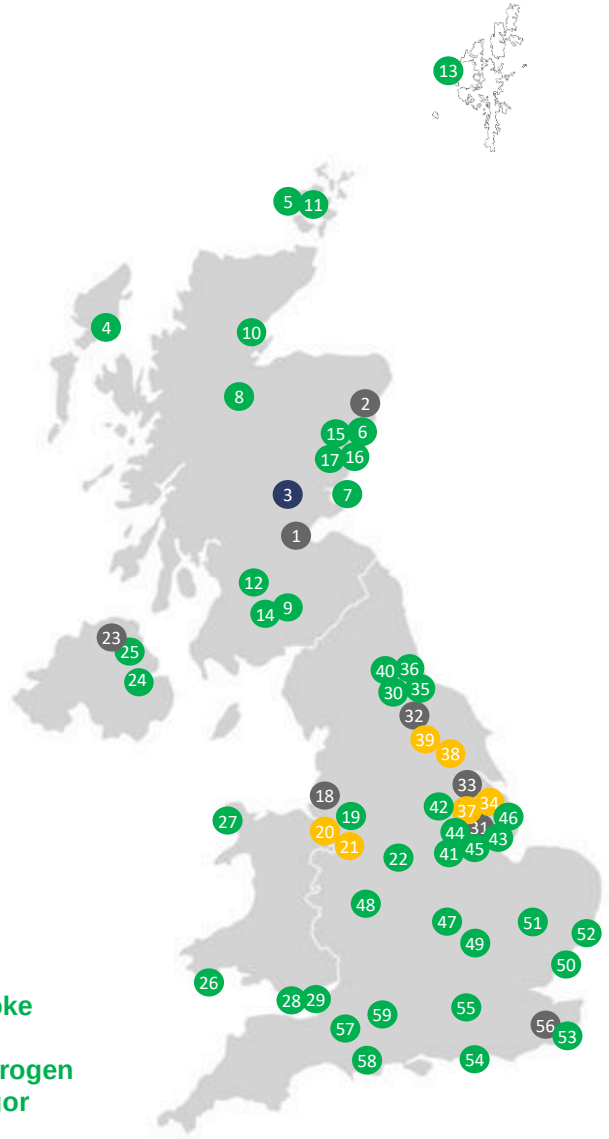
18. Hynet: HPP
19. Trafford Green /Carlton Power
20. Hynet: Phase 2 & 3 pipeline (Cadent)
21. Hynet: Salt Cavern Storage (INOVYN)
22. Octopus Hydrogen

Northern Ireland

23. Skuunaq
24. GenComm/Belfast Met
25. NI Water

Wales

26. RWE Pembroke
27. Mentor Mon
28. Octopus Hydrogen
29. Protium Magor



North East England

30. BP: CCUS enabled hydrogen and green hydrogen
31. Uniper Humber Hub
32. H2NorthEast
33. H2 to Humber Saltend
34. Aldbrough storage (SSE)
35. Protium
36. EDF Tees Green
37. ECC pipeline (Nat Grid Ventures)
38. Project Union (Nat Grid Gas)
39. East Coast Hydrogen (NGN)
40. Tees Valley Transport Hub
41. Octopus Hydrogen
42. Anonymized
43. Project Mayflower

East England

50. Sizewell
51. Octopus Hydrogen
52. Lowestoft Port

South East England

53. Ryze
54. Shoreham Port Green Hydrogen Production
55. Viridor
56. Cavendish

South West England

57. Bristol Airport
58. Canford Renewable Energy
59. Octopus Hydrogen

Yorkshire & Humber

44. Yorkshire Energy Park
45. Oyster Project
46. Gigastack

East & West Midlands

47. Tyseley Energy Park
48. Shropshire Council
49. Octopus Hydrogen /MIRA Technology Park

- CCUS enabled projects
- Electrolytic projects
- Storage & Distribution

Q&A