



# Hydrogen – local authority progress and pilots

Welcome

Event Sponsor



# Agenda



10:00	Registration and networking
10:20	Welcome & Opening Remarks – Cllr Susan Hinchcliffe
10:30	Plenary – presentations
11:45	Break – Tea & Coffee
12:10	Opening panel speech followed by panel discussion
13:15	Lunch
14:00	Case Study Showcase & Concluding Comments

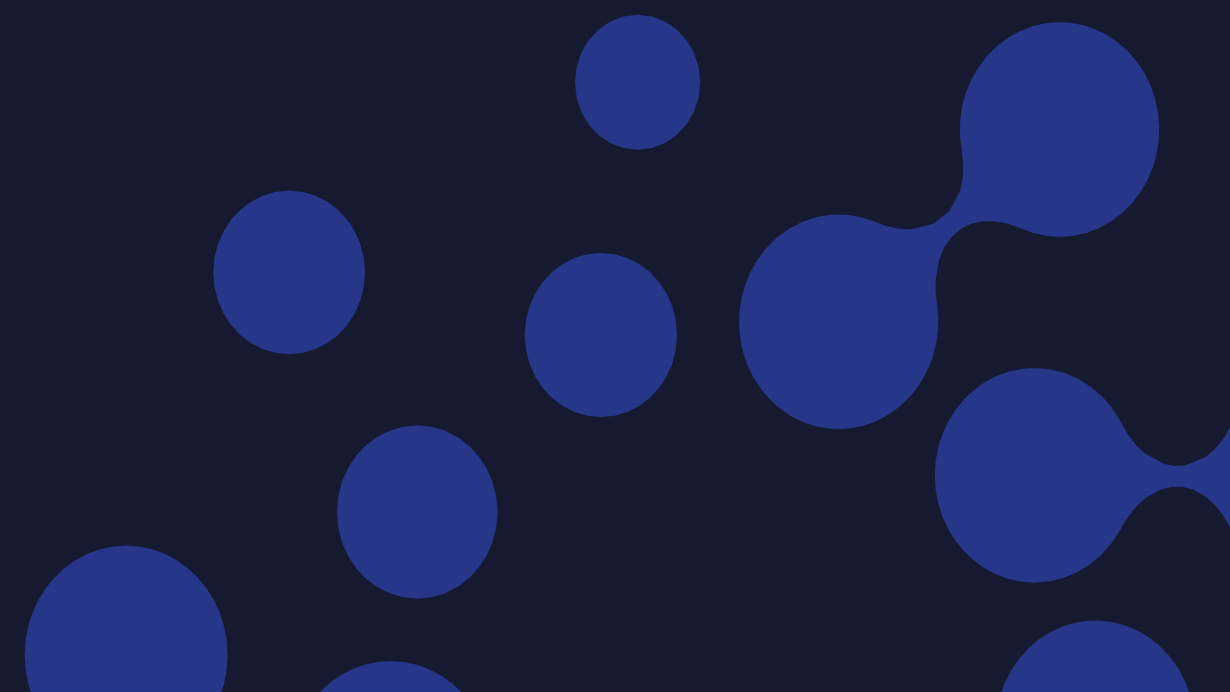
# Why Hydrogen?

Celia Greaves, Hydrogen Energy Association  
Wednesday 22<sup>nd</sup> January

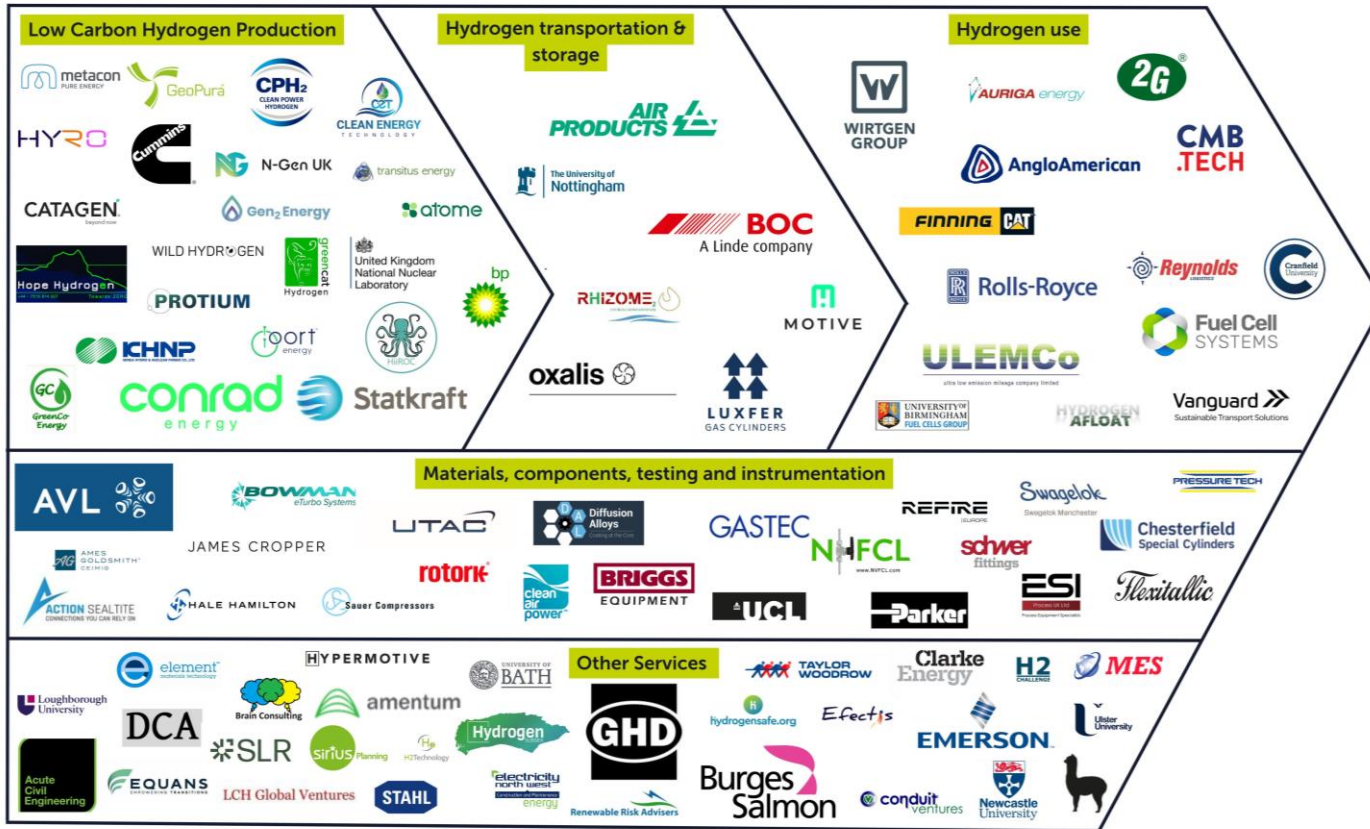


**Hydrogen  
Energy  
Association**

Formerly the UK Hydrogen and Fuel Cell Association



# About us



The leading UK Hydrogen trade group

Over 110 member organisations, encompassing all aspects of hydrogen and its applications

A key focal point for national and international engagement on hydrogen and its activities for UK plc and UK businesses.

Convening the Hydrogen Coordination Forum.

# Delivering jobs and growth



- The global demand for hydrogen technology is expected to increase to £700 billion annually by 2050, and there is an opportunity for the UK to be at the forefront of this new global industry, generating jobs and exports across the UK
- The UK economic opportunity out to 2030 is £11bn, with 12,000 high quality jobs focused in Teesside, across North-West & North Wales, Humber, Scotland and South-West, and many more in the supply chain. These jobs will encompass engineering, construction, manufacturing service sectors etc.
- A 10% share the hydrogen technology market alone could deliver £46bn per annum to the UK economy by 2050 and 410,000 jobs.
- Existing skills in oil and gas can help us provide global leadership in hydrogen.

# Delivering energy resilience

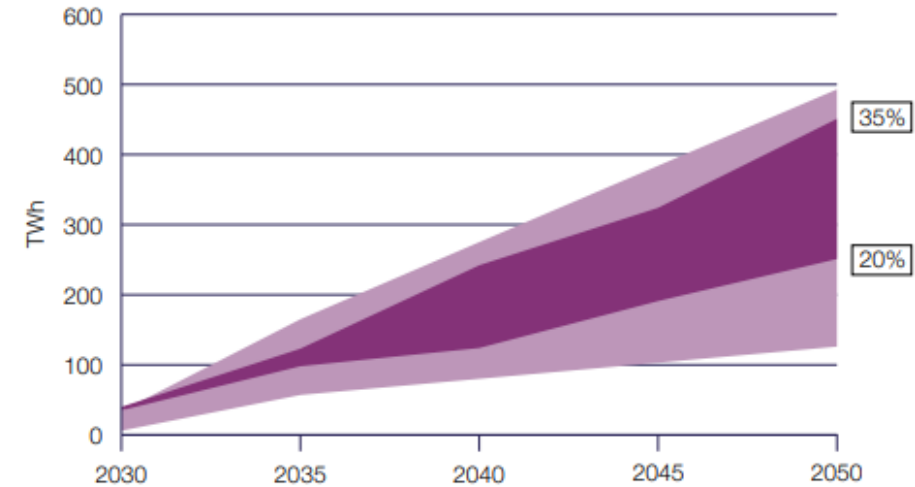


- Hydrogen allows us to balance supply and demand as we work towards our 50GW of offshore wind by 2030, with hydrogen storage as a vital buffer.
- In 2022 alone, there were 200 occasions when National Grid ESO had to pay Scottish wind farms to shut off their turbines, adding £800 million to consumer electricity bills and increasing greenhouse gas emissions by 1.3 million tonnes.
- Savings of £38bn have been identified if hydrogen is used to store energy to balance offshore wind and solar when the wind isn't blowing and the sun isn't shining.
- NESO on Clean Power by 2030: New dispatchable low carbon technologies, such as hydrogen, add significant value to the system, with even relatively small levels of operational capacity materially reducing the overall challenge for the rest of the programme.

# Delivering net zero

- The UK will not achieve its decarbonisation ambitions without hydrogen.
- Hydrogen's key role is in hard to abate sectors, where electrification is not possible – heavy industry, heavy duty transport (road, shipping, aviation) and power.
- By 2050, hydrogen could account for 35% of final energy demand.

Hydrogen demand and proportion of final energy consumption in 2050



# Hydrogen for Industry

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- Industry can't decarbonise without hydrogen.
- Up to 50TWh of demand in industry could be met by low carbon fuels, primarily hydrogen, in 2035.
- Typical user industries include steelmaking, chemical production, and food production.
- Hydrogen is decarbonising via: Fuel switching for boilers, burners and other high temperature processes used in industrial and manufacturing operations; and process gas feedstock.
- Experience across major industrial clusters can be transferred to businesses across the UK.

# Hydrogen for transport



- The transport sector accounts for ~40% of final energy consumption, with 80% of that being road transport.
- Decarbonisation cannot be achieved by electrification alone.
- Up to 45TWh of demand in transport could be met by hydrogen in 2035.
- Applications include road transport, rail, shipping and planes.
- Both fuel cells and combustion are options.

Sources (Clockwise from top left: ITM Power and Shell, ULEMCo, Fuel Cell Systems)

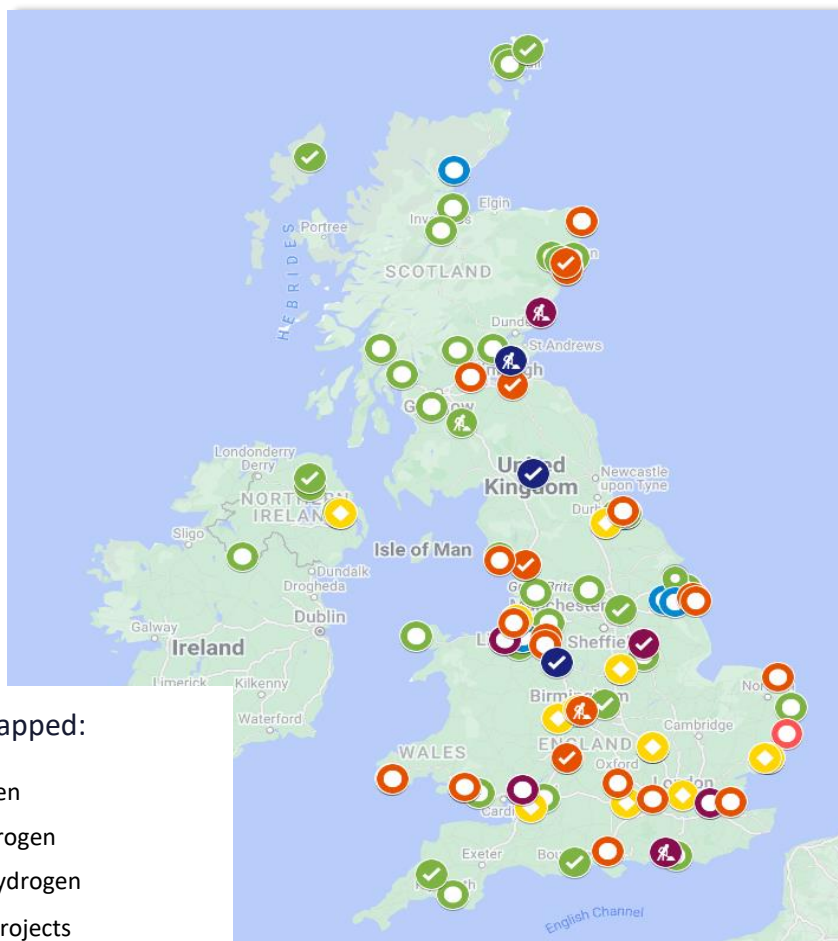
# What this means for local authorities



- Helping to meet local net zero targets
- Attracting new investment into regions
- Improving urban air quality and the health of urban populations
- Supporting local businesses looking to transition to support clean industries.
- Enhancing local energy resilience

Over 300 local authorities have declared a climate emergency, and nearly two thirds of councils in England aim to be carbon neutral 20 years before the national 2050 target.

# UK Hydrogen projects map



What projects are mapped:

- Electrolytic Hydrogen
- CCUS-enabled Hydrogen
- Nuclear-enabled Hydrogen
- H2 Infrastructure Projects
- Hydrogen-Powered Transport Use
- Commercial & Industrial Use Projects
- Hydrogen for Domestic Heating Projects

- Over 70+ low-carbon hydrogen production projects, post FEED, mapped
- Aberdeen H2 Hub (400MW), Cromarty Hydrogen Hub (300MW), Lowestoft hydrogen production facility (200MW) and Hybont (250MW) are some of these pioneering projects will be the first at scale electrolytic projects online
- Many industrial use projects advancing rapidly with HEA members and their partners across the country - e.g. JC peers, Kimberly-Clark, Budweiser Brewery
- Key hydrogen mobility examples such as Fleetwide Conversion for Aberdeen City Council, and Teesside Transport Hub with various HEA members involved, including ULEMCo

<https://ukhea.co.uk/uk-hydrogen-project-map/>

# Thank you

[ukhea.co.uk](http://ukhea.co.uk)



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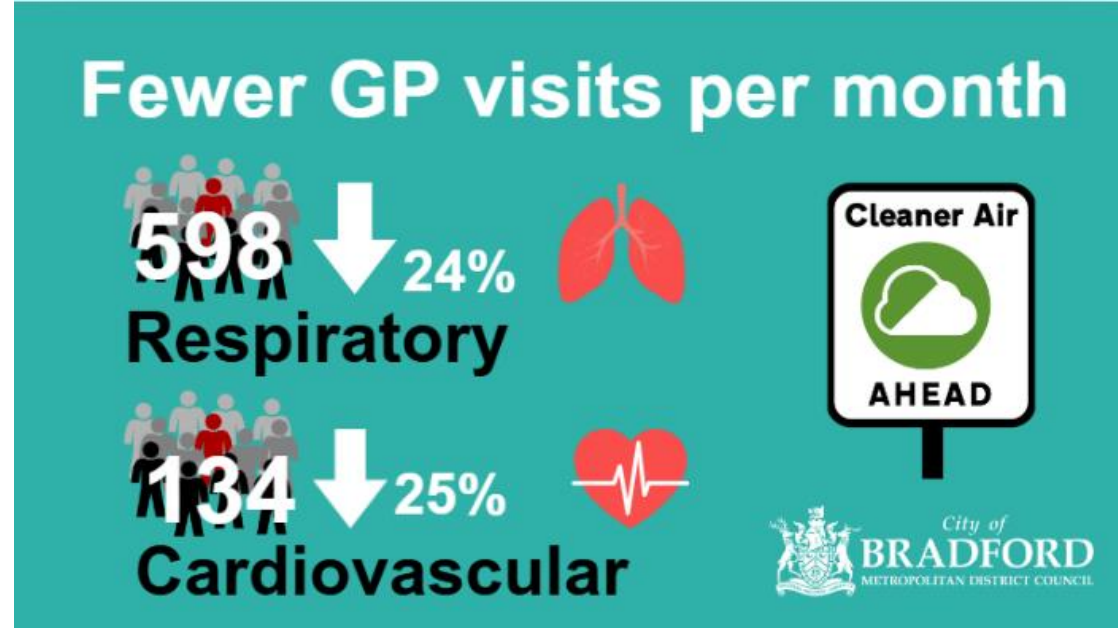
# **Strategic approach to Hydrogen by Bradford Council**

## **Practical experience of deploying a hydrogen production project**

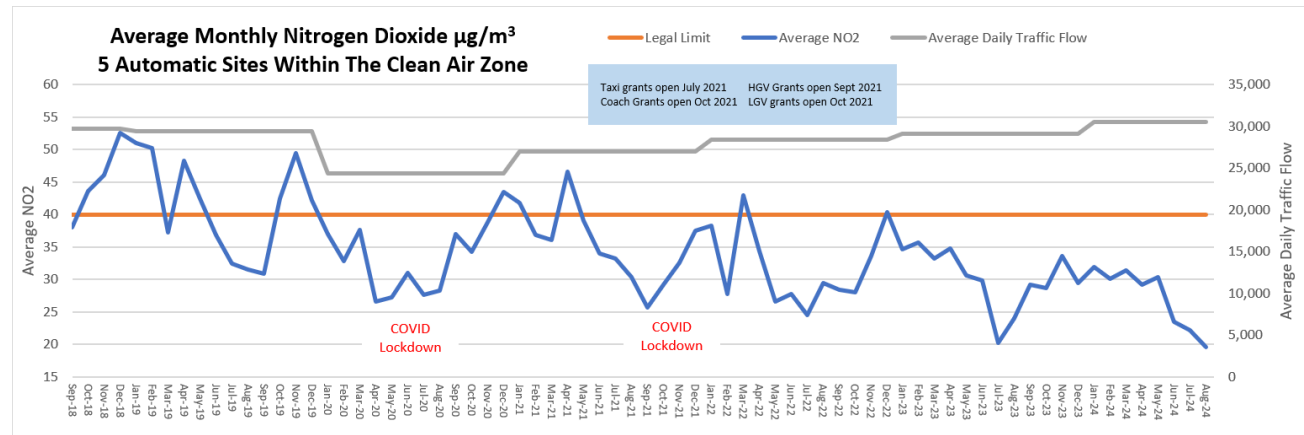
**Andrew Whittles – Assistant Director of Sustainability – Bradford Council**

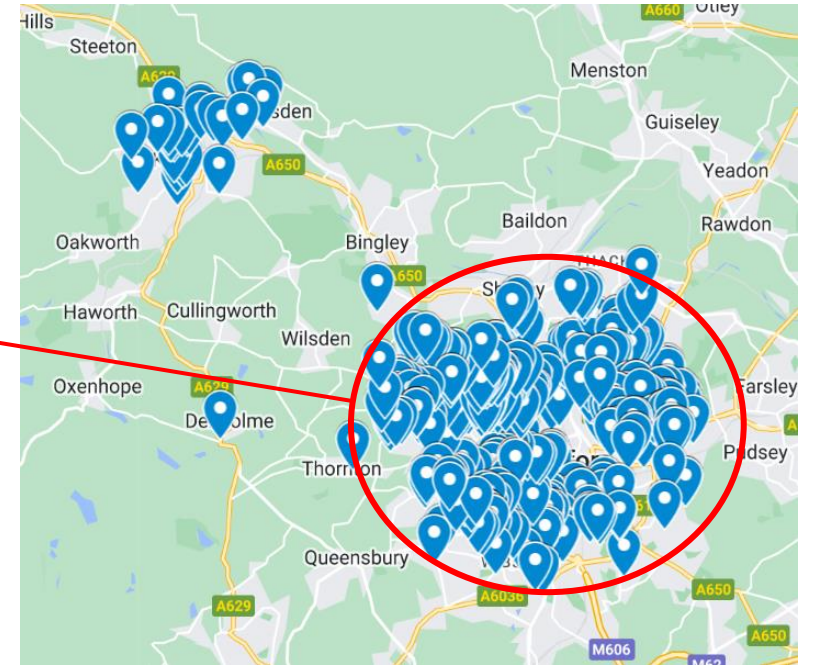
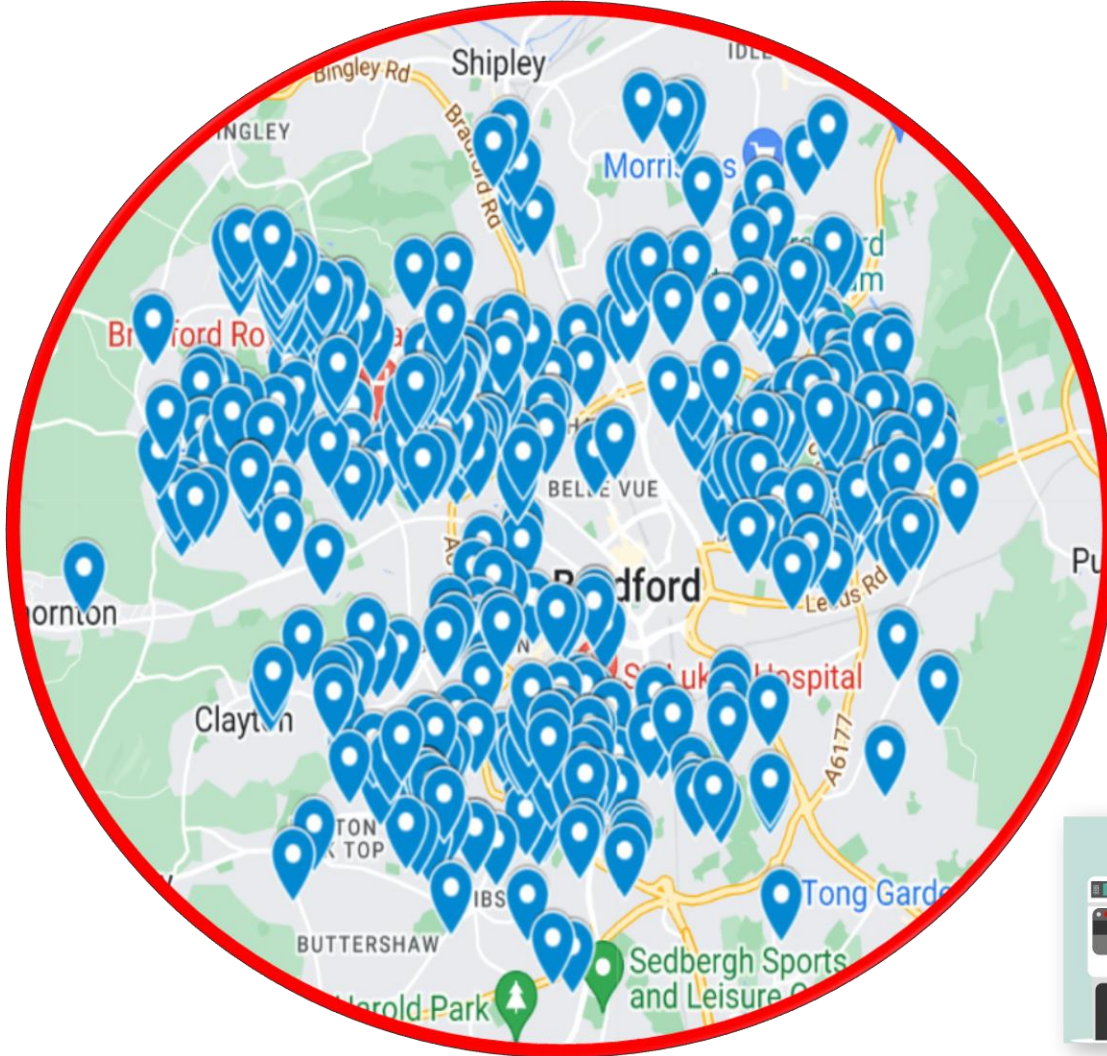
**Neil Travers – Head of Business Development – N-Gen Energy**





# Bradford Clean Air Zone (CAZ)





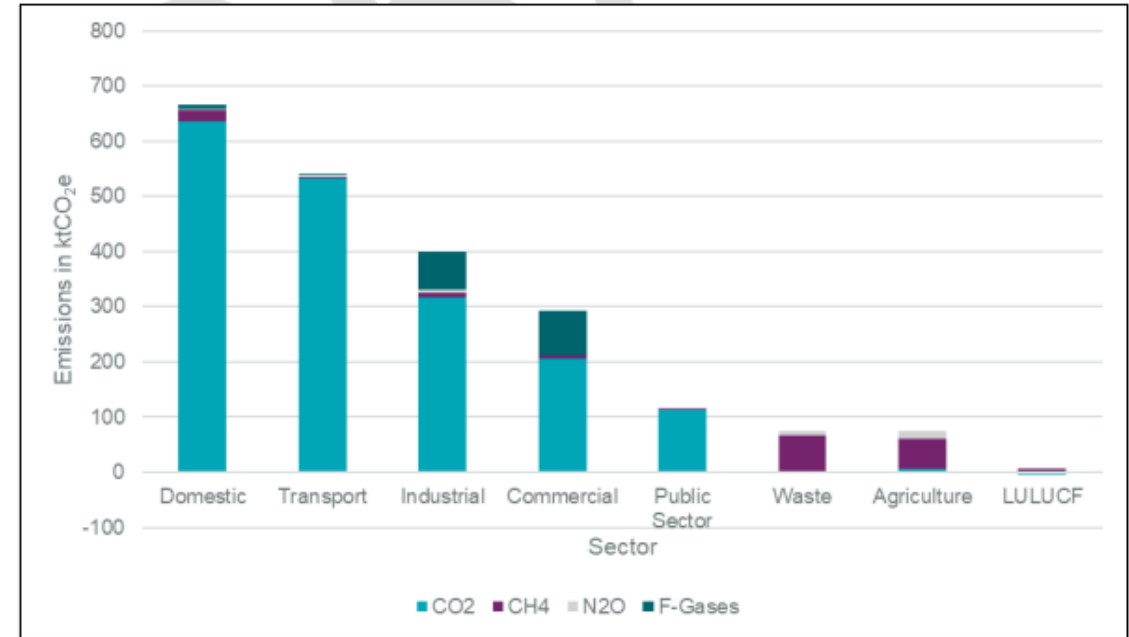
## **Zero Emission Vehicles & Infrastructure**



# CLIMATE ACTION PLAN

## Executive Summary

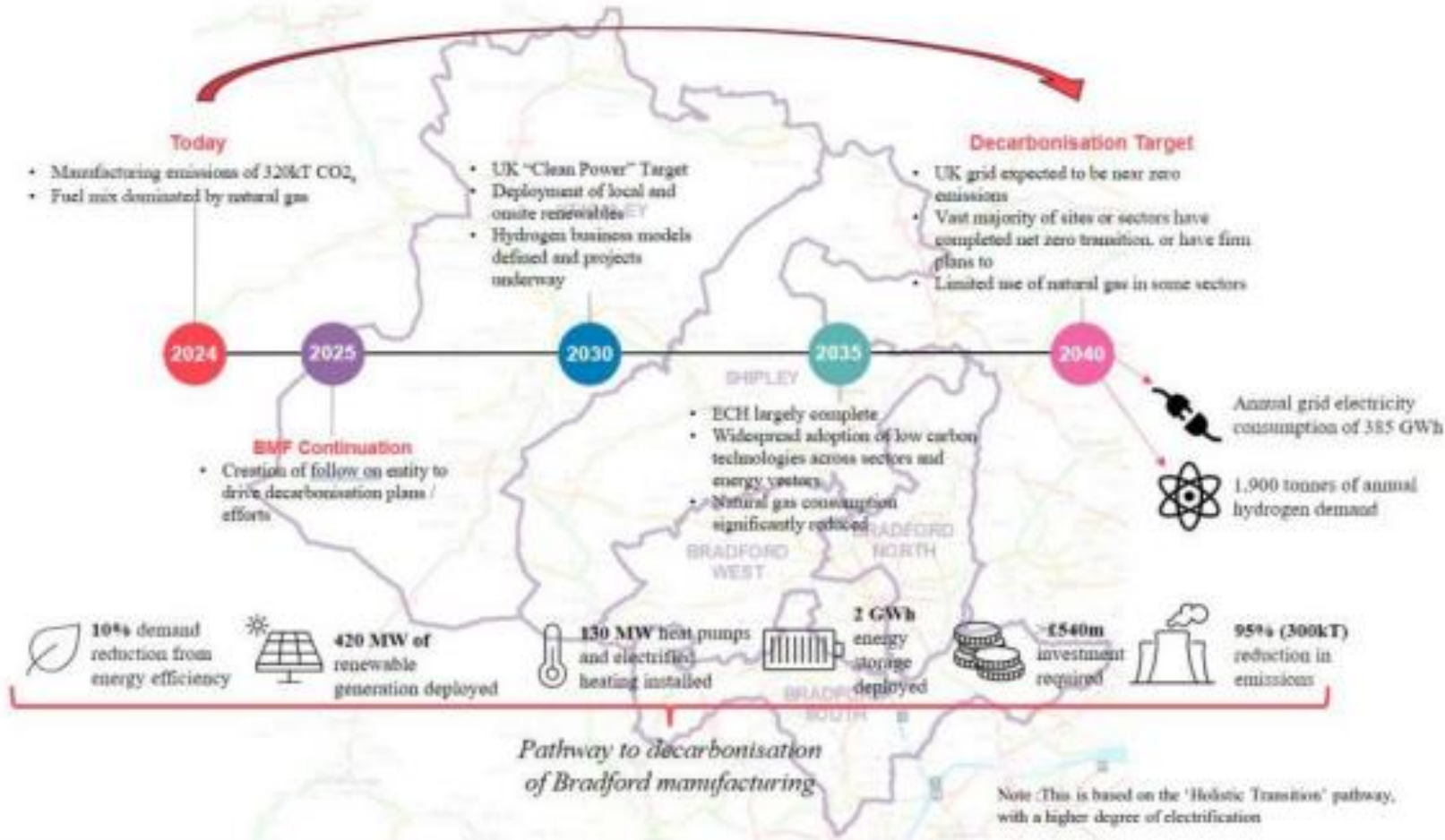
**Bradford District  
2025 - 2028**



## Draft Climate Action Plan for Consultation



**Indicative pathway for decarbonisation of manufacturing over the next 15 years**



**BRADFORD**  
MANUFACTURING FUTURES



**LOCAL INDUSTRIAL DECARBONISATION**

**Local Industrial Decarbonisation Programme**





# Bradford Energy Network (BEN)





## Zero Emission Vehicle & Infrastructure Plan

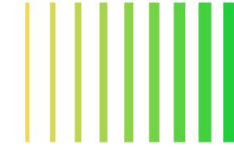


# Practical experience of deploying a hydrogen production project

Neil Travers – Head of Business Development – N-Gen Energy







# Hydrogen project viability - technical

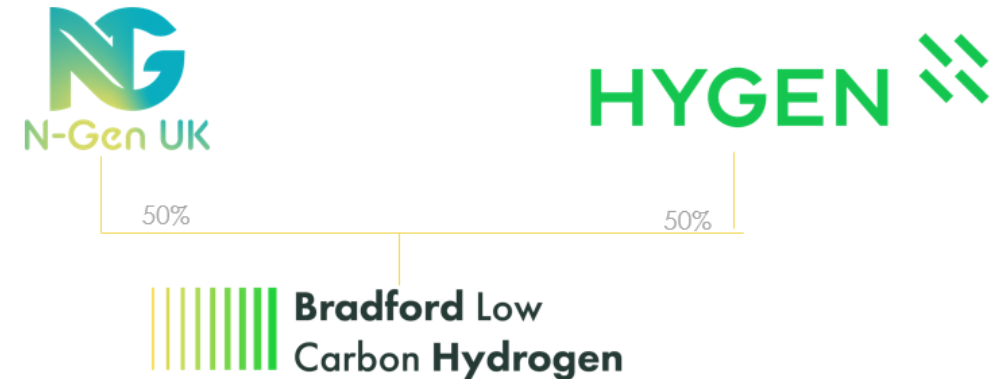
- Needs case
- Land
  - Availability
  - Long term availability
  - Environmental impacts
  - Risk assessments
- Power supply
  - Capacity constraints
  - Reinforcement and route to connection
- Water
  - Potable water
  - Waste water treatment plants
  - Natural springs
  - Wells
- Technology choices

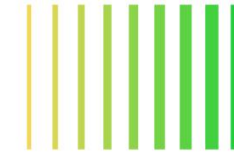




# Hydrogen project viability – economical

- Government support and subsidies through Hydrogen Production Business Models
  - Hydrogen Allocation Rounds
  - Low Carbon Hydrogen Agreement
  - Low Carbon Hydrogen Standards
  - Strike price
  - Price parity to counterfactual high carbon fuels
- Stakeholders
  - Investors
  - Community support
  - Local stakeholders
  - Bradford Council, including planning and consents
  - Third party utility providers
  - Off takers
- Power Purchase Agreement – up to 80% of running costs





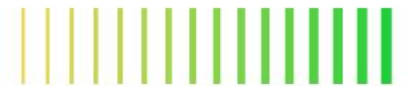
# Key challenges

- Time from project conception to operation
- Impact of delays– investor and offtaker confidence
- Establishing the market – supply and demand
- Long lead times for key equipment
- Emerging technologies





**Thank-you**



# Liverpool City Region Green Hydrogen Vision Case Study



Equans UK & Ireland | HEA x APSE Hydrogen Event | 2025

FREDDIE MINTER

Hydrogen Solutions Manager

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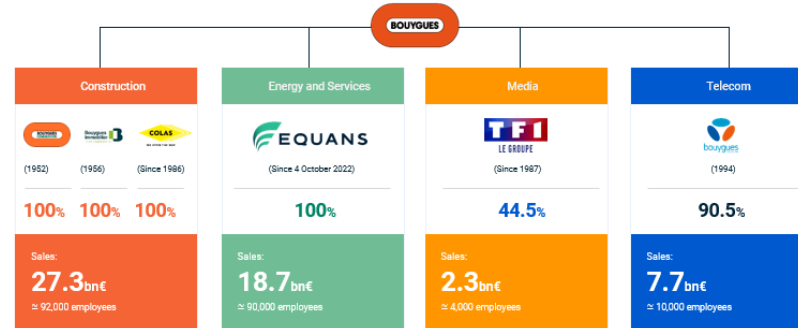


# EQUANS – A WORLD LEADER IN ENERGY SERVICES

## COMPANY PROFILE

*Equans designs, installs and supplies tailor-made solutions to improve its customers' equipment, systems and technical processes and optimize their use as part of their energy, industrial and digital transitions.*

## A BOUYGUES GROUP COMPANY



## UK OVERVIEW



**PEOPLE**  
Over 15,000 employees



**FINANCIAL**  
>£2bn turnover



**INDUSTRIES**  
Strategic supplier to government, blue chip businesses and mission critical infrastructure

## OUR MISSION



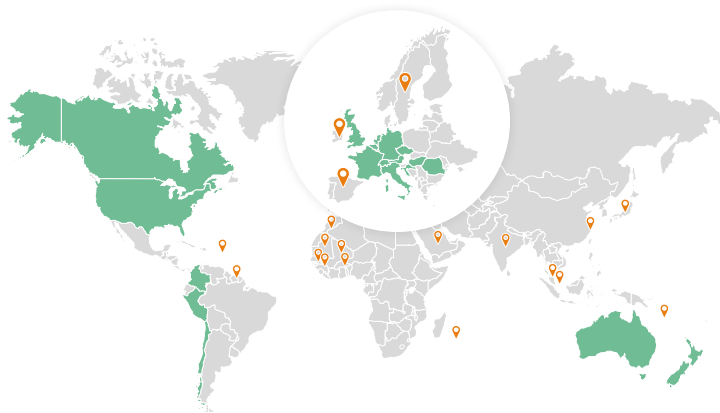
Accelerating our customers' transitions to a low carbon and resilient world

**Energy transition**  
Reducing our customers' carbon footprint

**Digital transition**  
Collecting, analysing, storing and protecting data to create value & solve city and citizenship challenges

**Industrial transition**  
Optimising productivity and supporting the reindustrialisation of regions

## EQUANS GROUP

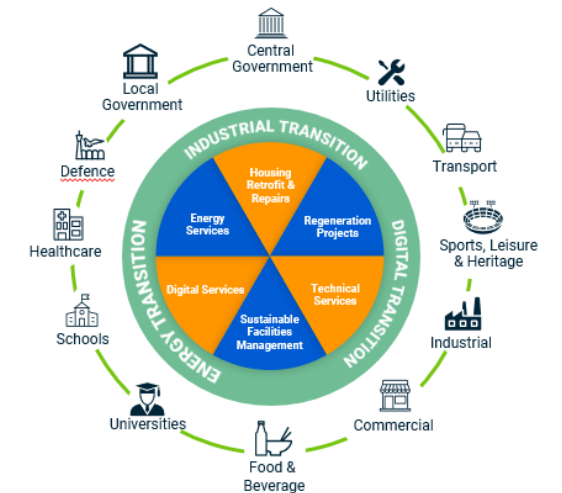


≈ **€18.76 bn**  
of revenues in 2023

≈ **90,000**  
employees

**20 Countries**  
with global footprint

## OUR SPECIALISED GLOBAL BRANDS



# EQUANS HYDROGEN OVERVIEW

**50+**  
experts in  
hydrogen processes

**>20**  
Hydrogen projects /  
studies completed

**HAR1**  
Pre-FEED and FEED  
study completed

**5+ YEARS**  
since the first  
H2 projects

**EXPERTISE**  
Feasibility, Front-End  
Design, EPC, O&M

**PARTNERSHIPS**  
For Innovation  
For Procurement

Top projects

Design & engineering centres

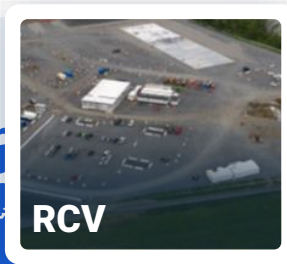
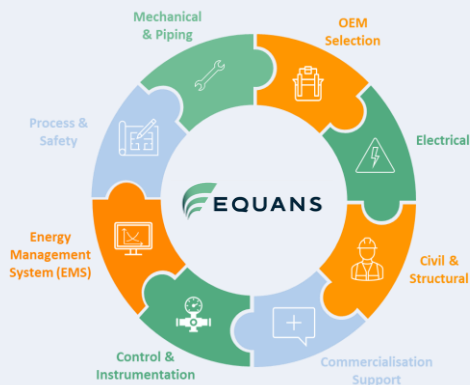
Equans Group footprint



**CA** – 100 MW project in construction as main contractor

## Our expertise:

- In-house engineering
- Industrial & process capabilities
- Excellent safety performance
- Global scale with local precision
- Broad network of suppliers
- Integrated service provision



**UK** 1 operational project and pre-FEED and FEED for HAR1 project

**FR** – MW scale projects in operation and large-scale hydrogen and e-fuels (>200MW) projects in design

**GER** – MW scale projects in operation including 5MW high pressure project commissioned in 2024

**NL & BELUX** – Actively involved in innovation projects

# HYDROGEN'S ROLE IN LIVERPOOL

LCR aims for net zero by 2040

H2 = >20% of final energy demand

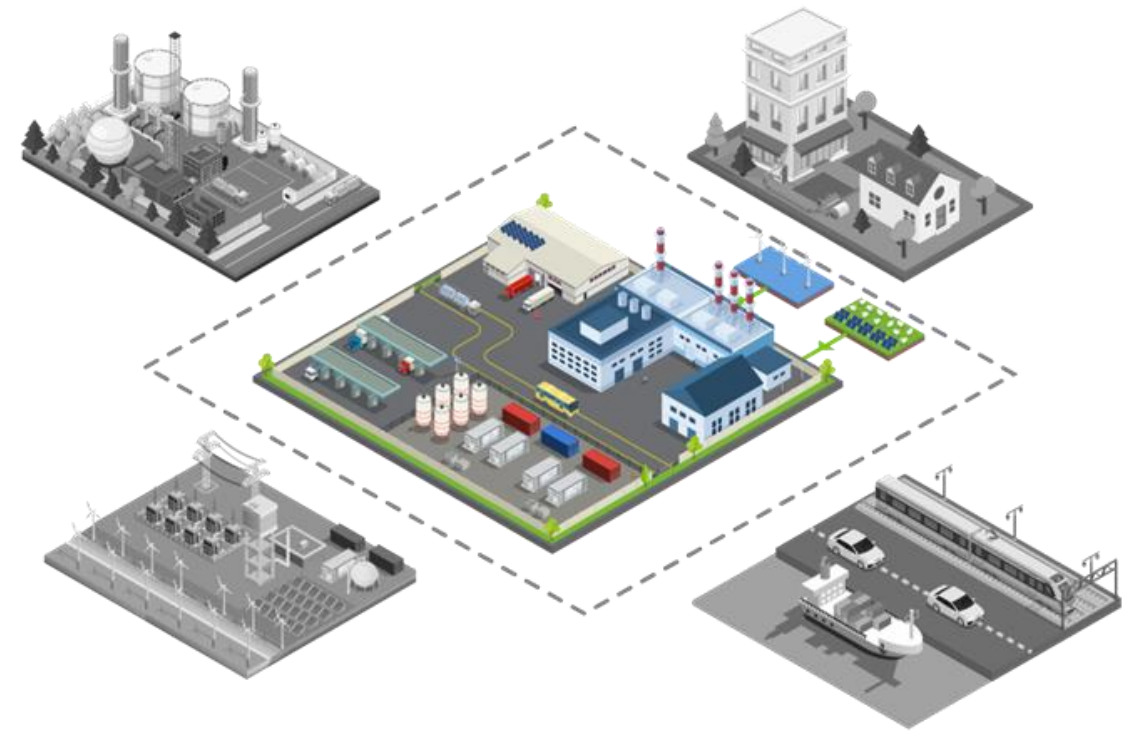
LCRCA has invested to kickstart the local H<sub>2</sub> economy

A region with strong hydrogen heritage

Heavy industry & transport and dispatchable power generation



# PURPOSE OF THE STUDY



The Vision focused on three areas:

- a) industrial operations
- b) freight & logistics
- c) municipal fleets

To determine the size and scale of this future economy

Establish the opportunity for decentralised hydrogen hubs by 2030

Decarbonise hard to abate sectors & deliver energy security

Attract investment and safeguarding jobs for long term industrial prosperity

Supported through community engagement and educational briefings

# ANALYTICAL METHODOLOGY

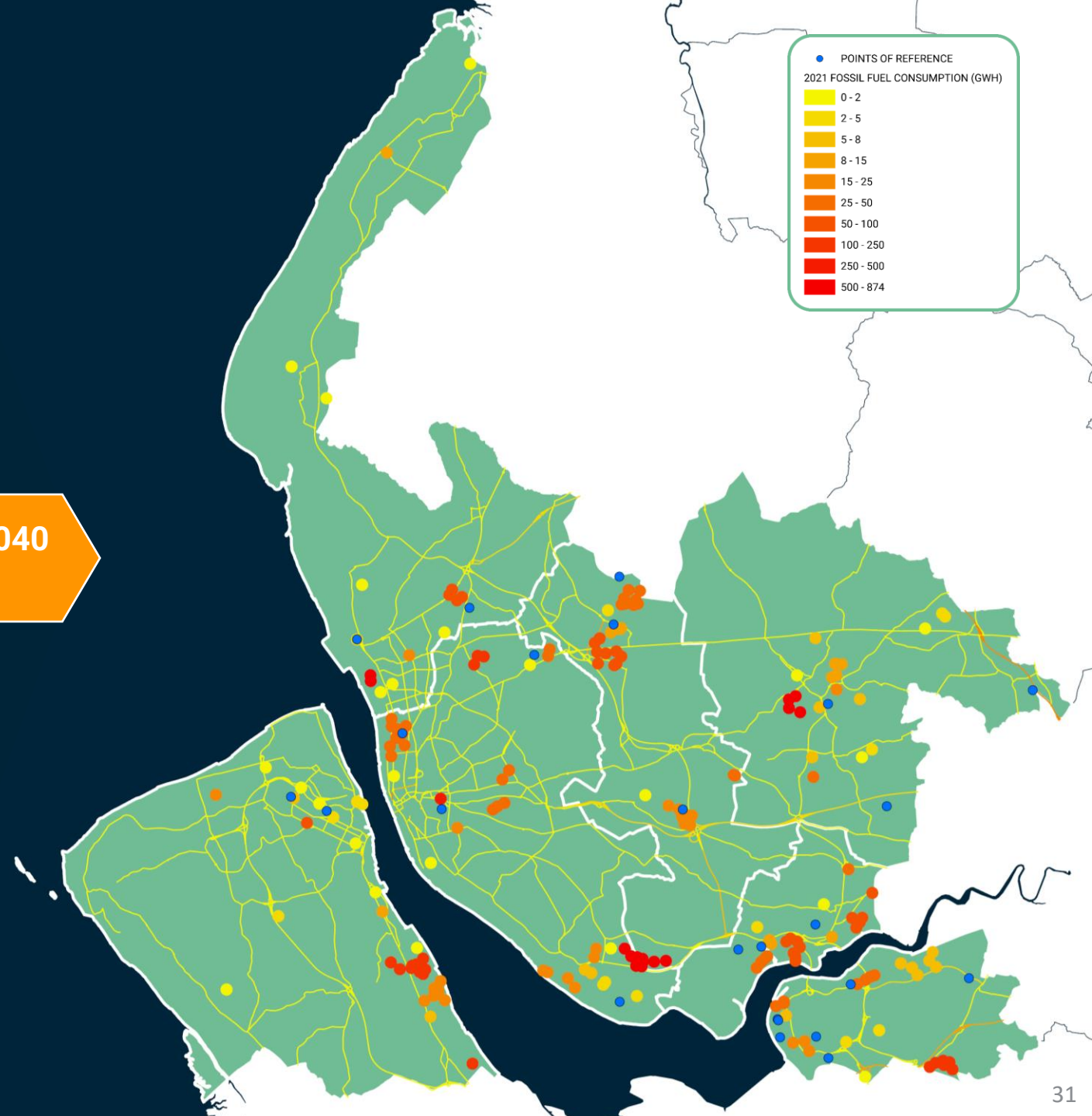
Identify consumers to calculate baseline

Consult with local stakeholders on anticipated route to net zero

Model decarbonised pathways to forecast 2030 and 2040 hydrogen demand

Aggregate adjacent demand into hydrogen hubs with shared infrastructure

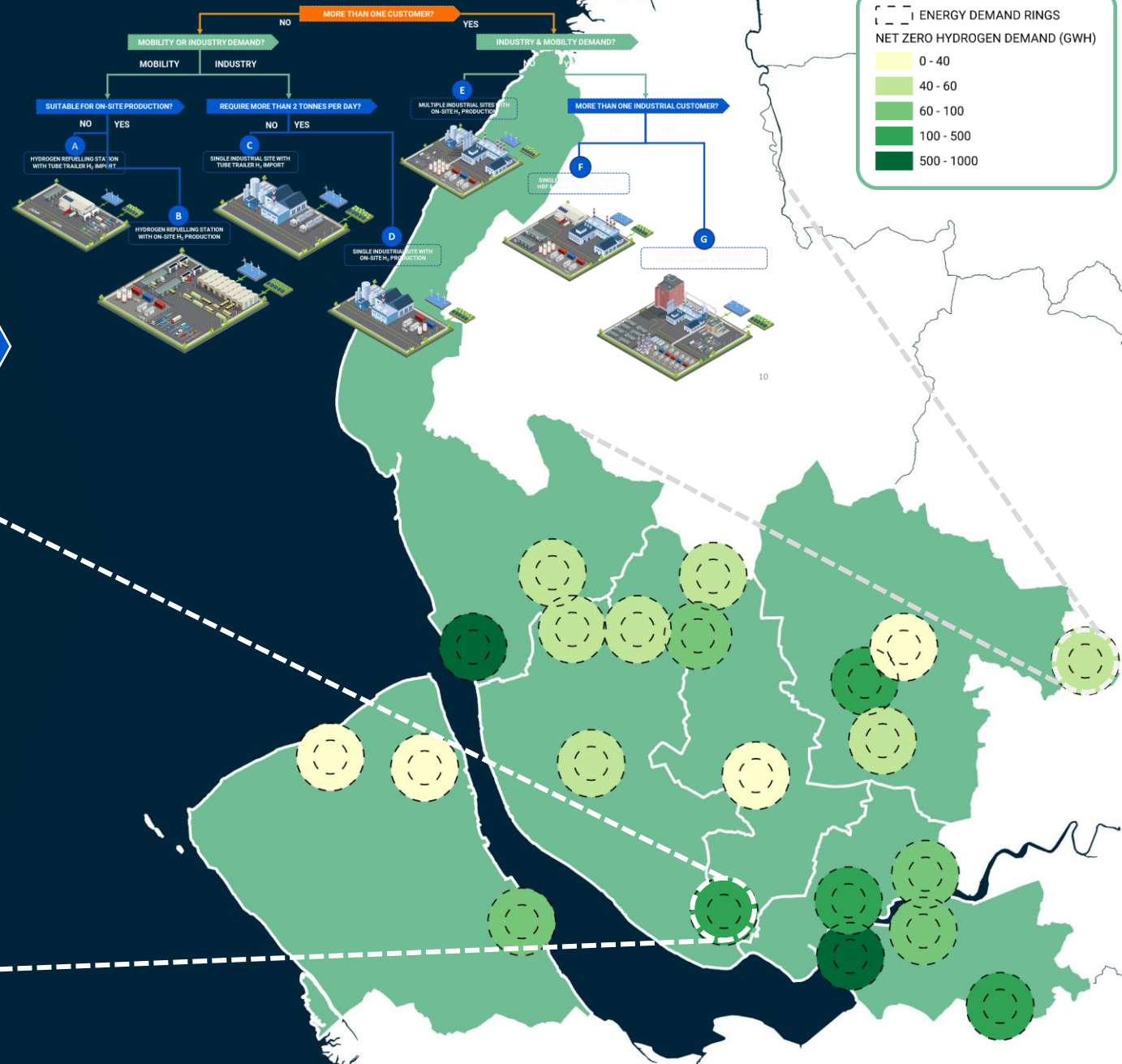
Verify viability of projects and prioritise key developments



# PRIORITY PROJECTS

21 potential hydrogen hubs

Infrastructure and investment requirements



**2030 Investment**  
€150m - €220m

**SPEKE / HALEWOOD**

2030	2040
70MWe electrolyser	Possible HyNet Connection
323GWh/a hydrogen demand	473GWh/a hydrogen demand
66,000 tonnes/a CO <sub>2e</sub> avoided	95,000 tonnes/a CO <sub>2e</sub> avoided

A large multi-use hub that would be developed out in phases. On-site hydrogen production likely to be constrained by electrical import capacity rather than demand so 70MWe is ambitious. HyNet connection possible in 2030s.

**Align potential demand at pharmaceuticals:** Tria, AstraZeneca and Seqirus and Medimmune

**Automotive manufacturers:** JLR and Ford could be major first movers

**Speke bus depot, as well as other P&L demand from:** Ford DHL, Liverpool John Lennon Airport, Fedex and Biffa

A large on-site production facility could meet some demand but a piped connection from HyNet is more likely by 2040

**Logos:** EQUANS, LIVERPOOL CITY REGION, Knowsley Council, Liverpool City Council

Example Hub 1: production facility with multiple industrial and mobility users

# SKILLS & JOBS

1

Upstream:  
Production



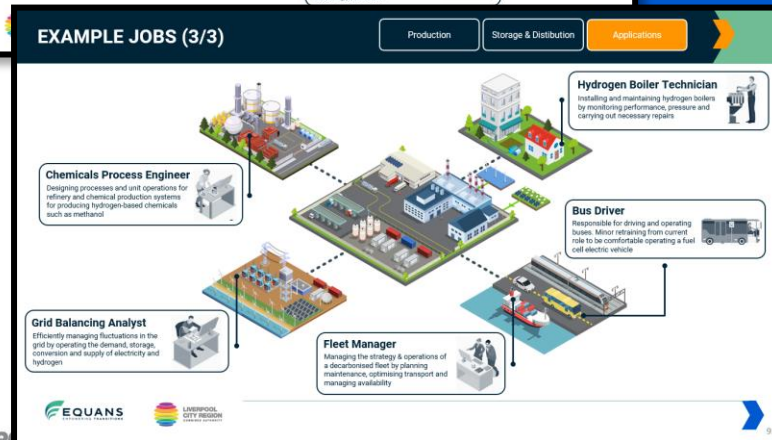
2

Midstream:  
Storage & Distribution



3

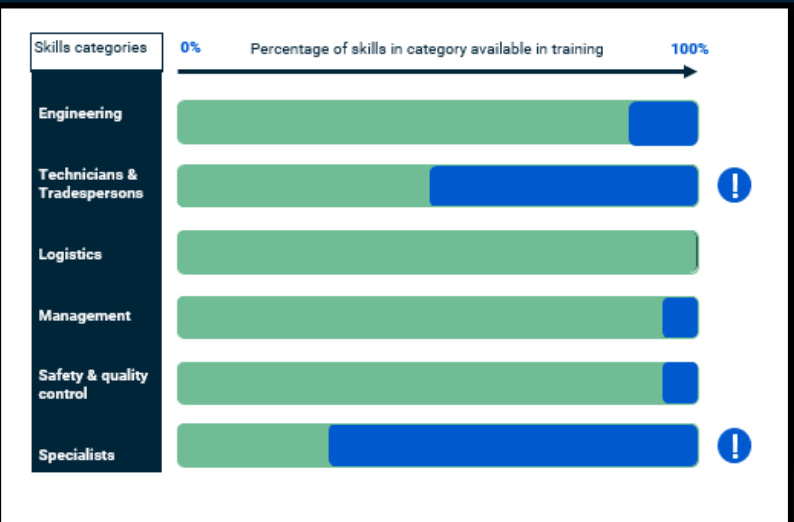
Downstream:  
End-use Applications



141,000 jobs are required in the LCR area to achieve net zero

The number of hydrogen jobs will need to more than double by 2030

Gaps in the current training ecosystem identified



\* Skills gap analysis carried out in conjunction with local providers

# COMMUNITY ENGAGEMENT & EDUCATIONAL BRIEFINGS

Awareness-raising and upskilling are key

Briefing sessions and accompanying educational literature shared with LCRCA and LA staff

Knowledge dissemination for teams responsible for strategy, finance and planning

Engagement with local NGO representatives from the LCR Climate Partnership

Consultations identified actions to galvanise the public

### HYDROGEN IN SOCIETY

What makes green hydrogen green?

To ensure hydrogen production becomes a decarbonisation solution rather than a problem, UK Gov announced a Low Carbon Hydrogen Standard in 2022. It will limit the CO<sub>2</sub>e/MWh to 2.4 kg CO<sub>2</sub>e per kg H<sub>2</sub> defined as low carbon. The graph illustrates which types of production would meet the criteria. Both green and blue production are expected to meet the criteria, however, grey and pink conventional production are unlikely to meet the threshold. Conventional energy directly connected renewables that are co-located to the site of hydrogen production are generally lower carbon than grid-connected renewables due to the fact that the grid is not energy decarbonised until it is carbonised by 2035. The energy intensity of electrolysis means that any use of fossil fuels to power it quickly increases its carbon footprint, thereby making the chance of being green prohibitive than the original carbon footprint.

To have the best chance of meeting this criteria, green H<sub>2</sub> production should meet additional requirements (electricity supplied by new-renew built assets or combined power), there should be temporal correlation between renewable production and hydrogen production, and higher emissions than hydrogen must be removed.

Green Hydrogen infographic

The infographic above shows how the hydrogen sector may look in years to come. Green hydrogen produced by electrolysis may offer the potential to produce, or at least to generate, transportation emissions, or at least hydrogen derivatives for more efficient transportation or storage. These molecules can then be moved in various ways.

### HYDROGEN ECONOMY: INFRASTRUCTURE & STORAGE

A functioning hydrogen economy will require infrastructure to align supply and demand

Hydrogen production won't always occur at the same location as demand (see Green H<sub>2</sub> Production) and the intermingling of renewables means hydrogen cannot be produced on demand at the same rate as generated by power plants. This means that infrastructure is required to bridge these geographical and temporal gaps.

Hydrogen is the cleanest source of transporting H<sub>2</sub>, hydrogen flow rates are comparable to natural gas pipelines, which means existing pipelines can be repurposed to safely carry hydrogen. New H<sub>2</sub> pipelines are being developed and are likely to have larger diameters, although they are more expensive (€0.27-0.41/kg H<sub>2</sub> versus \$0.08-0.17/kg H<sub>2</sub>). Advanced hydrogen pipelines are from regional scale, such as H2Belt in international, such as H2Belt, a planned project connecting Spain, Portugal, Germany and France to supply up to 10M t/d demand by 2030.

Over short distances, best suited vehicles like trains will play a role, initially assisting existing services connected to pipelines. This type of transport already exists in the UK to deliver small volumes of hydrogen. Over long distances, shipping hydrogen will be key, especially as a trade market emerges. It is likely to be stored as ammonia or methanol for this due to challenges transporting pure hydrogen. There will then be more options to handle large volumes of these chemicals and some LAD terminals may be converted.

Here the hydrogen gas is liquefied by cooling it to 252K, creating a much higher volumetric energy density.

- Very energy intensive process
- Higher volumetric energy density, reducing required storage volume

Here the hydrogen gas is compressed (350/700bar) to a higher volumetric energy density, after which it is stored in special high-pressure tanks.

- Volumetric density remains low (1/3 of liquid state)
- Low cost and low requirements

Hydrogen gas can be stored in underground gas pockets, aquifers or salt caverns. The North West has good access to these geological formations.

- Still requires a large volume of storage space

There are two types of solid hydrogen carrier options: 1) chemical carriers, where the H<sub>2</sub> reacts with the solid, and 2) physical carriers, where it is stored by surface adsorption.

- Still in development phase and it

Hydrogen carriers: Ammonia & methanol

H<sub>2</sub> can also be stored by converting it to a methanol (12.3 wt% H<sub>2</sub>) or ammonia (17.8 wt% H<sub>2</sub>). After transport it is then converted back into hydrogen and other products.

Policy

Infrastructure investment has long time horizons and requires significant CAPEX commitments. To give confidence to investors, UK Gov has committed to the Business Model by 2025 that will provide a form of financial support. A combination may exist in delivery 2022 with results due to be published Q1 2023. UK Gov aims to use an 'investment of value' balancing out supply and demand while not using and T&E infrastructure spend.

A key part of the Business Model includes the role of 'blending hydrogen into the gas grid up to 20%'. This could provide carbon savings of up to 7% and provide revenue streams to producers too, although it will be high priority use case for hydrogen (see the early on must be regional capacity). UK Gov is also expected to make a key decision on whether to convert the gas grid (including National Transmission System) to hydrogen in 2024. This would help to transport hydrogen across the country (national grid has been working to assess the feasibility of this).

### GREEN HYDROGEN PRODUCTION: KEY CONSIDERATIONS

Electrolytic hydrogen production requires modest space, but significant power and water supply and precise balance of plant

Producing green hydrogen at scale still remains relatively untested. Apart from the Ningde Baoping 160MW electrolyser in northwest China, the world's largest green hydrogen production facility, almost all electrolyser production to date has been 20MW. This means that there are unknowns regarding operational efficiencies, space optimisation and integration with other utilities. So rapid developments in the sector are consolidating knowledge.

Power: It is more renewable capacity is required than electricity capacity, although this can vary greatly (log scale) needs, wind and solar. One of the challenges for scaling green H<sub>2</sub> production is the scarcity of renewables (linked to distribution requirements) balancing grey H<sub>2</sub> with green H<sub>2</sub> in the UK would require building all of the country's renewables (both to date, without accounting for hydrogen gas as a fuel). The intermittency of renewables is also a challenge. This could be mitigated by powering electrolysis with a blend of different zero-carbon energy sources such as wind, solar, nuclear or tidal power.

Water: Hydrogen production requires significant volumes of freshwater (between 10-15kg/kg), depending on cooling requirements and on a high purity level, especially PEM electrolysers which are very sensitive to impurities such as iron, copper, and sodium. According to the 2022 research by RINA, water supply is not likely to become a limiting factor for several reasons. Firstly, decommissioning thermal power plants will save significant volumes of water (currently used for cooling). Secondly, with a near unlimited supply, seawater could be used. Seawater purification costs are marginal on the whole (c. 1.10\$/kg H<sub>2</sub>) although this is limited to coastal areas. Innovations in building at sea electrolysis have also been successful. Overall, all projects must evaluate and use potential water challenges into economic modelling. One major potential operational risk is the lack of water during droughts, which may become more frequent with a changing climate.

Space: Currently, the space requirements for green hydrogen depend on the technology that is used (electrolyser, compression, storage, etc.). Electrolysers are often housed in an ISO container (shipping container). The reference 120M electrolyser requires space, one with 100 containers. This is comparable to a battery of similar scale. The surface technology will require approximately the space of the electrolyser, doubling the overall footprint. PEM electrolysers are more compact than alkaline. The footprint size is likely to decrease with innovation and optimisation.

Balance of plant refers to the parts of the plant outside of the electrolyser, such as the power supply, water feed, purification processes, compression and much more. For both PEM and alkaline electrolysers the balance of plant contributes 45% of the costs and is, therefore, an important part of the overall system.

Item	Unit	Value
Power supply (120M)	€10M	75%
Water supply (120M)	€1M	8%
Balance of plant (120M)	€10M	80%
Electrolyser (120M)	€1M	8%

Source: Equans, 2022. All values are in €M unless stated otherwise.

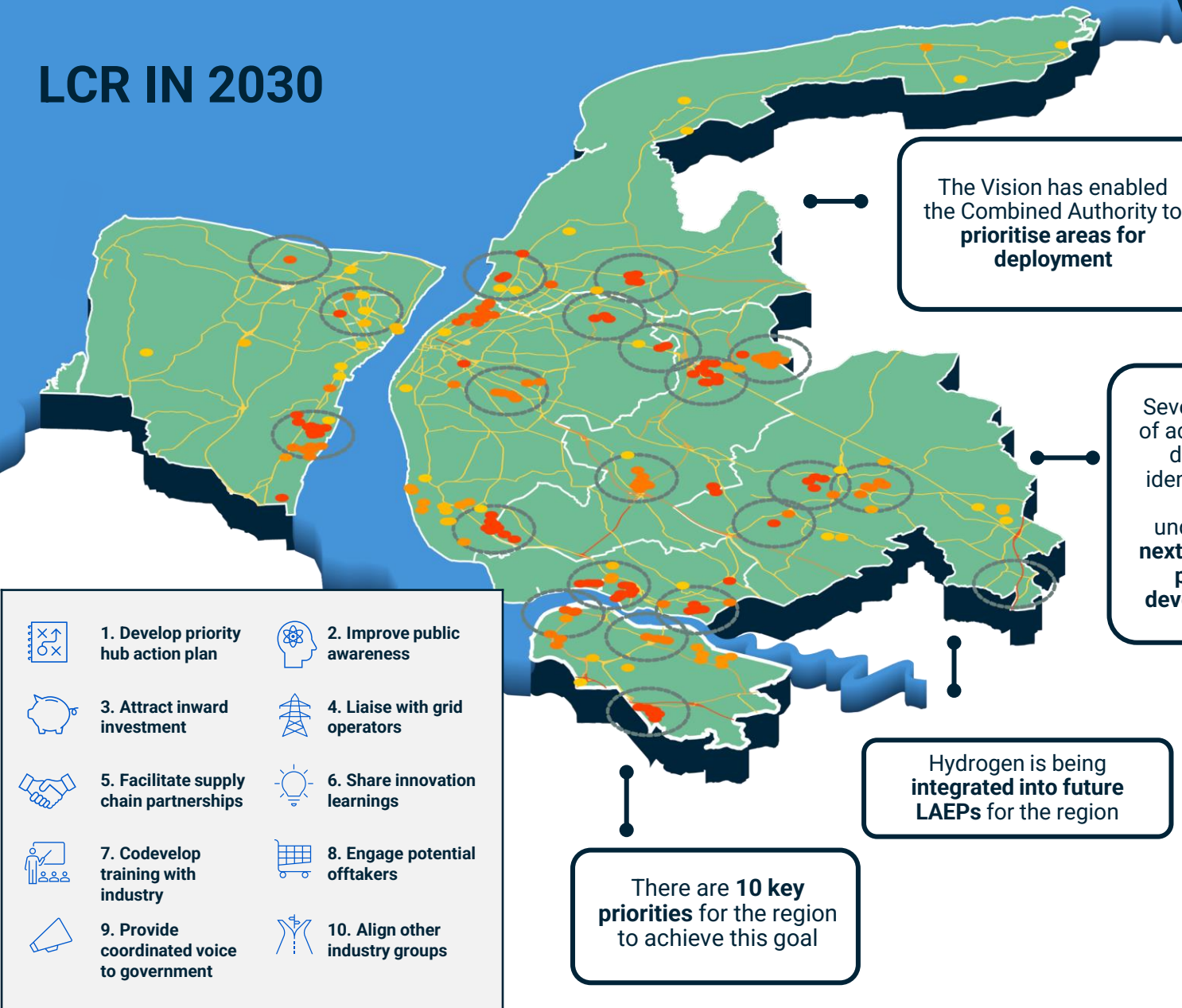
Treating hydrogen as a silver bullet

Health & safety challenges

Environmental impact of new pipelines

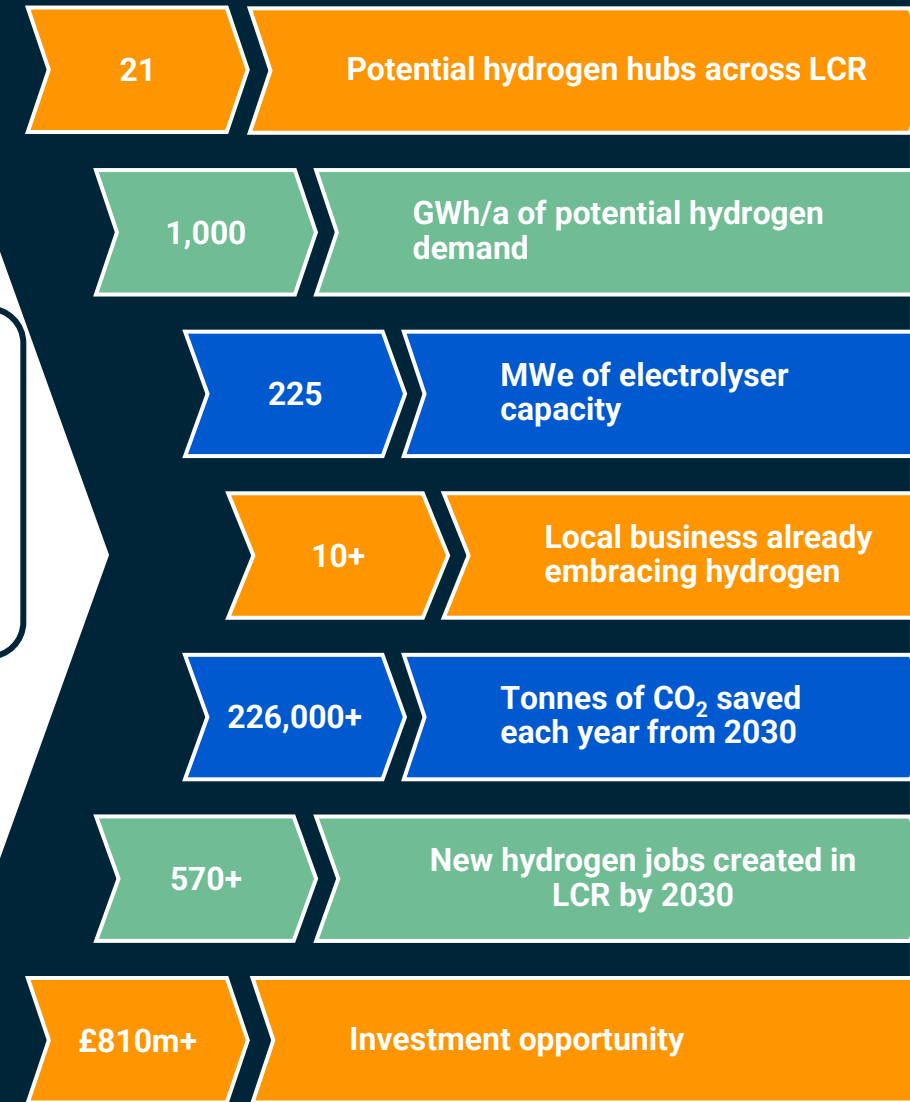
Water consumption and future scarcity

# LCR IN 2030



- 1. Develop priority hub action plan
- 2. Improve public awareness
- 3. Attract inward investment
- 4. Liaise with grid operators
- 5. Facilitate supply chain partnerships
- 6. Share innovation learnings
- 7. Codevelop training with industry
- 8. Engage potential offtakers
- 9. Provide coordinated voice to government
- 10. Align other industry groups

## KEY 2030 LCR STATS:



# LOCAL AUTHORITY ACTION AREAS



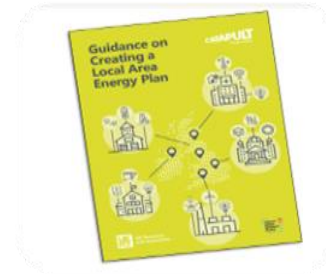
## ASSET OWNERSHIP

Direct reduction in Authorities Scope 1 emissions e.g., converting heavy-duty vehicles to hydrogen



## PROCUREMENT

Authorities place large contracts for external services in buses, waste collection, street sweepers, fire engines. Locally integrated transport networks are area of growth



## WHOLE-SYSTEMS

Collaborate with Net Zero Hubs to deliver Local Area Energy Plans to identify cross vector challenges and engage with NESO for wider national planning

# HyNet North West

## PARTNERSHIPS

Coordinated developments across business, academic and the public sectors



## STAKEHOLDER ENGAGEMENT

Using formal consultation processes to engage and communicate with communities



## DEVOLUTION REVOLUTION

Increased autonomy of funding through devolution will open up opportunities to fund for hydrogen innovation or capital deployment



## LINKS TO GOV

Engaging with DESNZ to support hydrogen projects: policy shaping, letters of support and bidirectional messaging between national and local



## PLANNING

Upskilling Local Planning Authorities to understand principles of hydrogen projects and wider landscape

# Record H2 PPT for Bradford H2 Event -

2025-01-21 13:02 UTC

Recorded by

Prasad, Kunal -  
Oxfordshire County  
Council

Organized by

Prasad, Kunal -  
Oxfordshire County  
Council