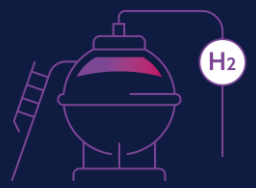
Hydrogen Valley

Hydrogen Valley

Consortium Meeting

26th June 2025



Hydrogen Valley

Introduction

Arran Williams, Cadent

Welcome

This session will be recorded. The recording and slides will be available after the webinar.

Turn off your microphones unless you are speaking.

Please feel free to comment in the chat.

We will take questions throughout the session. Please type your question into the Q&A function.

Hydrogen Valley

Cadent
Your Gas Network

national gas

Agenda

Introduction and New Member Spotlight	Arran Williams, Cadent	14:00-14:05
Setting the Scene & Cadent Update	Arran Williams, Cadent	14:05-14:15
Communications Update	Amy Taylor, Gemserv	14:15-14:20
Breakout Session		14:20-14:30
National Gas Update	Roger Barnfield, National Gas	14:30-14:40
Progressive Energy	Mike Cairns-Terry, Progressive Energy	14:40-14:55
Ceramics UK	Andrew McDermott, Ceramics UK	14:55-15:10
Carlton Power	Eric Adams, Carlton Power	15:10-15:25
Wrap Up and Questions		15:25-15:30

Upstream
Hydrogen production

equilibrion.
GeoPura
JEPCO
LEVIDIAN
PROGRESSIVE ENERGY
PROTIUM
SEEL
tep TYSELEY ENERGY PARK
New member
Carlton POWER

Midstream
Transportation

HyCymru
WALES&WEST UTILITIES

Public and third sector
Local authorities, higher education, research

UNIVERSITY OF BIRMINGHAM
BIRMINGHAM ENERGY INSTITUTE
Cranfield University
ERA ENERGY RESEARCH ACCELERATOR
Keele UNIVERSITY
MIDLANDS ENGINE
MIDLANDS NET ZERO HUB
North Northamptonshire Council
North Sea Transition Authority
Shropshire Council — Creating a low carbon future for you
Staffordshire County Council
H2 East
New member
Worcestershire Local Enterprise Partnership

Downstream
Hydrogen demand

HOLCIM
Birmingham Airport
BritishSugar
CEMEX
CERAMICS UK SUPPORTING MANUFACTURING
CHURCHILL
Black Country Industrial Cluster
Hill & Smith PLC
Keeling & Walker World Leader in Tin Oxide
New member
avara foods
wienerberger
Palm Paper
RWE
THE COMPLEAT FOOD GROUP

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Setting The Scene

Arran Williams, Cadent

Hydrogen Landscape Updates

- Apr 25: HAR2 projects shortlisted
  - → Electrolytic green hydrogen production.
  - → 27 projects shortlisted across England, Scotland, and Wales
  - → Fantastic to see that 3 of those are in the West Midlands.

Hydrogen Landscape Updates

- Jun 25: Comprehensive Spending Review

  → £500m of funding to support the UKs first regional hydrogen transport and storage network.

  → Funding committed to CCUS projects including the Viking and Acorn cluster which are part of wider hydrogen projects.

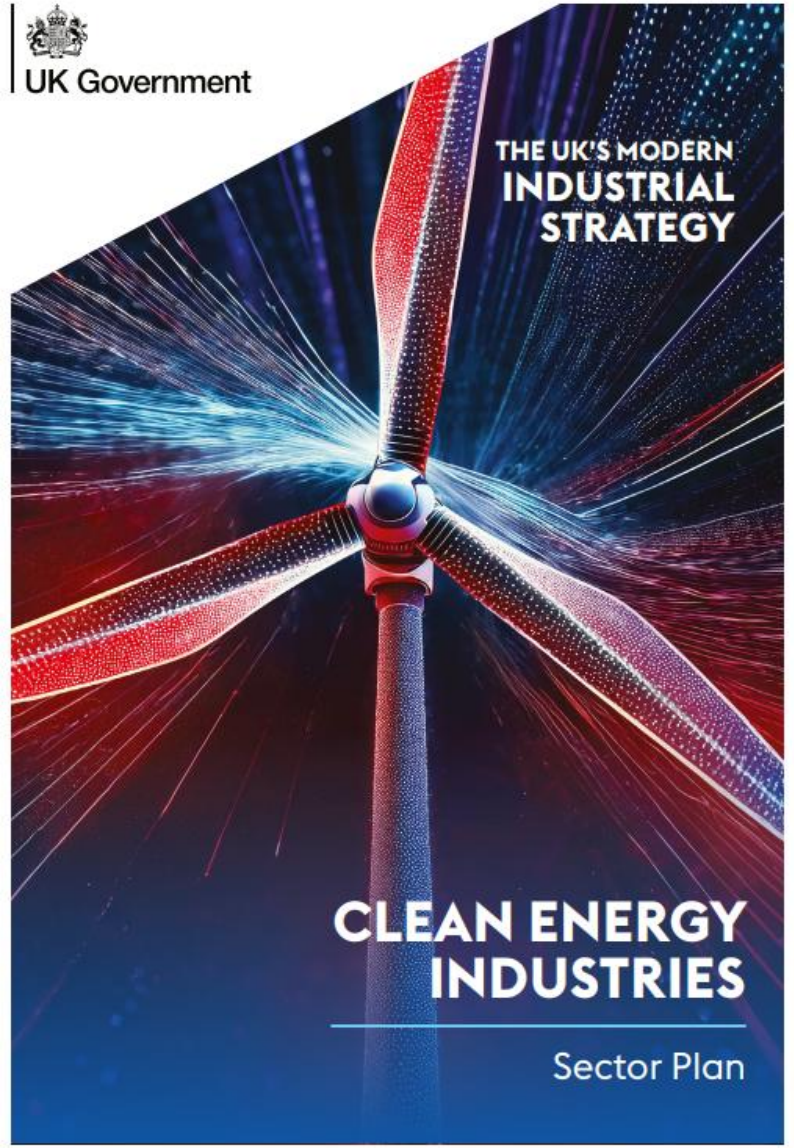
Hydrogen Landscape Updates

- Jun 25: Industrial Strategy

  → Continued Hydrogen Allocation Rounds; HAR3 in 2026, HAR4 from 2028.

  → The first hydrogen transport and storage (HTBM and HSBM) allocation rounds will launch in 2026, and a new Hydrogen to Power business model will also launch in 2026.

  → A revised Hydrogen Strategy to update deployment timelines will be released later this year.



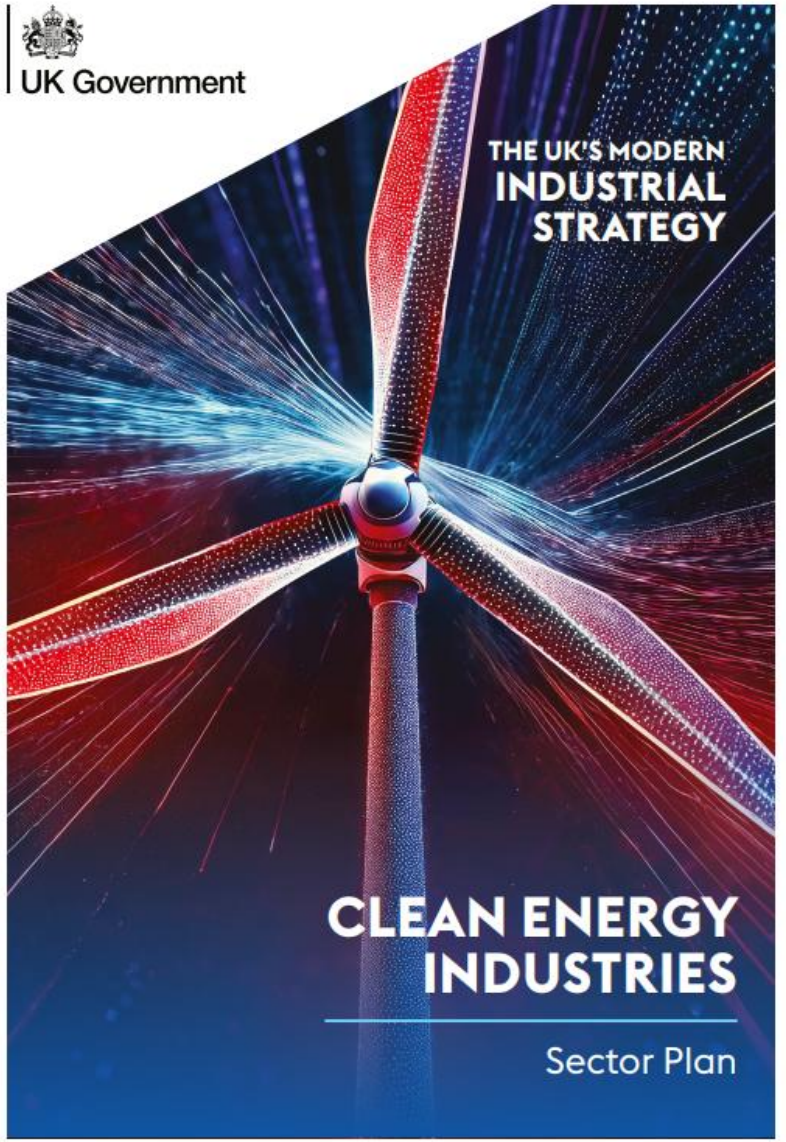
Hydrogen Landscape Updates

- Jun 25-> Industrial Strategy

  → Consultation to extend the Clean Industry Bonus to hydrogen projects.

  → Removal of the Climate Change Levy on electricity for electrolysis from 2026.

  → Assessing the case for hydrogen blending into the existing GB gas distribution and transmission networks. Transmission blending will be consulted on this summer.



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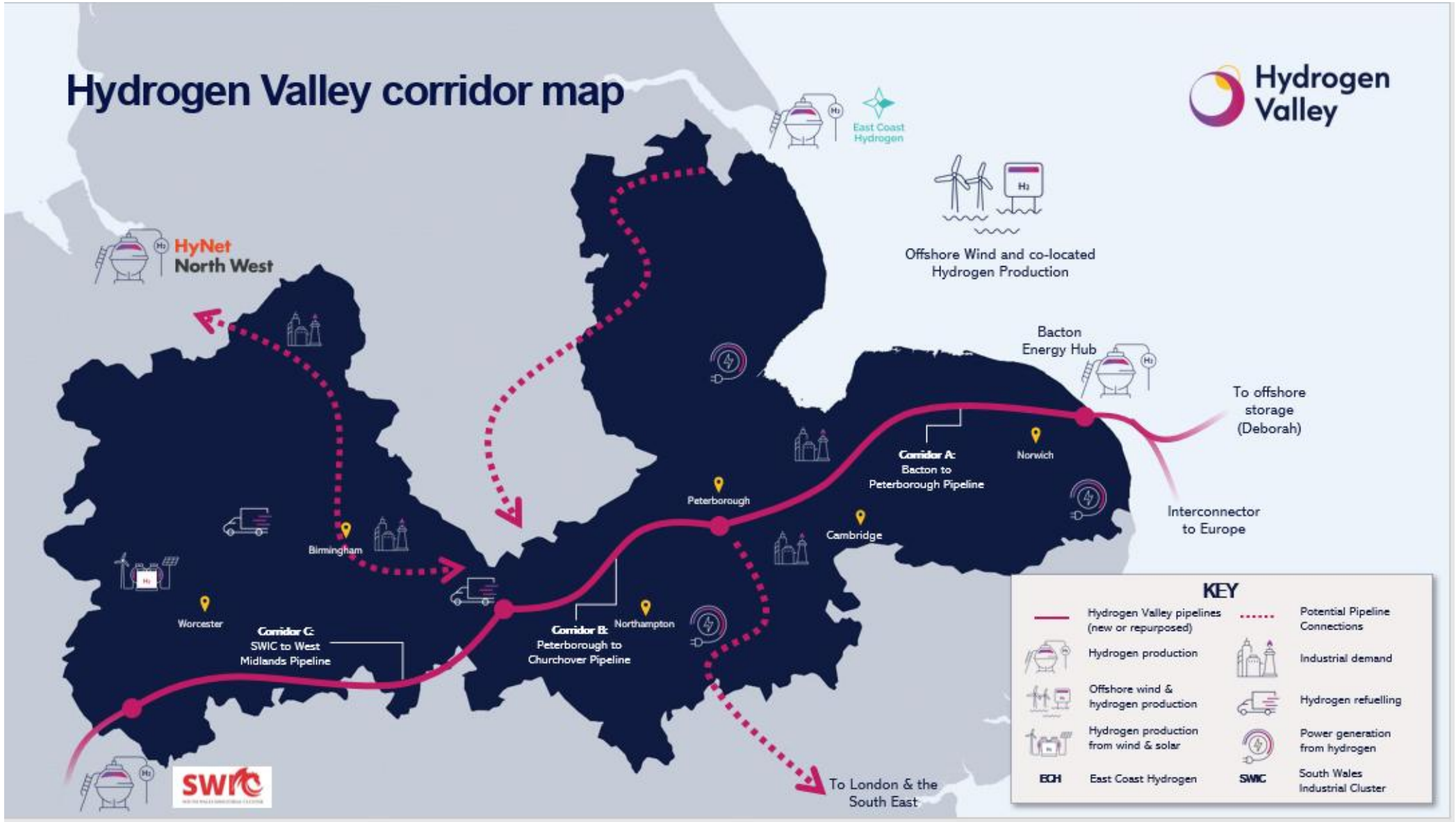
Cadent Update

Arran Williams, Cadent

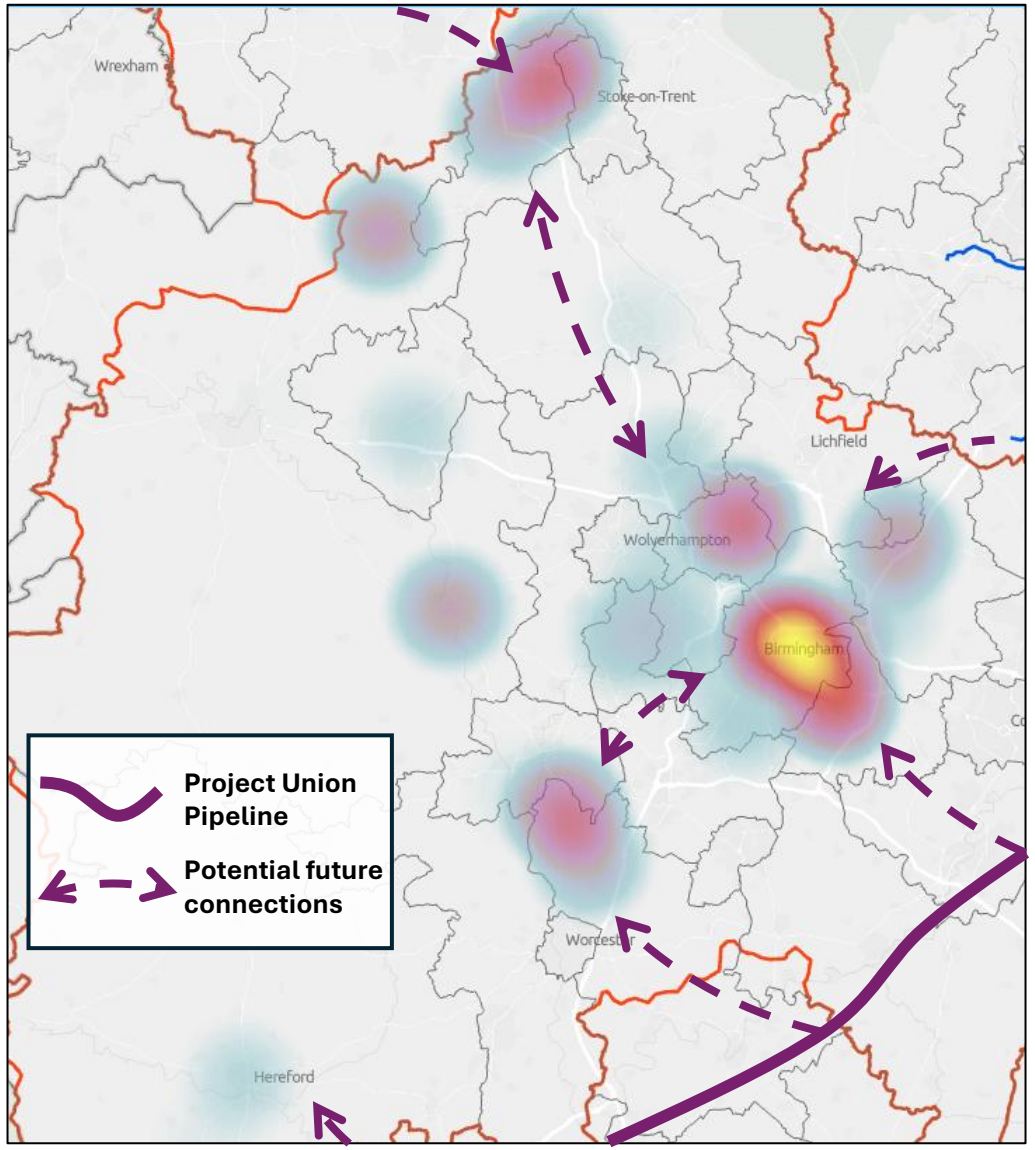

Hydrogen Valley corridor map
Hydrogen Valley
East Coast Hydrogen
Offshore Wind and co-located Hydrogen Production
HyNet North West
Bacton Energy Hub
To offshore storage (Deborah)
Corridor A: Bacton to Peterborough Pipeline
Norwich
Peterborough
Cambridge
Interconnector to Europe
Birmingham
Worcester
Corridor C: SWIC to West Midlands Pipeline
Corridor B: Peterborough to Churchover Pipeline
Northampton
To London & the South East
SWIC
KEY
Hydrogen Valley pipelines (new or repurposed)
Potential Pipeline Connections
Hydrogen production
Industrial demand
Offshore wind & hydrogen production
Hydrogen refuelling
Hydrogen production from wind & solar
Power generation from hydrogen
ECH
East Coast Hydrogen
SWIC
South Wales Industrial Cluster

Demonstrating Industrial Demand

~100 industrial sites considering use of hydrogen as a fuel to decarbonise across the WM.

Represents a wide range of sectors inc. ceramics, automotive, metal, paper, and food & drink.

Emergence of distinct clusters with multiple supply options on the table.



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Communications Update

Amy Taylor, Marketing Executive, Gemserv

LinkedIn and Website

- Launched page on 24th October 2024
- 497 followers (111% increase)
- Average post engagement rate: **11.19%**

Website

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Breakout Session

Breakout Rooms

Small group discussion for 10 minutes

- 4-5 companies per breakout room

Suggested conversation starters

- Name
- Company
- *Is your company currently involved in any hydrogen-related programmes or initiatives?*
- *Is there any additional public or private sector support that could help your organisation to realise any hydrogen programmes or initiatives?*
- *Are there any cross-sector opportunities for collaboration you'd like to explore?*

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National Gas Update

Roger Barnfield, Senior Hydrogen Development Engineer, National Gas

Project Union Update

national gas

June 2025

The National Transmission System (NTS)

The role of gas today:

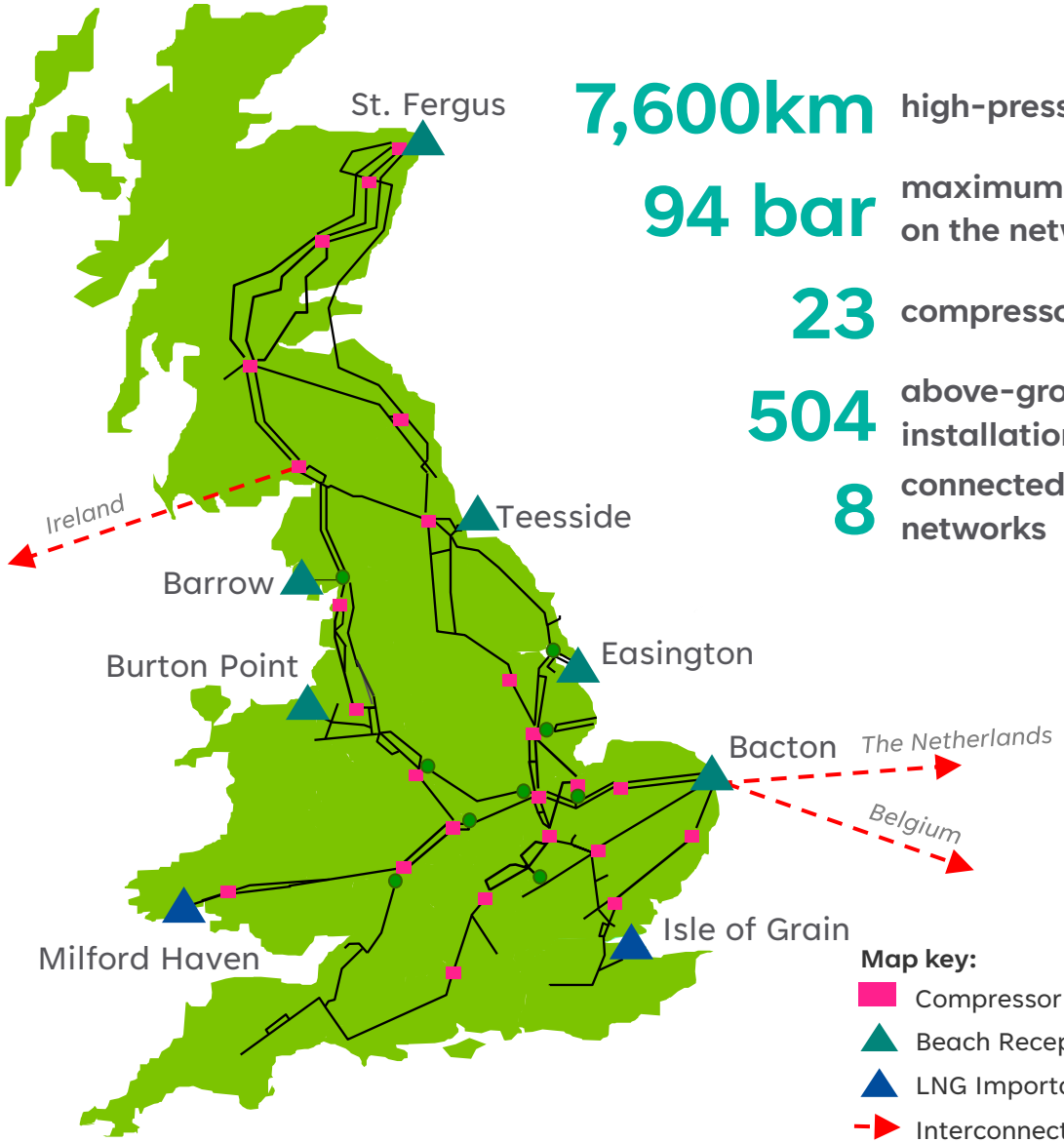
23m
gas customers across the UK

85%
households using gas for heat

881TWh
of energy is delivered by NTS

UK gas demand:

39%	38%	23%
Power Generation	Domestic Use	Industrial & Commercial



7,600km high-pressure pipe

94 bar maximum pressure on the network

23 compressor stations

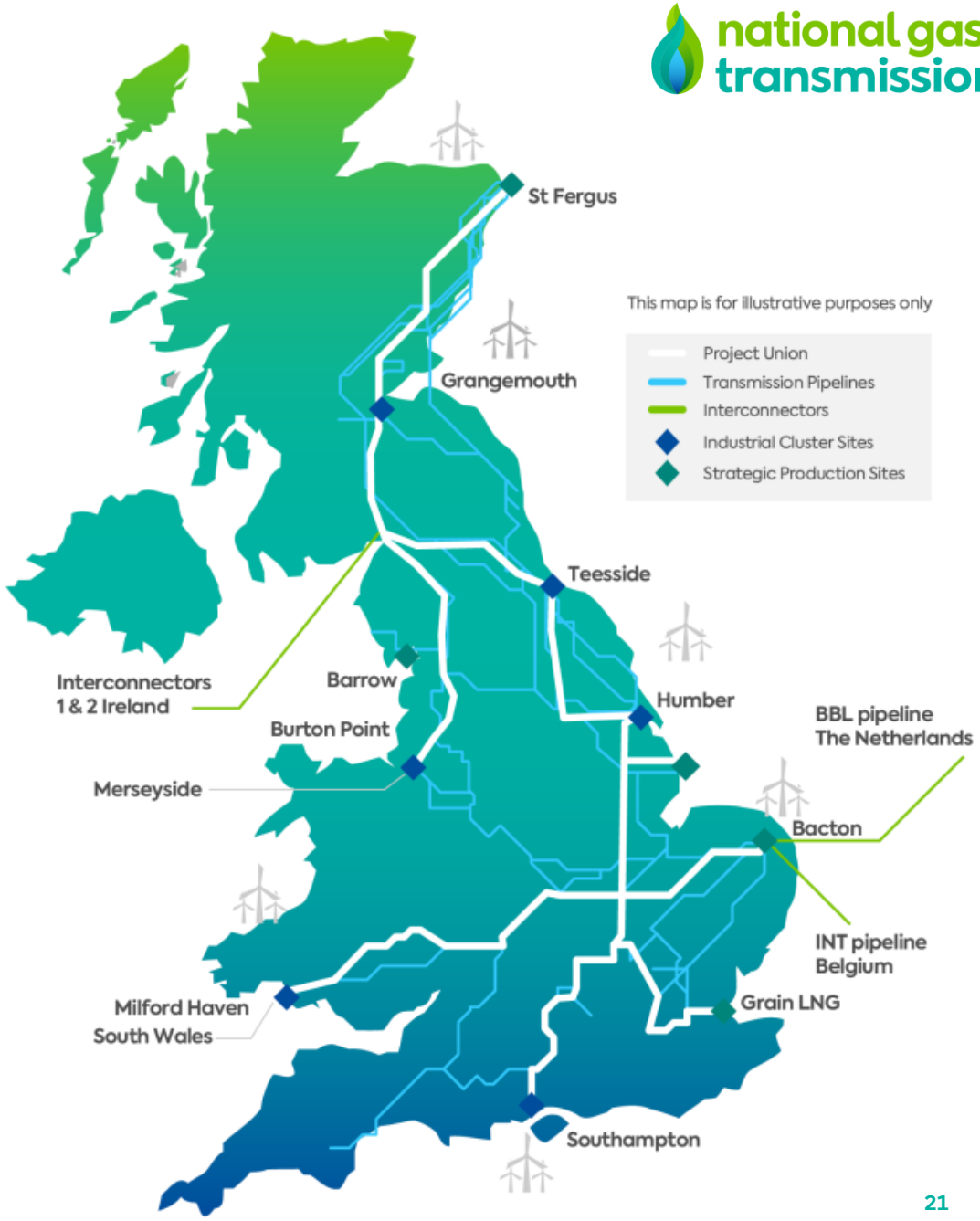
504 above-ground installations

8 connected distribution networks

ProjectUnion

Project Union will connect, enable net zero and empower a UK hydrogen economy, by creating a hydrogen 'backbone' for the UK, transporting 100% hydrogen, by the 2030s.

- ~2,500km hydrogen transmission network
- Connect cross GB supply, demand and strategic storage sites
- Use existing and new infrastructure
- Enable early and affordable market growth of a low carbon hydrogen economy



Project Union Phasing Strategy

1. Full hydrogen value chain established across production, storage and demand
2. Vast renewable energy for green hydrogen production and hydrogen export potential
3. Cluster demand and linking North to South providing access to storage.
4. Large storage potential vital to a hydrogen economy

5. Connection to Europe, import and export opportunities
6. Decarbonising electricity consumption: Currently 7 methane-fired power stations are connected in the region
7. Industrial cluster demand: Black Country Industrial Cluster
8. Industrial cluster demand: The Solent industrial cluster
9. Industrial cluster demand: South Wales Industrial

Project Union Phase 1: East Coast Hydrogen

The build out of Project Union will start in the East Coast region. The East Coast region aims to be a foundation upon which the UK can build its hydrogen economy, delivering decarbonisation, resilience, energy security, and green economic growth. Currently awaiting a funding decision from Ofgem for FEED studies and associated key market enabling activities.

PU: East Coast will deliver significant benefits for the region

27 TWh/year
of power demand connected through direct connects by 2030

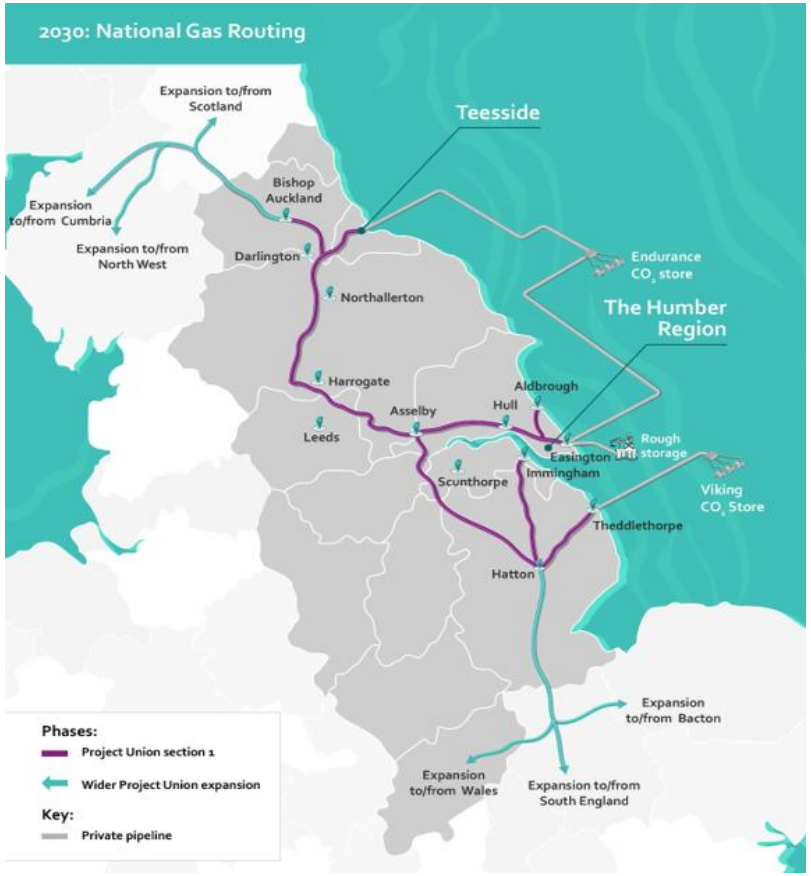
1.3 TWh/year
of industrial demand connected through direct connects by 2030

11.4 TWh/year
supported for NGN to connect to by 2030

Up to 330km
of repurposed natural gas pipelines reducing new infrastructure required

3.6 TWh
of potential hydrogen storage capacity connected from Rough Gas Reservoir and Aldbrough by 2030

5 $MtCO_2$/year
saved through fuel switching from natural gas by 2030



Network configuration is indicative and subject to change

Thank you

You can find out more and get in touch:

hydrogen@nationalgas.com

nationalgas.com

National Gas Transmission

national gas transmission

Hydrogen Valley

Progressive Energy – Hydrogen Producer

Mike Cairns-Terry, Principal Engineer, Progressive Energy

Progressive Energy

Demonstrating hydrogen in industry

Mike Cairns-Terry

Hydrogen Valley Consortium Meeting

Progressive Energy

- A low carbon energy project development company formed in 1998
- Focused on decarbonising industrial and power sectors using low carbon hydrogen and CCS
- Originator and lead developer on multiple industrial decarbonisation projects, including HyNet

HyNet North West

HyNet IFS Industrial Fuel Switching

HyNet infrastructure

Underground pipeline network to transport CO_2 emissions to permanent storage

Facilities to capture CO_2 emissions

Underground storage for hydrogen to be stored ready for use

Underground pipeline network to transport hydrogen from production to storage and use

Low-carbon hydrogen production plants

CCS-enabled hydrogen production

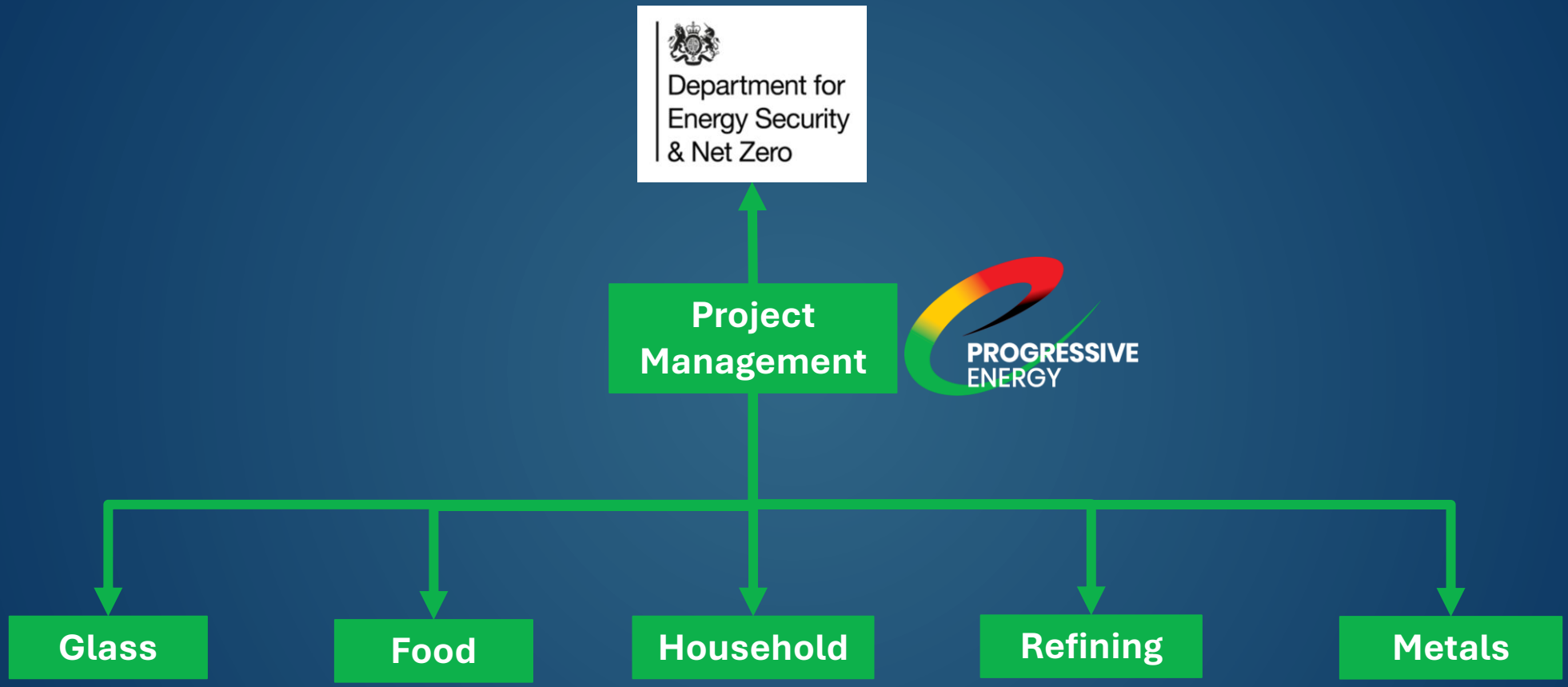
- 350MW HPP1 plant
  - Government funding announced October 2024
  - EPC contract signed
  - To be followed by 1000MW HPP2 plant
- Together, sufficient hydrogen to power Liverpool

Nearly £22bn pledged for carbon capture projects

DARREN STAPLES/PA

The prime minister made the announcement on a visit to to the North West with Rachel Reeves and Ed Milliband

Industrial Fuel Switching



PILKINGTON

Kellanova

Unilever

ESSAR

Novelis

HyNet

Fuel Switching questions

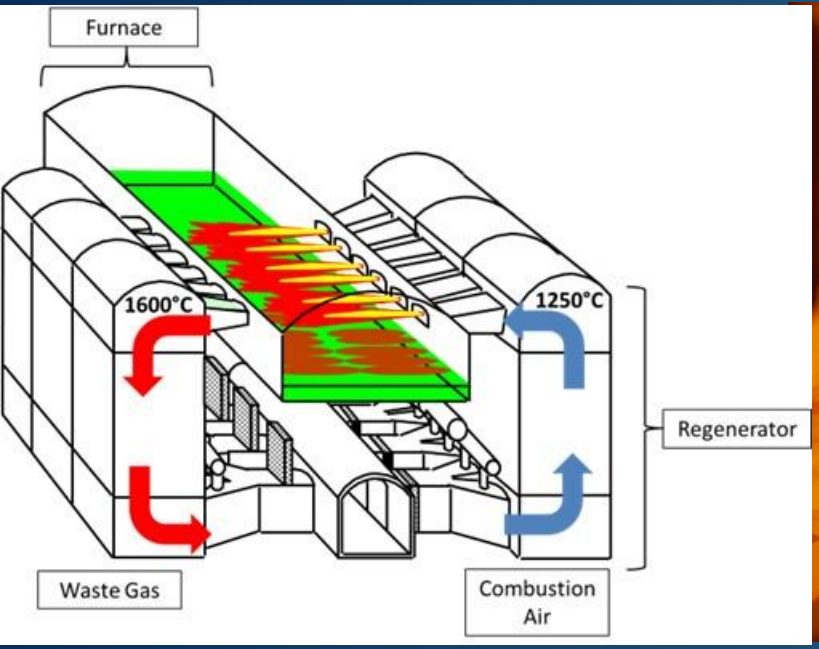
	User requirement	Addressed by
Technical feasibility	Product quality	IFS programme
	Regulatory compliance inc. NOx	
	Safety	
	Equipment longevity	
Commercial feasibility	Conversion costs	
	Security of supply	
	Low-carbon credentials	LCHS
	Competitive fuel cost/efficiency	LCHA/IFS programme

HyNet IFS aim: to enable participating and wider sites to switch to hydrogen as soon as it is available

Technical feasibility

- Each criteria was assessed during feasibility work
- Demonstrations designed to:
- address specific concerns
- validate feasibility work
- gather operational data on efficiency and NOx
- develop commercial operating methodologies

Live hydrogen use: Glass industry



PILKINGTON

Conclusion: hydrogen is a suitable fuel for use in its float glass furnace, once available from HyNet

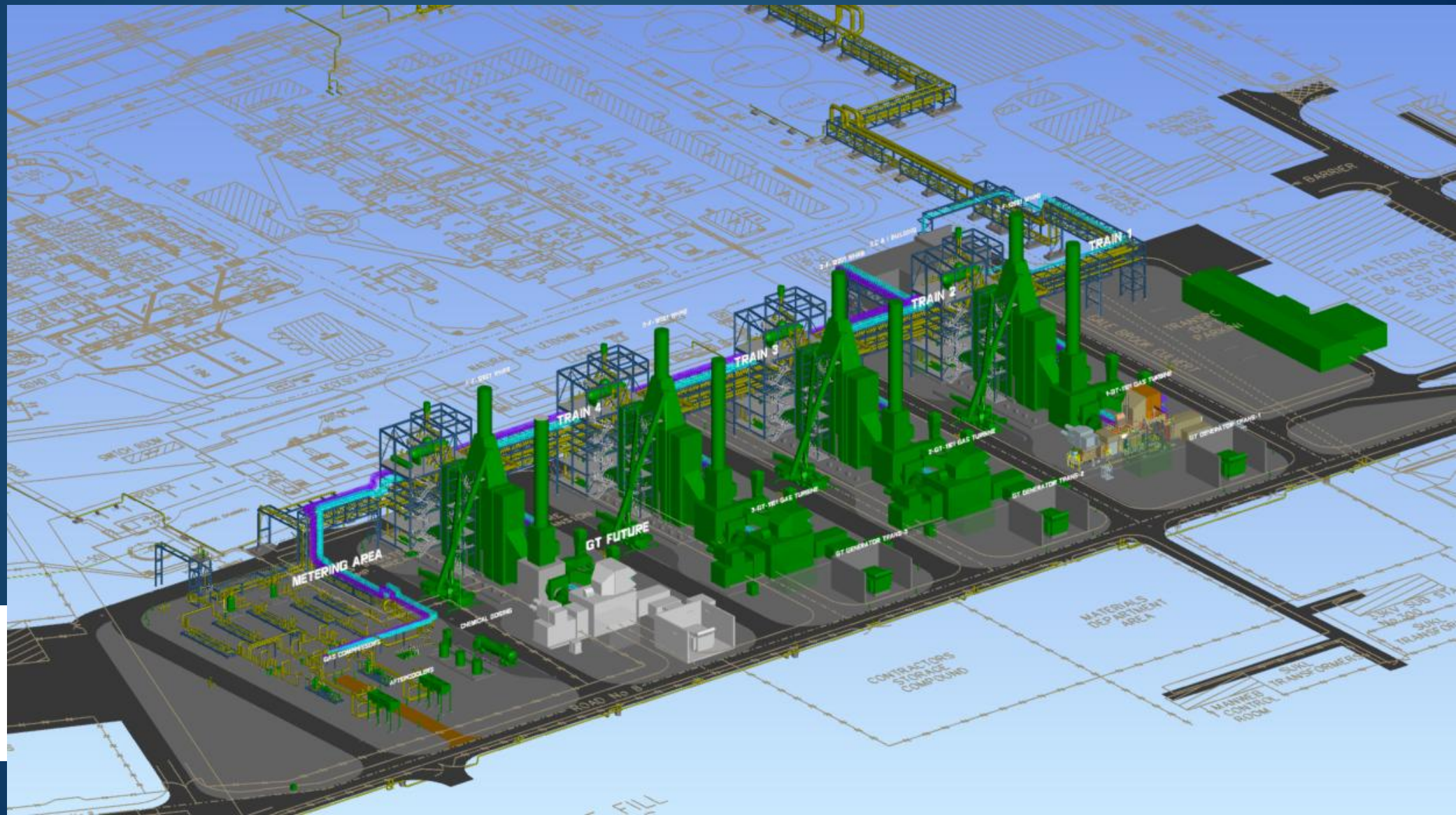
Live hydrogen use: Package boilers

Hydrogen met site steam load reliably over several weeks, evidencing suitability in package boilers

FEED study: Hydrogen CHP

PROGRESSIVE ENERGY

ESSAR



Live hydrogen use: Metals industry

Hundreds of tonnes of aluminium melted using hydrogen, product quality maintained

Live hydrogen use: Food production

Hydrogen-fuelled production of Kellanova's core cereal product groups, achieving quality benchmarks

Conclusions to date

- Safe hydrogen use can be accomplished using existing engineering design practices and standards
- Hydrogen is a suitable replacement for natural gas in all applications investigated to date; much of the learning is transferable between industries
- External expertise is available to assist resource-constrained site teams unfamiliar with hydrogen

Thank You

Mike Cairns-Terry

mike.ct@progressive-energy.com

www.progressive-energy.com

Hydrogen Valley

Ceramics UK– End-User

Andrew McDermott, Deputy Chief Executive, Ceramics UK

Hydrogen Valley Consortium Meeting,

Thursday 26th June 2025

Firing the Future: Revolutionising Ceramics Firing with Hydrogen

Dr Andrew McDermott

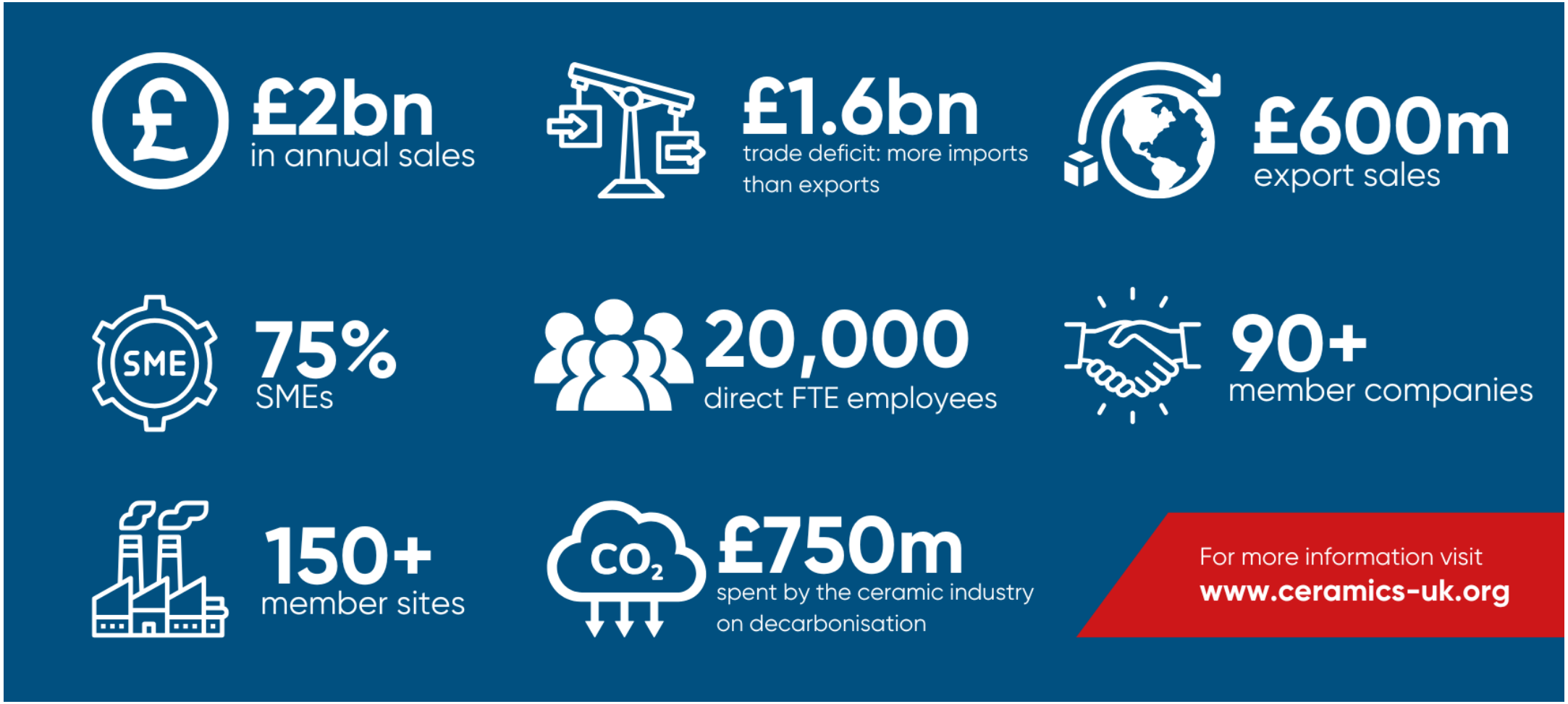
Deputy Chief Executive

andrewm@ceramics-uk.org, 07833 059 661

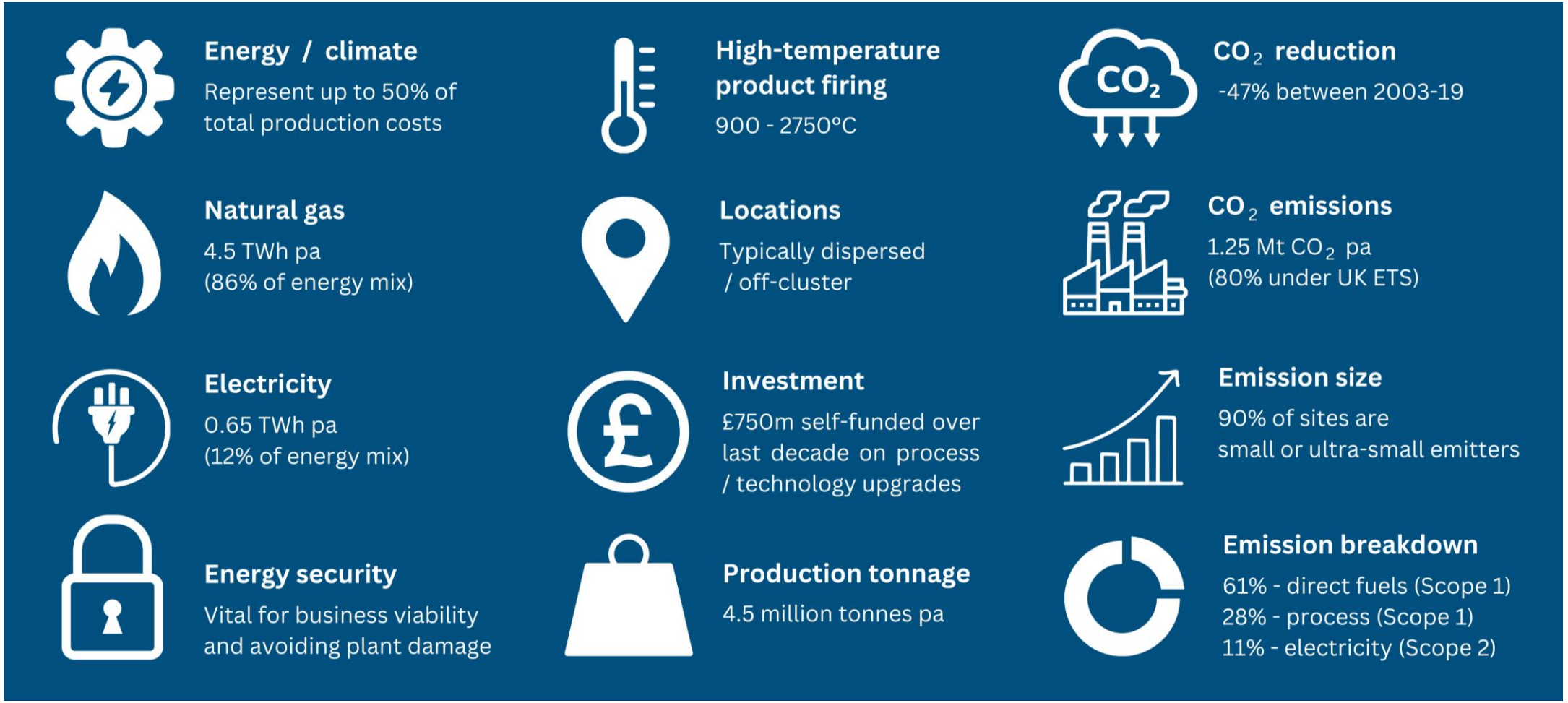
Presentation Agenda

1. **UK Ceramics Sector**
   Sector overview, emissions and hydrogen's CO_2 reduction potential
2. **Hydrogen Project Phase 1 (H2P1)**
   Scope, key insights and lessons
3. **Hydrogen Project Phase 2 (H2P2)**
   Scope, progress and next steps
4. **Conclusions**
   Key takeaways and implications for the sector
5. **Q&A**
   Audience questions

1. UK Ceramics - Facts and Figures



1. UK Ceramics - Key Energy and Climate Figures



1. UK Ceramics - Properties, Products and Applications

General Properties

Strength
Hardness
Durability
High-temp Stability
Low Thermal Conductivity
Chemical Inertness
Wear Resistance
Electrical Insulation
Biocompatibility

Products

Clay Construction Products
Tableware & Giftware
Sanitaryware
Wall & Floor Tiles
Refractories
Technical Ceramics
Material Suppliers
Equipment Suppliers

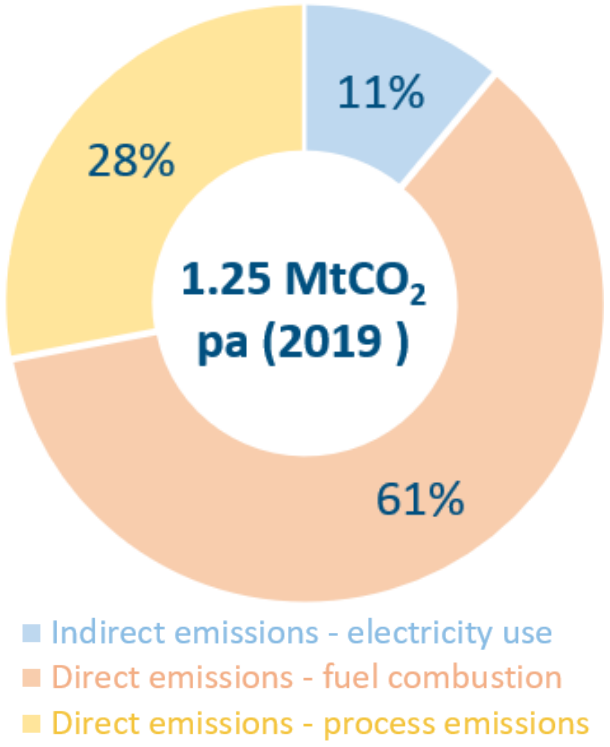
Applications

Aerospace
Automotive
Construction & Housing
Consumer Goods
Defence & Security
Electronics
Energy
Healthcare
Industrial Processes

Used in everything from toilets to turbines to teeth!

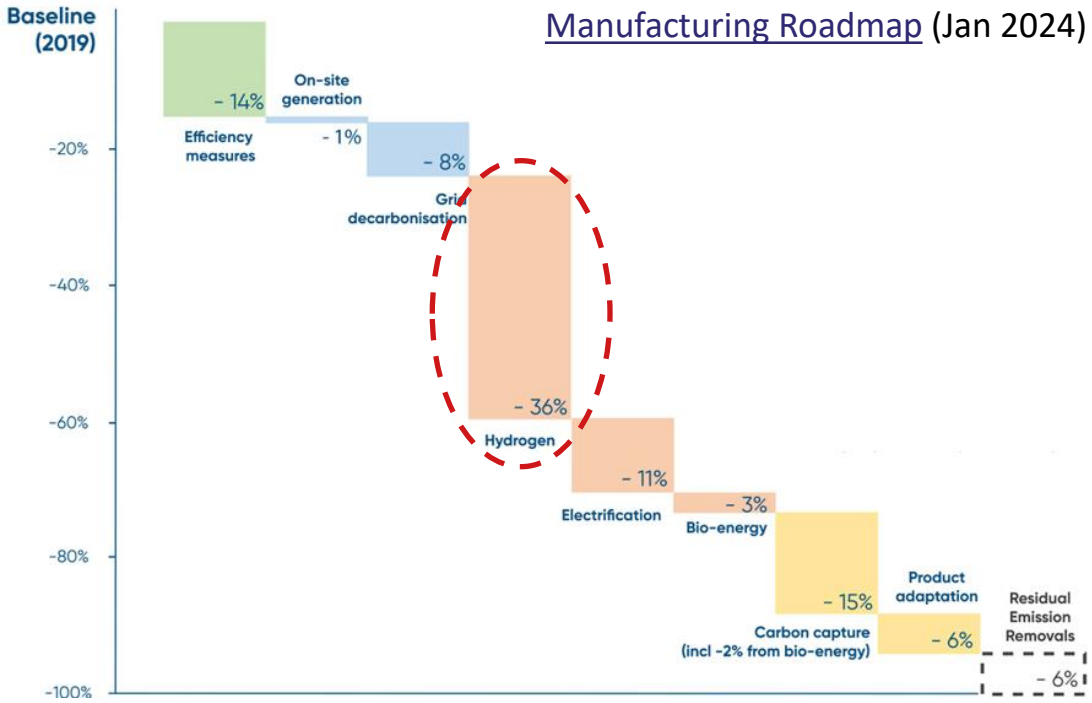
1. UK Ceramics - Emissions and Decarbonisation Technologies

UK Ceramics Scope 1 and 2 Emissions



2050 Decarbonisation Technologies

Source: Ceramics UK Decarbonising UK Ceramic Manufacturing Roadmap (Jan 2024)



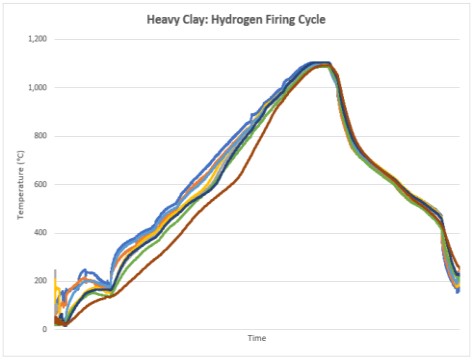
H_2 firing could cut sector CO_2 by ~ 36% (~450 $ktCO_2$ pa), subject to cost + availability.

2. Hydrogen Project Phase 1 (H2P1)

- Overview:
  - BEIS-funded IFS project (~£300k, 6-month feasibility study).
  - Delivered Q2-3 2022.

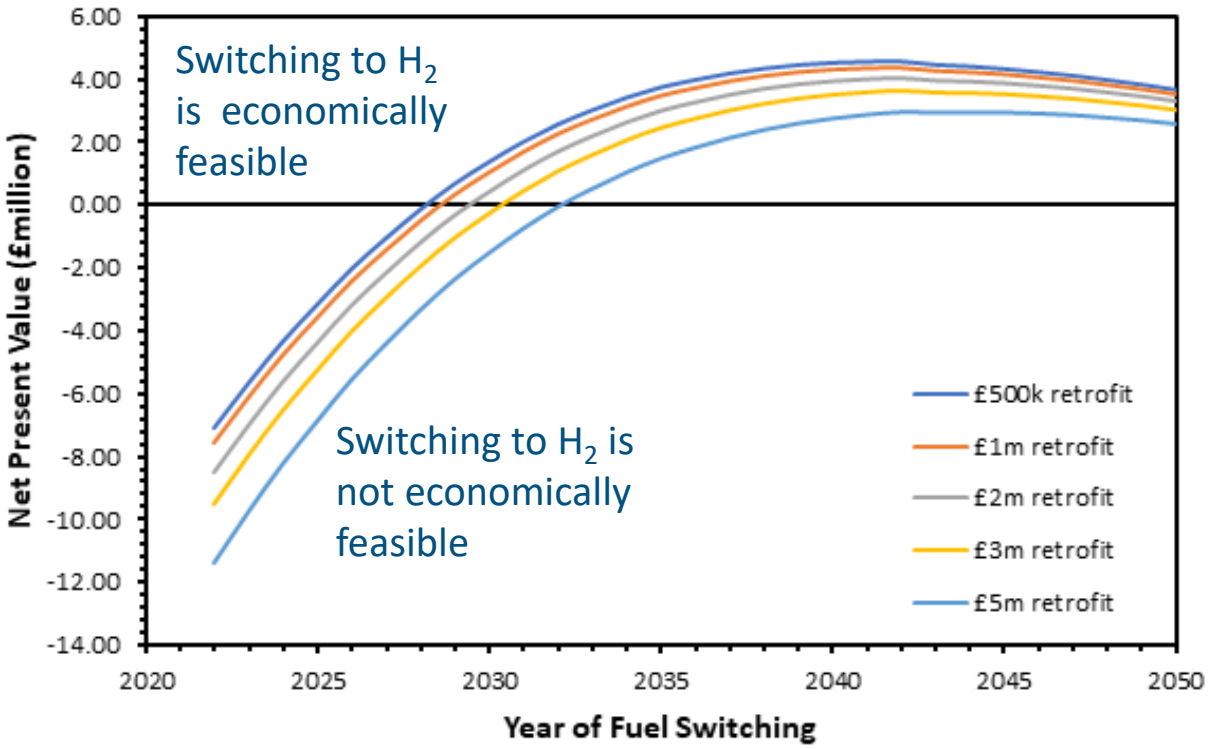
- Objectives:
  1. Review global research on hydrogen-firing in ceramics.
  2. Demonstrate 100% hydrogen firing of ceramics on a modified glass-sector pilot rig.
  3. Design a custom pilot kiln for future hydrogen trials.
  4. Complete pre-FEED studies for retrofitting production kilns.
  5. Apply glass-sector techno-economic model to assess hydrogen conversion costs in ceramics.

2. Hydrogen Project Phase 1 (H2P1)



Pioneering firings (June 2022) – likely a world first – demonstrated various ceramics can be fired with 100% H_2 without affecting product quality.

2. Hydrogen Project Phase 1 (H2P1)



Model suggests H_2 firing could be cost-effective by 2030s and optimal by 2040s.

- More Info:
  - H2P1 YouTube video, Glass Futures, Aug 2022.
  - H2P1 Final Report - Hydrogen for the Ceramics Sector, BCC, Jun 2023.

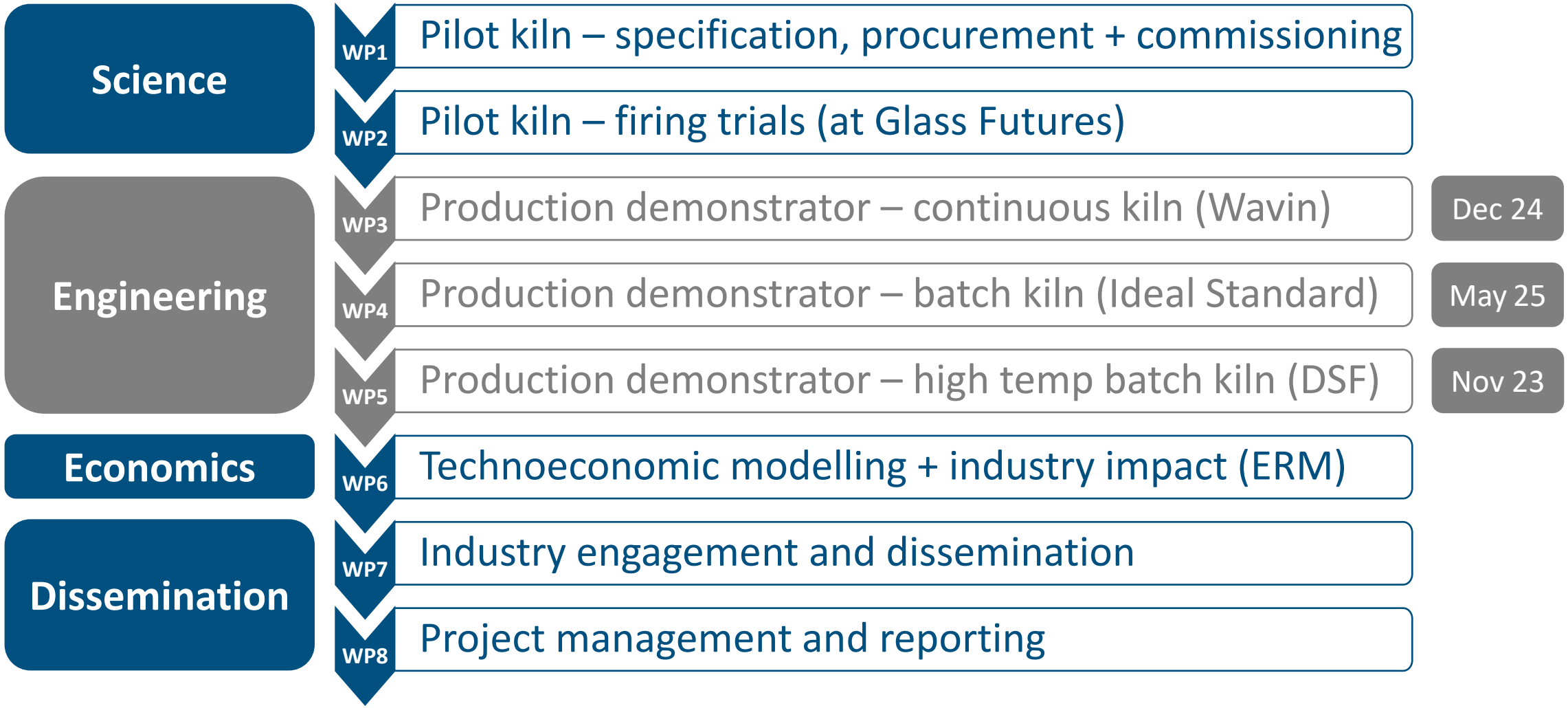
3. Hydrogen Project Phase 2 (H2P2) - Introduction

- DESNZ-funded IFS Project (~£6m, 2-year demonstration study).
- Phase 2 (H2P2) builds on H2P1, expanding efforts to demonstrate the technical and economic viability of hydrogen-firing ceramics via four key workstreams:

Science	Design, build, install, and operate a bespoke pilot kiln to evaluate hydrogen-firing across various ceramic types and firing conditions.
Engineering	Retrofit existing methane-fired, production-scale kilns to run on hydrogen, demonstrating real-world adaptability.
Economics	Adapt and refine an existing technoeconomic model (developed for glass) to estimate the capital and operational costs of switching to hydrogen.
Dissemination	Share findings across ceramics and other sectors, both in the UK and internationally, to accelerate knowledge transfer and uptake.

3. Hydrogen Project Phase 2 (H2P2) - Consortium Partners

3. Hydrogen Project Phase 2 (H2P2) - Work Package Structure



3. Hydrogen Project Phase 2 (H2P2) – WP1 (Jun 2025)

Delivery (May 2024)

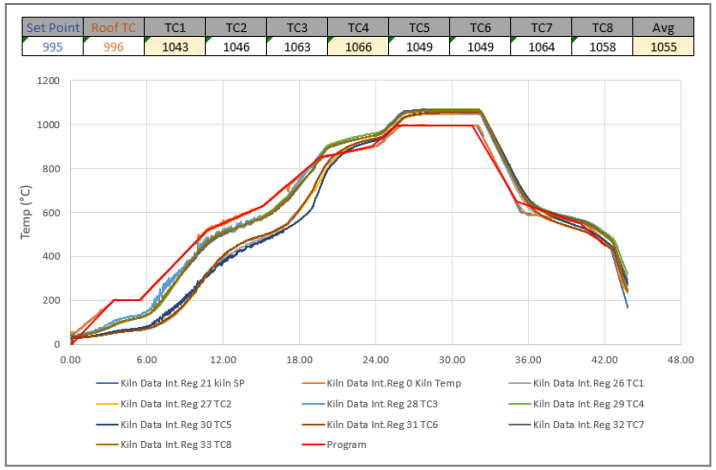
Installation (Jul 2024)

First methane trial (Sep 2024)

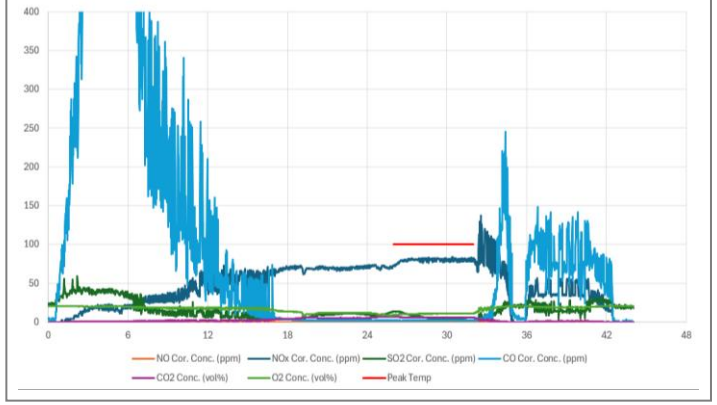
- Pilot kiln (4m^3, 2.2 tonnes, 1500°C max) specified, built, delivered, installed and commissioned (on methane, hydrogen and blends).
- Reduction firing commissioning intentionally deferred to end of project.

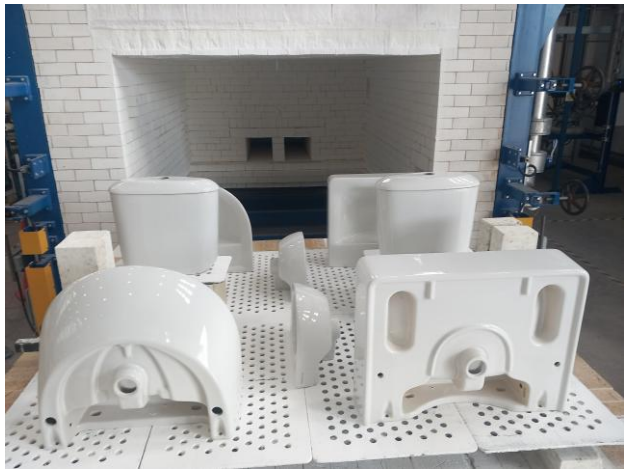
3. Hydrogen Project Phase 2 (H2P2) – WP2 (Jun 2025)

Set Point	Roof TC	TC1	TC2	TC3	TC4	TC5	TC6	TC7	TC8	Avg
995	996	1043	1046	1063	1066	1049	1049	1064	1058	1055



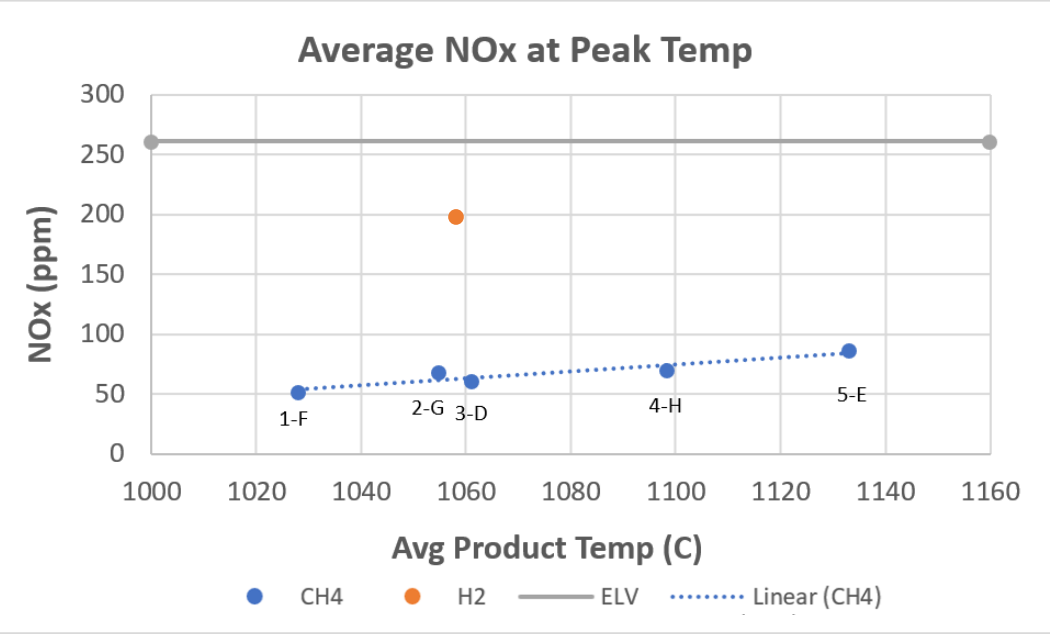
NO (ppm)	NOx (ppm)	SO2 (ppm)	CO (ppm)	CO2 (vol%)	O2 (vol%)
-	79.8	6.2	2.1	6.0	10.7

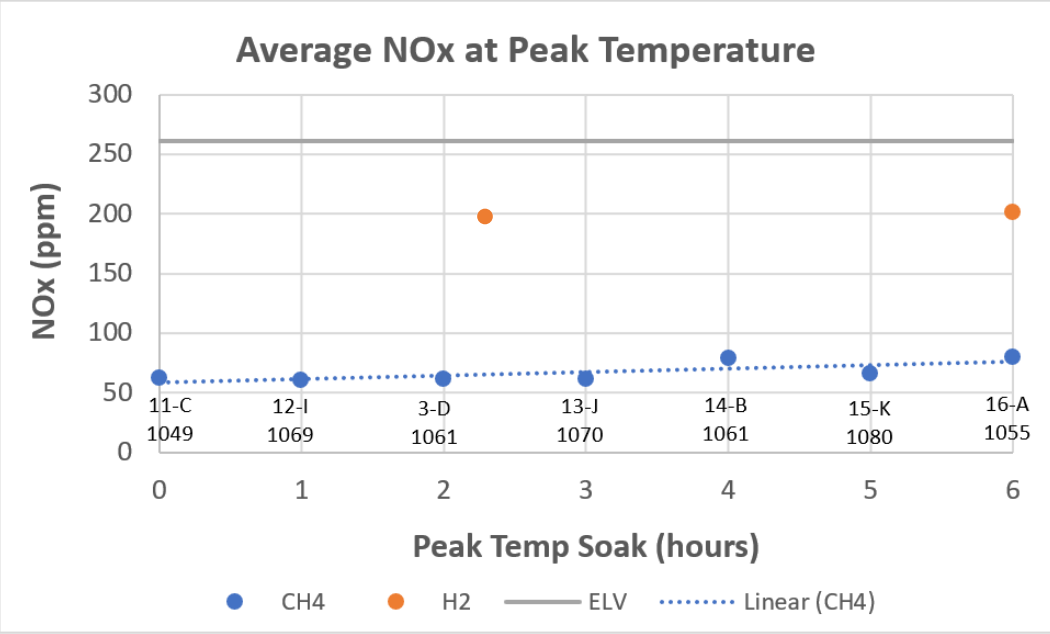




- WP2B: Firing of two Wienerberger brick bodies under varied conditions - peak temps, dwell times, fuel blends, and atmospheres.
- WP2C: Products from a range of industrial partners being fired.
- Targeting completion of firings by end of July.

3. Hydrogen Project Phase 2 (H2P2) – WP2 (Jun 2025)





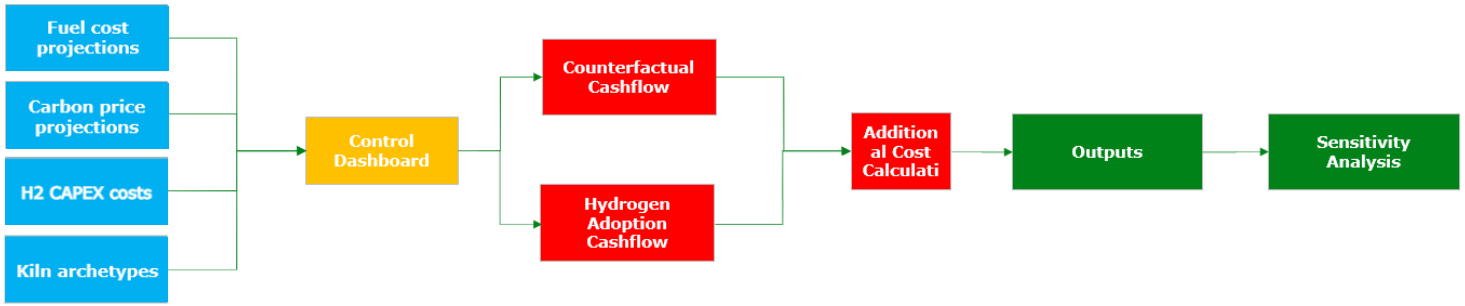
- Higher peak temp - slight NO_x rise.

- Longer soak time - minimal NO_x impact.
- Hydrogen firing - NO_x ~ 2.5x higher).

3. Hydrogen Project Phase 2 (H2P2) – WPs 3 and 4 (Jun 2025)

- WP3 (Wavin):
  - Continuous kiln - clay drainage pipes.
  - Hydrogen firing two zones was planned.
  - FEED, P&ID and HAZOP studies completed.
  - Burner modifications required.
- WP4 (Ideal Standard):
  - Batch kiln - sanitaryware.
  - Hydrogen firing kiln twice was planned.
  - FEED, P&ID and HAZOP studies completed.
  - New burners required.

3. Hydrogen Project Phase 2 (H2P2) – WP6 (Jun 2025)



- Model runs for 5 sector archetypes:

Sector	Kiln type	Atmosphere
Heavy clay	Continuous	Oxidative
Heavy clay	Continuous	Reductive
Whiteware	Batch	Oxidative
Refractories	Batch	Oxidative
Technical ceramics	Batch	Oxidative

- Also running for each industrial partner.

4. Conclusions

- Hydrogen's CO_2 Reduction Potential:
  - H_2 firing could cut UK ceramic sector CO_2 by ~36% (~450,000 tCO_2e / year).
- H2P1 Success (2022):
  - Successfully fired various ceramics with 100% H_2, with no loss in product quality.
- H2P2 Progress:
  - Pilot kiln commissioned; trials now well advanced. Early results show higher NO_x, but indistinguishable product performance.
  - Retrofitting of production kilns won't now proceed, but key insights gained from two detailed site studies (HAZOPs completed).
  - Technoeconomic model developed and in use.
- Target Completion: Q3 2025.

5. Questions

CERAMICS UK
SUPPORTING MANUFACTURING

ceramics-uk.org

Ceramics UK
Commerce House
ST1 5BE

Follow us on social:

Hydrogen Valley

Carlton Power – Hydrogen Producer

Eric Adams, Hydrogen Projects Director, Carlton Power

Carlton Power

Harnessing Hydrogen for a Sustainable Future

Eric Adams: eadams@carltonpower.co.uk

Green Hydrogen Market Leader

Carlton Power

- Founded in 1995
- Proven track record with over 3.5GW of thermal and renewable generation projects delivered and operational, including: Enfield, Langage, and Carrington CCGT's which have a combined capacity of 2.2GW and a capital cost of over £1bn.
- Expertise in:
  - Early-stage development of complex nationally significant projects and diverse, multi-site portfolios.
  - Construction and operations management, trading and optimization of large power generation portfolios.
  - Equity and Debt financing of development and construction.

Hydrogen Development

- Three highly mature projects awarded contracts in the first subsidy allocation round for green hydrogen (HAR1).
- Two further projects shortlisted in the second subsidy allocation round for green hydrogen (HAR2)
- Focus on large industrial gas users with low barrier to making dual-fuel switch.
- GHECO JV established to deliver projects: https://www.h2-view.com/story/green-hydrogen-project-portfolio-gheco-established-by-carlton-power-and-schroders-greencoat/

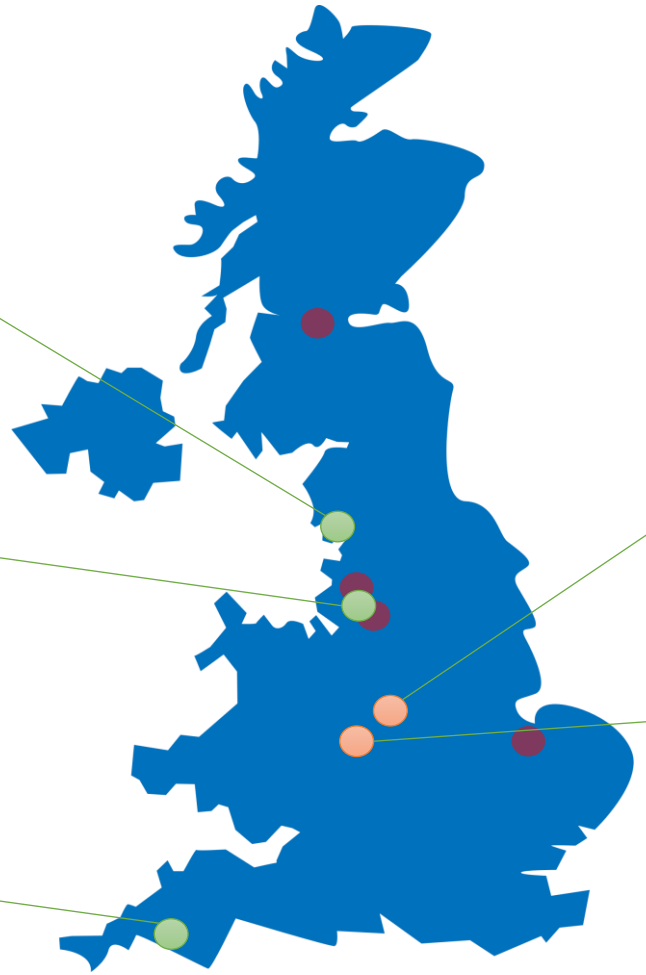
TRAFFORD GREEN HYDROGEN
LANGAGE GREEN HYDROGEN
BARROW GREEN HYDROGEN
HARTLEBURY GREEN HYDROGEN
WALSALL GREEN HYDROGEN

Carlton Power Portfolio

BARROW
GREEN HYDROGEN

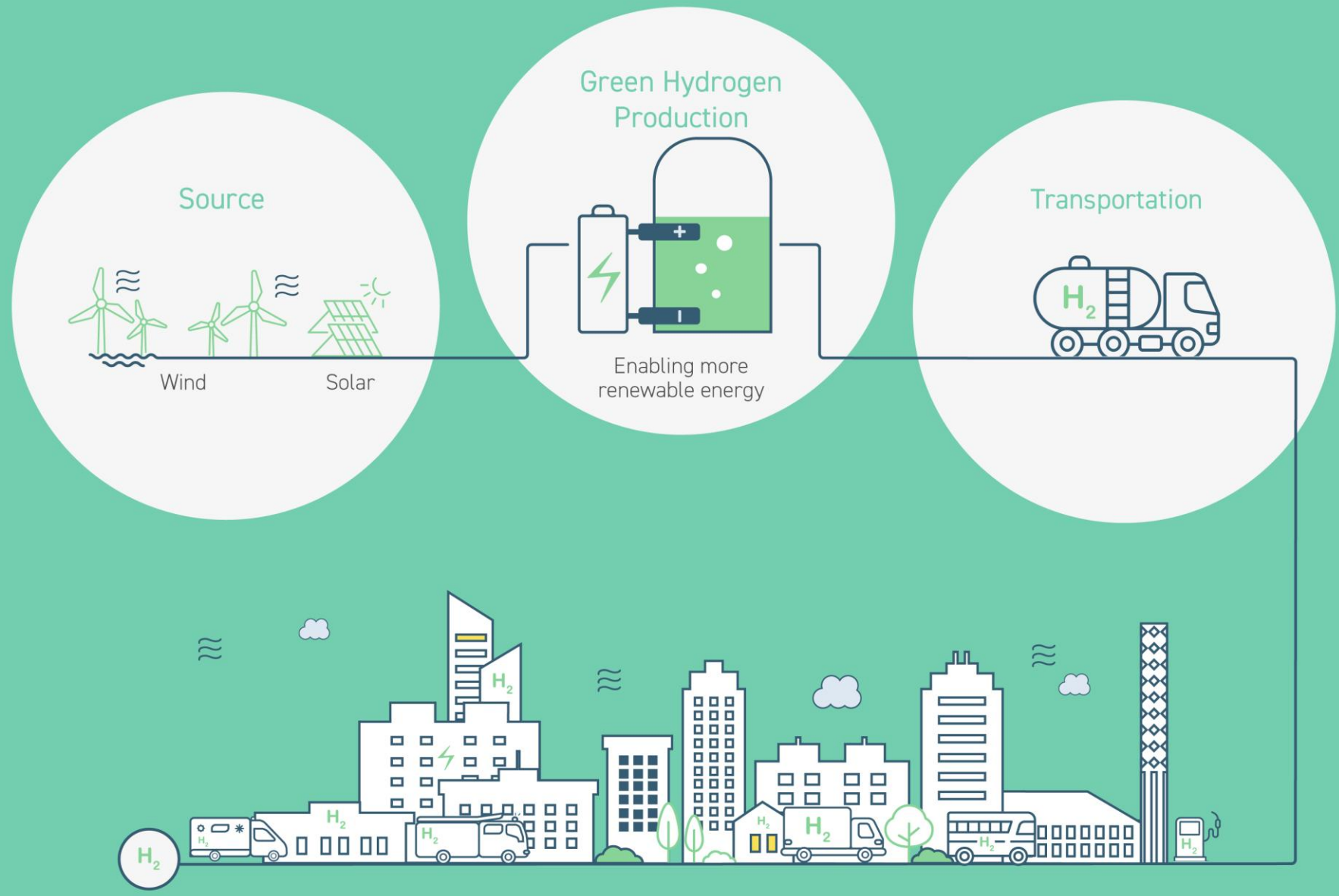
TRAFFORD
GREEN HYDROGEN

LANGAGE
GREEN HYDROGEN



WALSALL
GREEN HYDROGEN

HARTLEBURY
GREEN HYDROGEN


Source
Wind
Solar
Green Hydrogen Production
Enabling more renewable energy
Transportation
H2

TRAFFORD GREEN HYDROGEN

Carlton POWER

Summary

- Initial 15 MW project with offtaker committed to take 100% of hydrogen produced
- Future expansion to 200MW with offtakers engaged
- Grid Connection and Land secured
- Planning for Hydrogen Production Facility granted
- Planning for Hydrogen Pipeline granted
- 11,700 tonnes CO_2 emissions avoided
- Future connection to gas network at Partington
- MoU with Greater Manchester Combined Authority, Trafford Council, Cadent Gas, Electricity North West and Manchester Metropolitan University
- https://www.traffordgreenhydrogen.co.uk/

electricity north west
TRAFFORD COUNCIL
GMCA GREATER MANCHESTER COMBINED AUTHORITY
Manchester Metropolitan University
Cadent Your Gas Network

BARROW GREEN HYDROGEN

Carlton POWER

Summary

- 30MW plant underpinned by large multinational anchor offtaker, Kimberly Clark, who are committed to taking 100% of the hydrogen initially produced.
- Growth potential for up to 200MW with known offtakers engaged.
- Grid connection and land rights secured
- Planning permission for Hydrogen Production Facility granted
- Planning permission for Hydrogen Pipeline granted
- 23,400 tonnes CO_2 emissions avoided
- MoU with Cadent Gas, Electricity North West and Cumbria Local Enterprise Partnership and Barrow Borough Council
- https://www.barrowgreenhydrogen.co.uk/

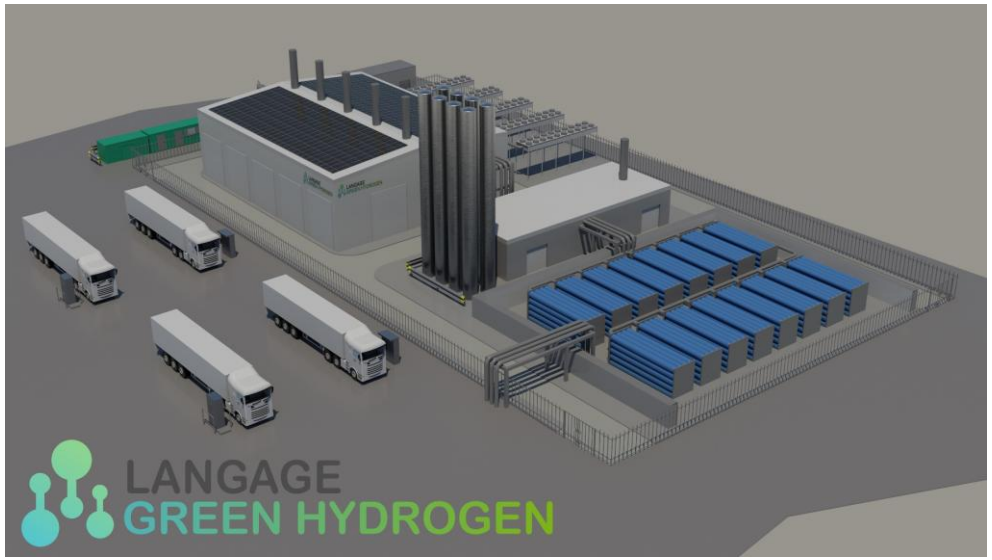
electricity north west

CLEP

Cadent
Your Gas Network

LANGAGE GREEN HYDROGEN

Carlton POWER



Summary

- Initial 10MW project intended to supply several industrial sites requiring gas for high-heat processes
- Future expansion to 50MW
- Grid connection and land secured
- Planning permission for Hydrogen Production Facility granted
- Tanker supply
- 6,500 tonnes CO_2 emissions avoided
- Up to 10% of electricity generated by CP owned Langage Solar Park
- https://www.langagegreenhydrogen.co.uk/

heart of the south west local enterprise partnership

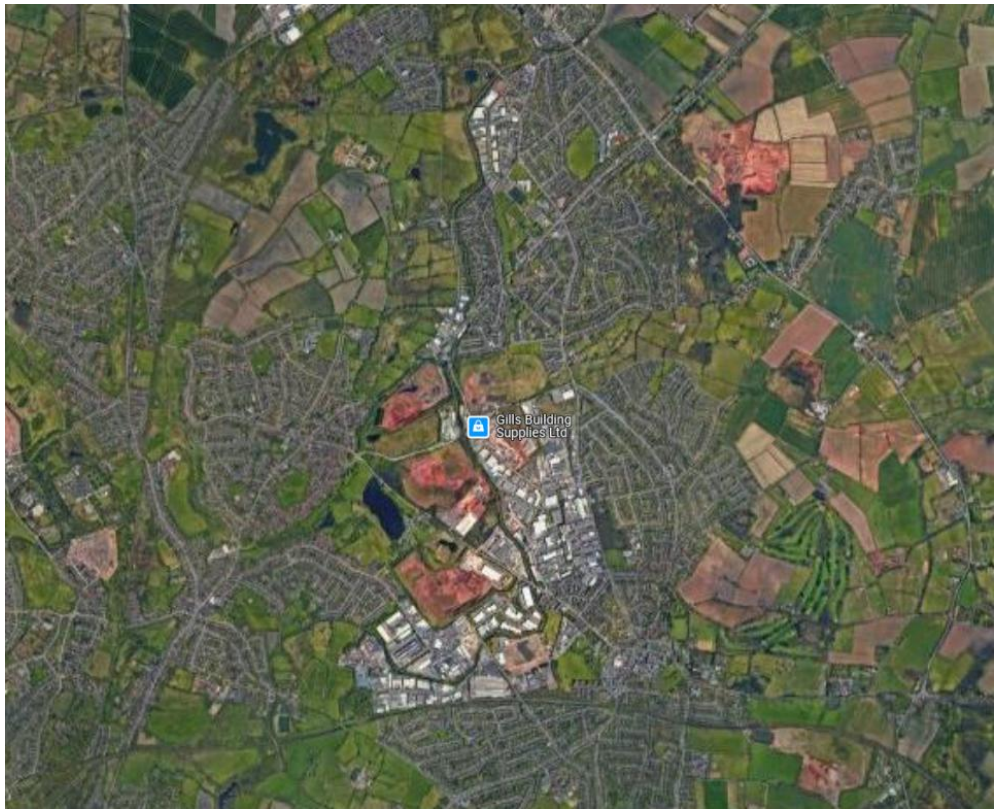
South Hams District Council

PLYMOUTH CITY COUNCIL

Devon County Council

WALSALL GREEN HYDROGEN

Carlton POWER



Summary

- Initial 25MW project underpinned by multiple offtakers in ceramics industry
- Difficult to decarbonise industries.
- Future expansion up to 50MW
- Land secured, planning in progress.
- 19,500 tonnes CO_2 emissions avoided
- Direct pipeline supply.
- Secondary offtakers engaged to rapidly expand scale via pipelines.
- Grid connection secured
- HAR2 Shortlisted

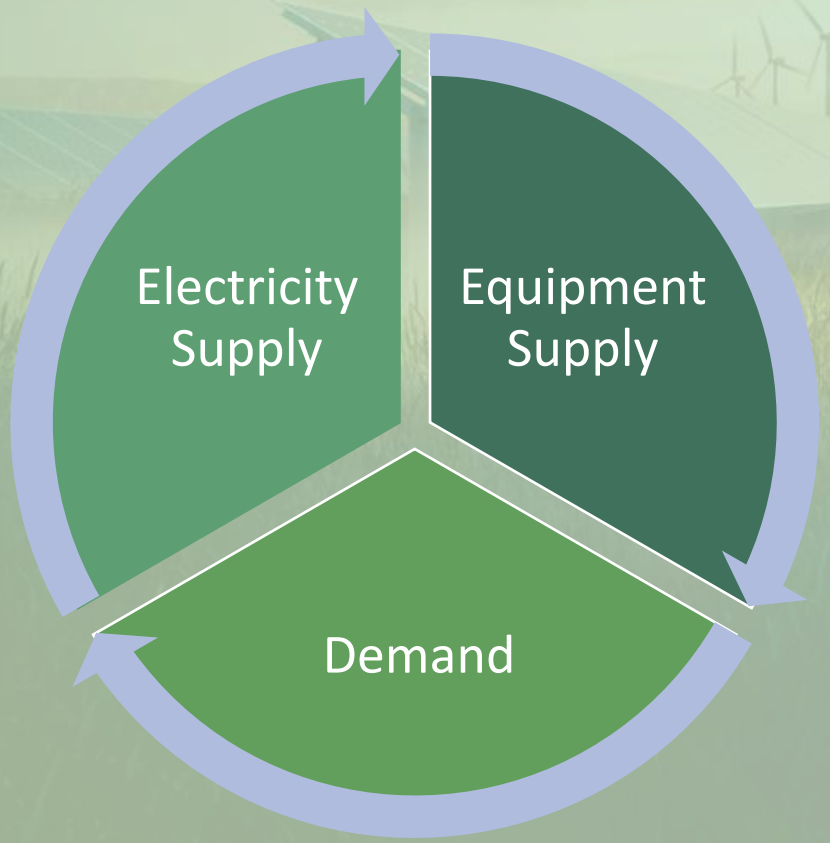
HARTLEBURY GREEN HYDROGEN

Carlton POWER

Summary

- Initial 20MW project underpinned by multiple offtakers in ceramics industry
- Difficult to decarbonise industries.
- Future expansion up to 50MW
- Land secured, planning in progress.
- 15,600 tonnes CO_2 emissions avoided
- Direct pipeline supply.
- Secondary offtakers engaged to rapidly expand scale via pipelines.
- Grid connection secured
- HAR2 Shortlisted

The hydrogen challenge: how do we reduce costs?



Electricity Supply

- Price
- Availability
- LCHS Compliance

Equipment Supply

- Capex
- Performance (efficiency & degradation)
- Warranties

Demand

- Demand Variability
- Managing Supply Interruptions

Hydrogen Valley

Open Q&A

Hydrogen Valley

Thank you