

# Shaping the Gas Transmission System of the Future

## Transitioning to a hydrogen backbone

We will start at 10.02 to allow participants to finish previous meetings and join the call

**nationalgrid**



While you are waiting, please access Sli.do which we will be using for Q&A

Event Code:

# GTX5

### Sli.do Instructions:

You can access Sli.do at [www.sli.do](http://www.sli.do) or by downloading the Sli.do app.

Once you've logged on, enter the code above when prompted.



# Welcome and Opening

**Thank you for joining us today**  
**Please get involved via SLIDO**



**Antony Green**  
Hydrogen Director

# Who will be speaking today?

**Danielle  
Stewart**  
Hydrogen Programme  
Manager



**Emily Ly**  
Senior Hydrogen  
Analyst



**Alastair  
Grundy**  
Hydrogen  
Development  
Engineer



**Jennifer  
Pemberton**  
Stakeholder  
Experience Manager



# Logistics



Should last for approximately about 60 min



Questions and polling via [slido.com](https://www.slido.com) #GTX5



All callers will be placed on mute



We will circulate the slides and a recording of this webinar

# Agenda

**Hydrogen Roadmap & Considerations for the transition**

**Alignment on all scales**

**Key transition projects**

**What we've heard**

**Questions**

# UK Policy Landscape

2020



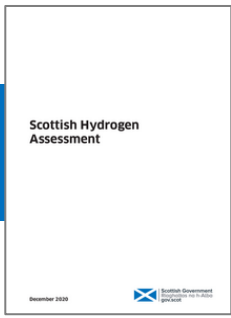
**TEN POINT PLAN FOR A GREEN INDUSTRIAL REVOLUTION**  
November 2020



**ENERGY WHITE PAPER**  
December 2020

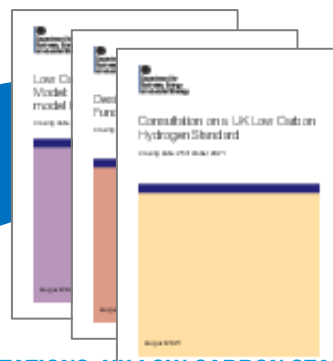


**CCC 6th CARBON BUDGET**  
December 2020



**SCOTTISH HYDROGEN: ASSESSMENT REPORT**  
December 2020

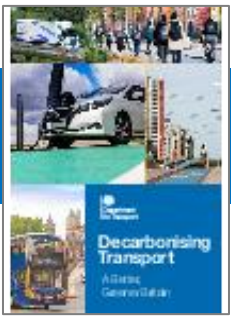
2021



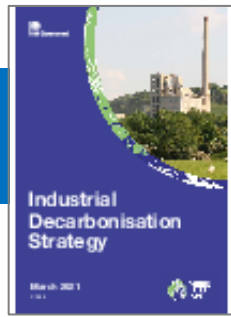
**CONSULTATIONS: UK LOW CARBON STANDARD DESIGN OF THE NET ZERO HYDROGEN FUND HYDROGEN BUSINESS MODEL**



**UK HYDROGEN STRATEGY**  
August 2021



**DECARBONISING TRANSPORT**  
July 2021



**INDUSTRIAL DECARBONISATION STRATEGY**  
July 2021



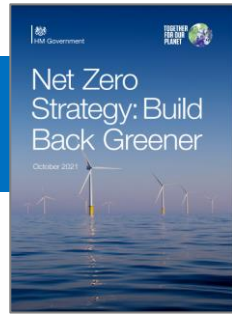
**HYDROGEN IN WALES - CONSULTATION**  
January 2021



**HEAT IN BUILDINGS STRATEGY SCOTLAND**  
October 2021



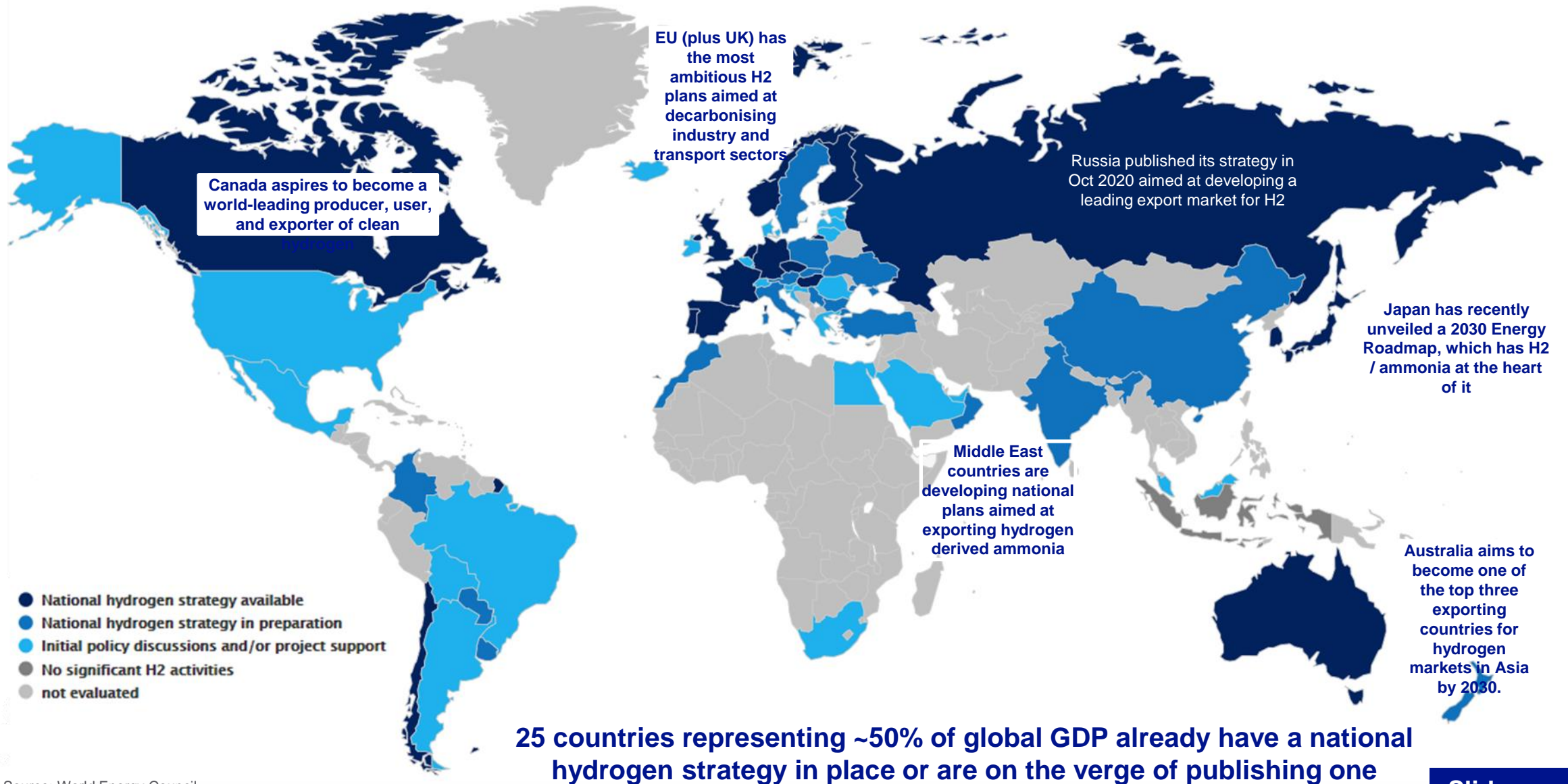
**HEAT AND BUILDINGS STRATEGY**  
October 2021



**NET ZERO STRATEGY**  
October 2021



# Status of current National H2 Strategies / Plans (Q3 2021)



# Hydrogen roadmap to 2050

nationalgrid

## BUILDING THE EVIDENCE BASE

2020

- 01 Programme of work for hydrogen informed
- 02 Government Ten Point Plan and Energy White Paper

2021

- 03 Key Government strategies published
- 04 Policy influencing development
- 05 FutureGrid programme begins

2022

- 06 Hydrogen and CCUS business models finalised
- 07 Continued strategic stakeholder engagement

## ENABLING THE TRANSITION

2024

- 12 Trials prove ability to deblend
- 13 Upskilling the workforce

2023

- 08 Increased hydrogen production
- 09 Hydrogen neighbourhood trials
- 10 20% blend testing complete
- 11 Online transmission trials begin

2025

- 14 1GW of hydrogen production capacity
- 15 GS(M)R updated and Hydrogen blends injected into NTS
- 16 First hydrogen village established
- 17 Hydrogen-ready boilers mandated

2026

- 18 Two low-carbon clusters are operational with CCUS
- 19 NTS Conversion Plan finalised

2027

- 20 Project Union hydrogen transmission backbone begins

2029

- 21 Third cluster operational

## GROWING THE HYDROGEN NETWORK

2038

- 33 Distribution networks move towards national coverage
- 34 NTS moves towards national coverage

2035

- 32 NTS able to support imports and exports of hydrogen at interconnectors

2032

- 30 Green hydrogen becomes cost competitive with blue hydrogen
- 31 5th low-carbon cluster operational and joins backbone

2031

- 27 Hydrogen power generation
- 28 4th cluster joins the backbone
- 29 Distribution networks continue conversion to hydrogen

2030

- 22 40GW of offshore wind
- 23 5GW hydrogen production capacity
- 24 Scotland GHG emissions reduced by 75%
- 26 First hydrogen town  
Four low-carbon clusters operational

## REACHING NET ZERO

2040

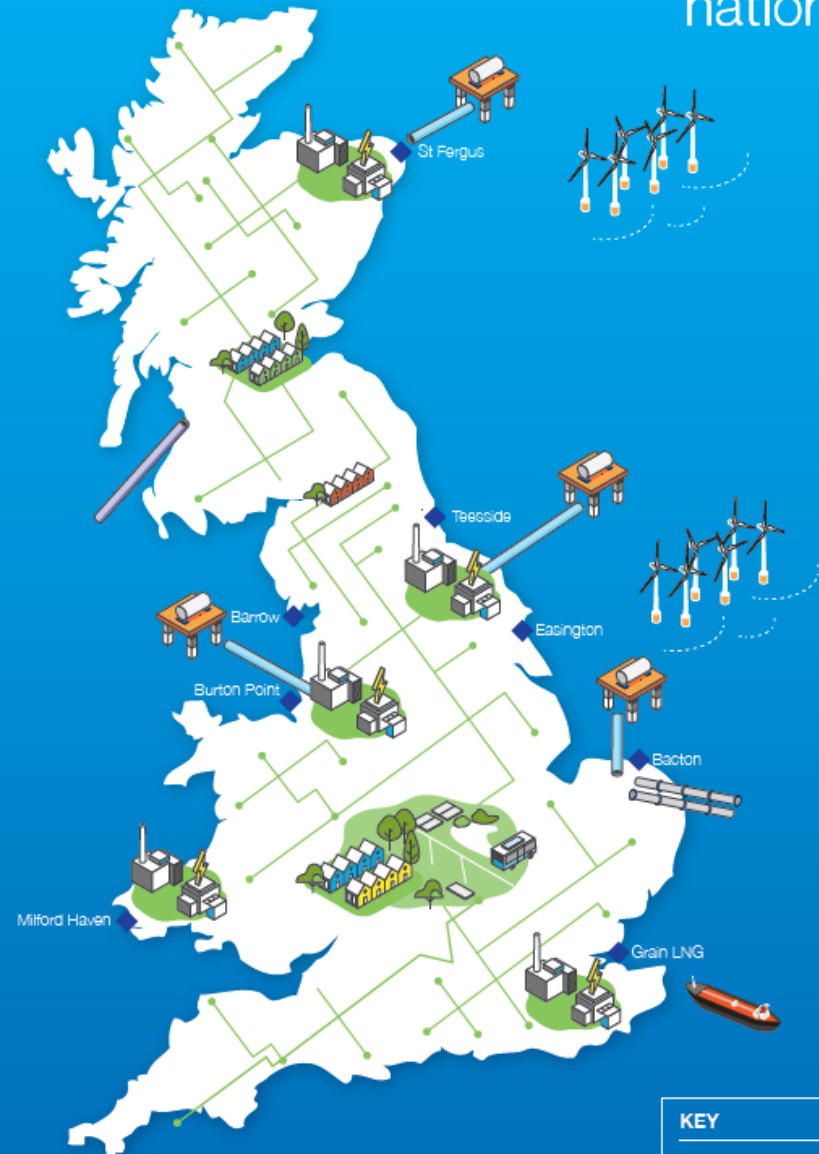
- 35 Scotland GHG emissions reduced by 90%

2045

- 36 Scotland achieves Net Zero
- 37 National Hydrogen Transmission Network

2050

- 38 UK achieves Net Zero



**KEY**

- Government milestones
- ◆ Industry milestones

Dates are estimated and subject to change.  
Illustrations shown on map are not indicative of actual geographical location.

Net Zero



# Quick poll

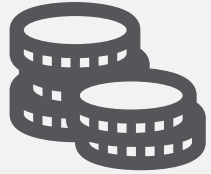
**Have we captured and articulated all the challenges in transitioning the Gas Transmission System?**

**Yes**

**No**

**Please explain**

# Considerations for the transition



**Funding and Regulation**



**System Design**



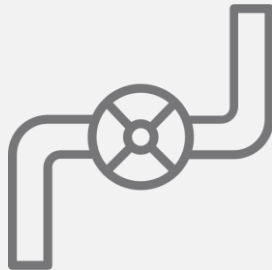
**System Operation**

Operating the network  
Wed 08<sup>th</sup> Dec @ 10.00



**Customers**

Supporting regional hydrogen transitions  
Fri 03<sup>rd</sup> Dec @ 09.00



**Technical**



**Markets**

Gas Markets Plan  
Watch again



**Skills**

Understanding the skills needed for a net zero world  
Mon 06<sup>th</sup> Dec @ 13.00

# Quick poll - results

**Have we captured and articulated all the challenges in transitioning the Gas Transmission System?**

**Yes**

**No**

**Please explain**

# Quick poll

**How should we prioritise our engagement?**

**International**

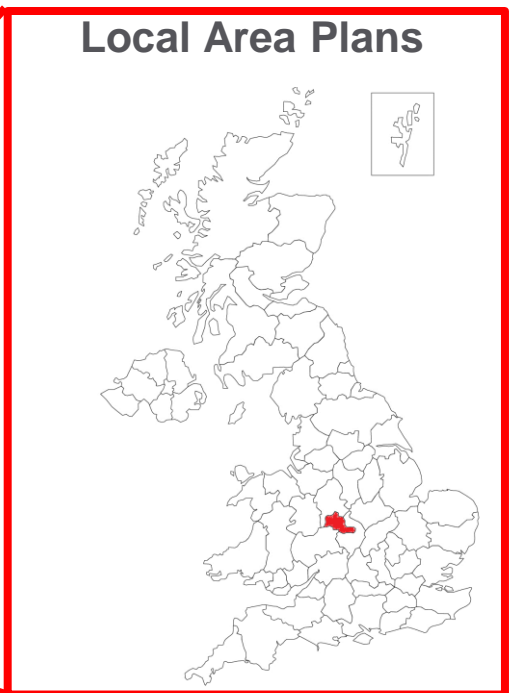
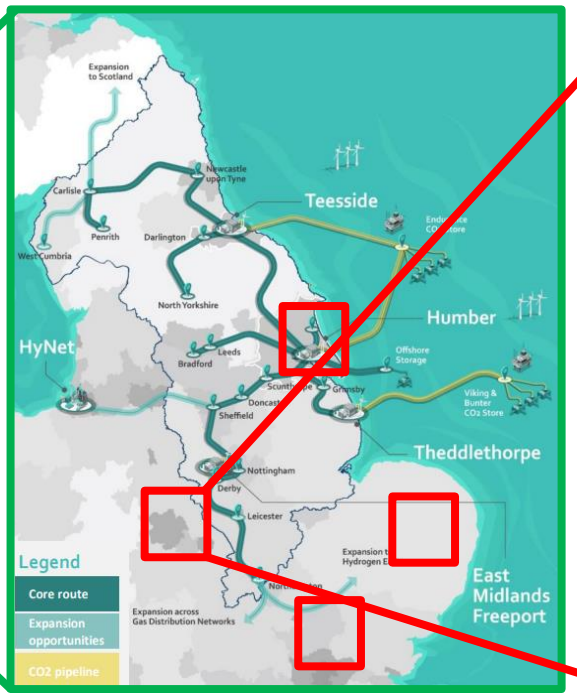
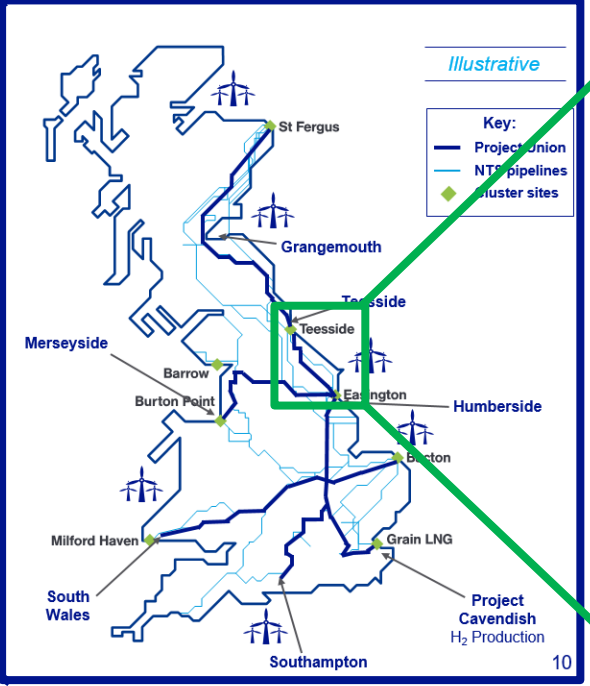
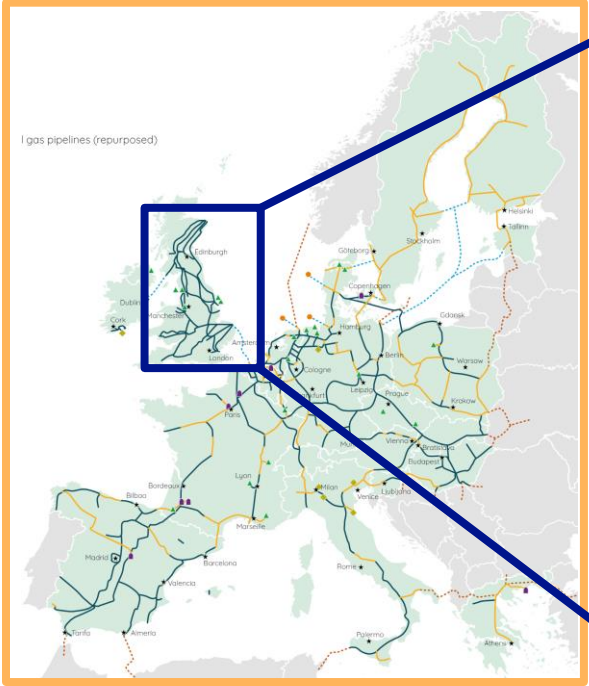
**National**

**Regional**

**Local**

**Please explain**

# Alignment on all scales





# European Hydrogen Backbone

The updated European Hydrogen backbone maps show a vision for

**39,700 km**

hydrogen pipeline infrastructure

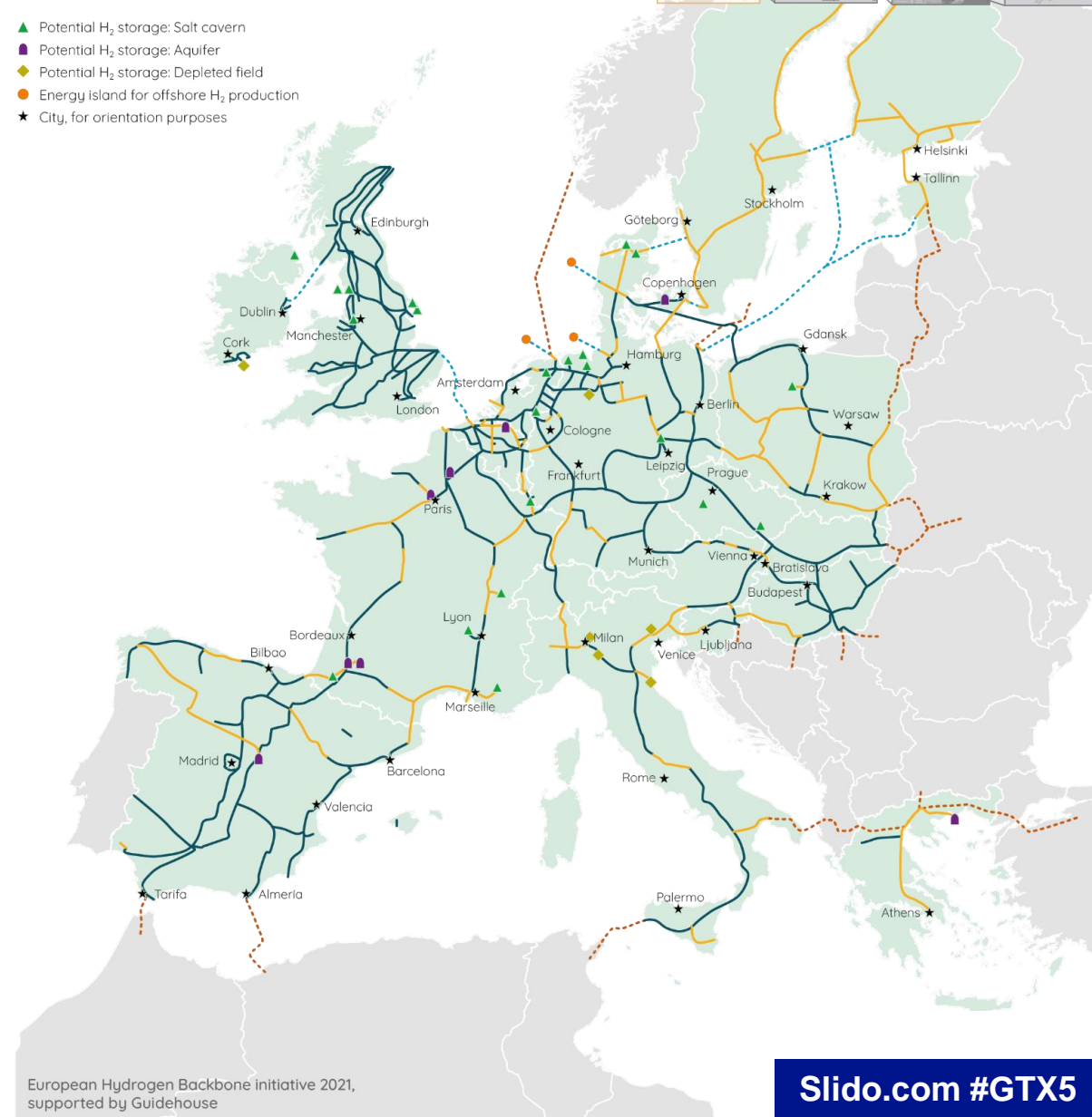
In **21** countries by 2040

almost **70%** of which is based on repurposed existing natural gas pipelines

At an average cost of **€0.11-0.21 per kg**



- H<sub>2</sub> pipelines by conversion of existing natural gas pipelines (repurposed)
  - Newly constructed H<sub>2</sub> pipelines
  - - - Export/Import H<sub>2</sub> pipelines (repurposed)
  - - - Subsea H<sub>2</sub> pipelines (repurposed or new)
- 
- Countries within scope of study
  - Countries beyond scope of study
- 
- ▲ Potential H<sub>2</sub> storage: Salt cavern
  - Potential H<sub>2</sub> storage: Aquifer
  - ◆ Potential H<sub>2</sub> storage: Depleted field
  - Energy island for offshore H<sub>2</sub> production
  - ★ City, for orientation purposes



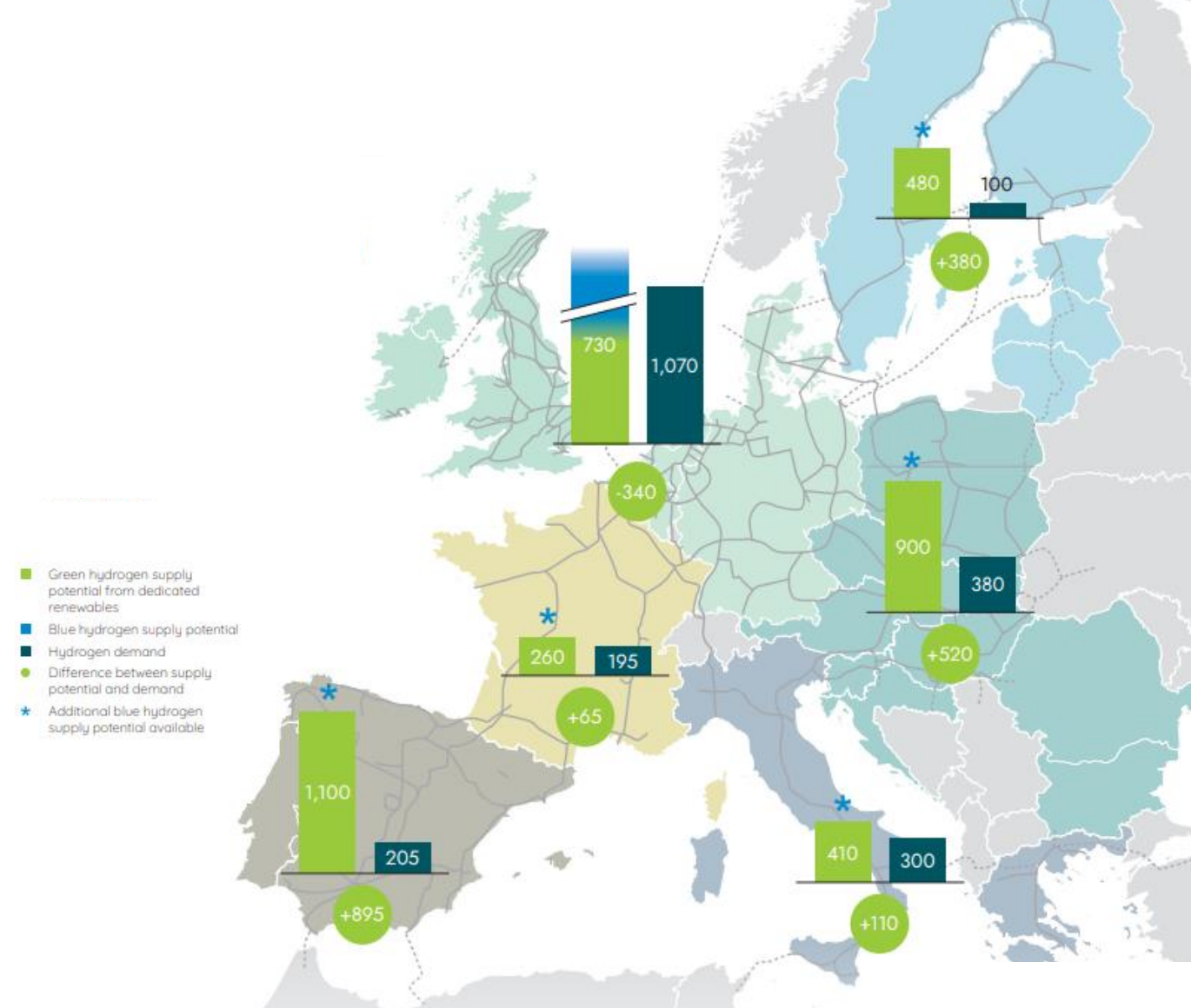
# European Hydrogen Backbone

**Hydrogen** is crucial in meeting Europe's climate targets. By 2050, **demand** will be ~2,300 TWh, or 20-25% of final energy demand

**Domestic** European green and blue hydrogen **supply** potential at affordable cost exceed projected hydrogen demand

**Neighbouring regions** can be attractive partners

**Hydrogen network needed** to bridge regional differences in hydrogen supply and demand and to connect Europe to neighbouring regions with abundant supply potential  
**Pipelines** are the most cost-efficient option for long-distance, high volume transport



EU and UK countries are grouped into 6 based on geographical and supply/demand characteristics: North Sea, Baltic Sea, Central & Eastern Europe, South East Europe, Portugal & Spain, and France.

# Project Union



Development of a UK hydrogen “backbone” by repurposing ~2,000 km of existing assets (~25% of NTS today)



Integral to delivering the UK’s hydrogen strategy



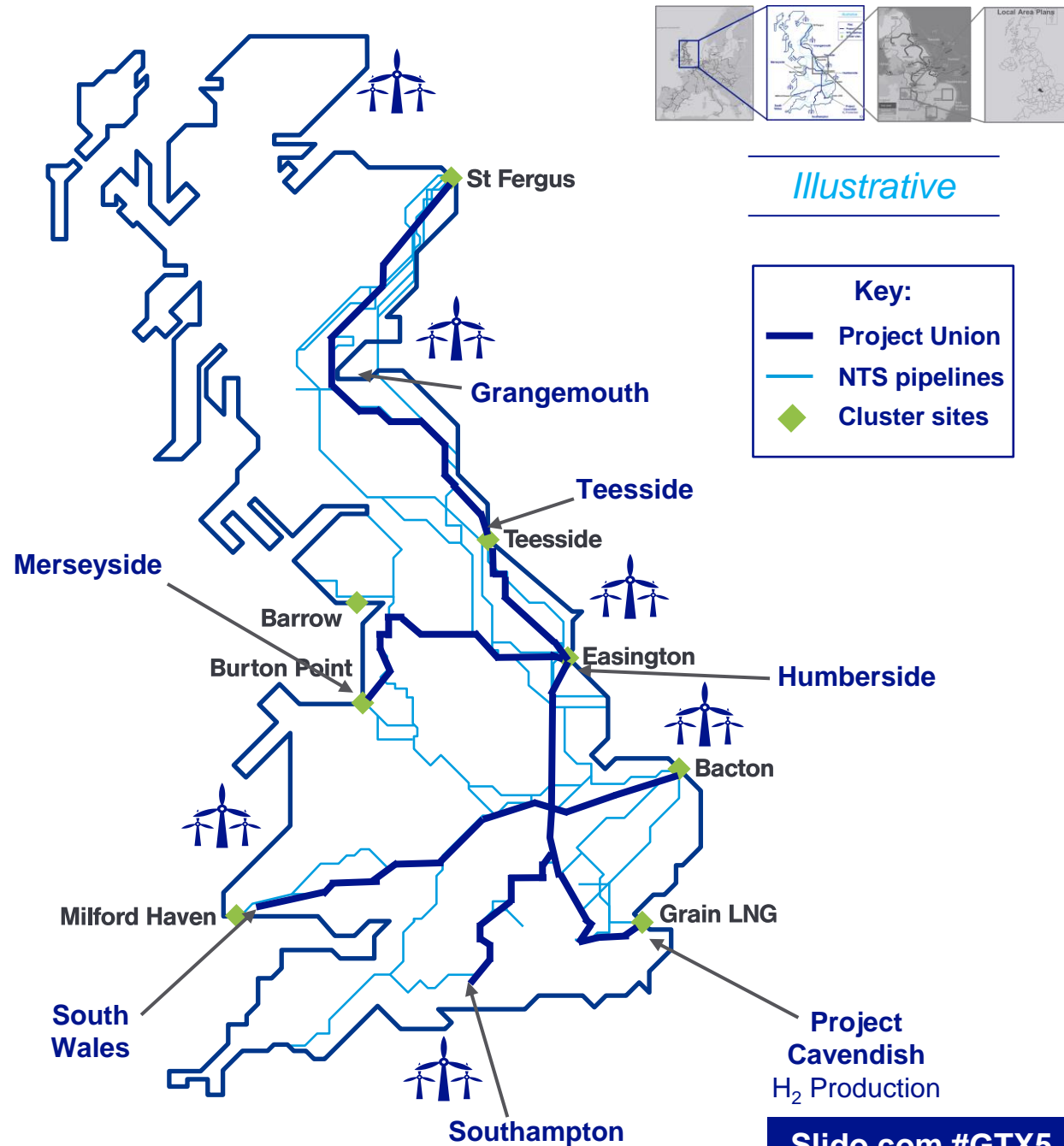
Aligned to green and blue hydrogen developments and CCUS clusters



Decarbonise heavy industry (e.g. steel, concrete, and glass manufacturers)



Connect hydrogen production, demand, storage, and export centres



# Project Union

## We are engaging with a broad range of stakeholders...

### Government



HM Government

The Scottish Government

Llywodraeth Cymru  
Welsh Government

### Consumers



MAJOR ENERGY USERS' COUNCIL

CIA CHEMICAL INDUSTRIES ASSOCIATION

ena energy networks association

Energy UK

citizens advice

RWE

JM Johnson Matthey  
Inspiring science, enhancing life

### Networks



Cadent

Northern Gas Networks

SGN

Wales & West Utilities

FLUXYS

OVO

SSE

wpd think energy

UK Power Networks

### Stakeholder feedback

“If you can create a market for green H<sub>2</sub>, you're not locked into bilateral contracts... The NTS gives you a market and a business case where you can scale H<sub>2</sub> a lot easier with less risk.”

Tom Johnson, RWE


“The chemical sector net zero roadmap depends on H<sub>2</sub> and CCUS. As technology as it stands today, electricity is just not part of the question for most CIA members - they couldn't do it”

David Mitchell, Chemical Industries Association

“Project Union has clear benefits to the clusters and H<sub>2</sub> projects. In a highly distributed system, each individual project has to meet peak demand. If you connect the hubs, you massively improve resilience between them and increases asset utilisation. ”

Nilay Shah, Imperial College London

### Regulators



ofgem

Department for Business, Energy & Industrial Strategy

Infrastructure and Projects Authority

National Infrastructure Commission

Climate Change Committee

HSE

### Producers



ITM POWER

Shell

bp

RWE

equinor

Orsted

Dolphyn

centrica

OGUK

### Clusters and projects



BACK THE SCOTTISH CLUSTER

PROGRESSIVE ENERGY

h2i

acorn

HyNet North West

nepic

SWIC South Wales Industrial Cluster

Net Zero Teesside

Hydrogen East

East Coast Hydrogen



# Project Union

## ...and have received wide support for Project Union

**Project Union is required to decarbonise industry and support levelling up across the UK**



**“[Project Union] could save industry a lot of money and even keep many of our members in business - some companies would find electrification impossible and be forced out of business without this.”**

**Eddie Proffitt – Major Energy Users Council**

**“Project Union will benefit UK manufacturing outside the first clusters. The race to sustainability will be led by the clusters which get a head start and global headquarters will then invest in areas with the infrastructure and benefits to get to net zero faster.**

**And this is already happening - We know a local company that has lost a large order for Jammie Dodgers to national super market based on the CO2 content in manufacturing”**

**Chris Williams, Wales Industry Group**

**“Large-scale green hydrogen will require national transmission and access to storage. Having a backbone network connecting the dots allows the whole system to grow.”**

**Project Union is required to connect large-scale hydrogen production and energy storage**



**Rob Duncalf – Orsted**



**“By the mid 2030’s we need significant access to storage for hydrogen... The NTS can connect large scale renewable energy production to large-scale storage sites and help cover energy deficit periods in the winter.”**

**Graham Cooley– ITM Power**

**Project Union will connect isolated markets together and drive competition**



**“Union allows you to connect isolated hydrogen markets and production points together to create a level and fair playing field and drive competition.”**

**Mike Copson – Shell**



**“Union would allow us to connect to customers outside the clusters and enable us to scale production faster and help support costs coming down”**

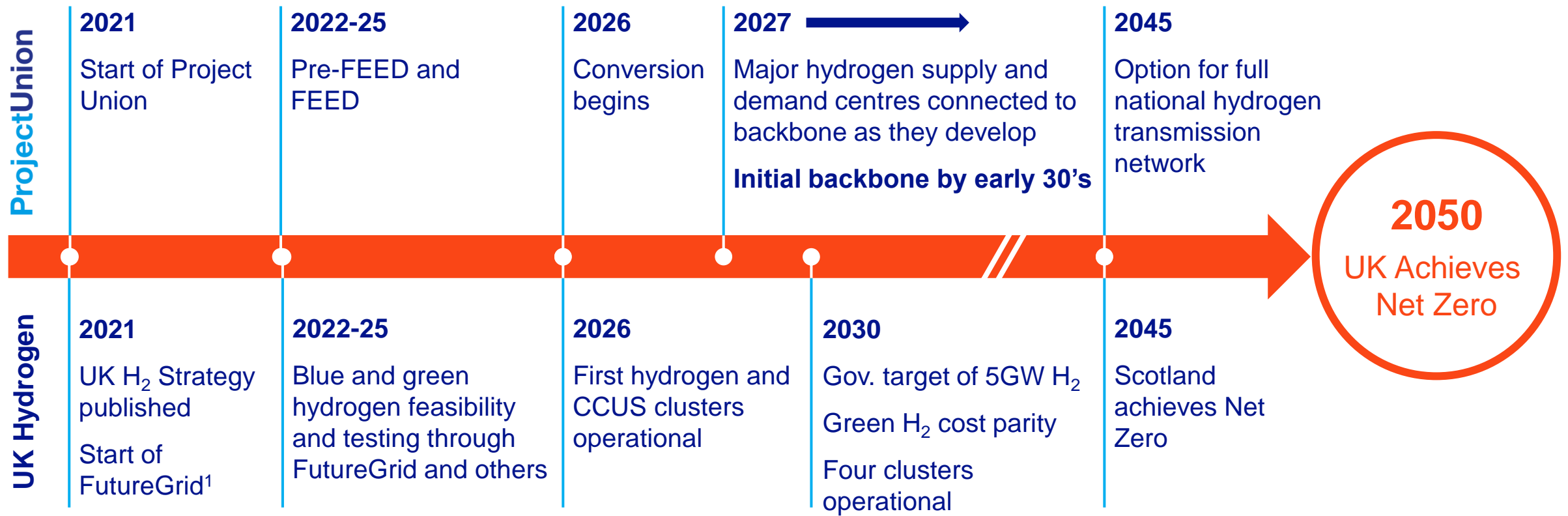
**Martin Foreman - BP**



# Project Union

## Roadmap to 2050

*“There is huge potential for hydrogen to help the UK transition towards a green economy and we are committed to investing in its development as part of our plans to build back greener”*  
- Energy Minister Anne-Marie Trevelyan



**We are starting now to reach net zero**

1. FutureGrid is NG's project to study the technical delivery and safety of hydrogen delivery, blending and deblending through the NTS

# Quick poll - results

**How should we prioritise our engagement?**

**International**

**National**

**Regional**

**Local**





**Please explain**

# Quick poll

**What do you see as the biggest opportunities for you of transitioning the gas network?**

**Please explain**

# What we've heard

	1	<b>Resilience</b>	<ul style="list-style-type: none"><li>• Ensure resilience in existing methane supply through the transition and beyond 2050</li><li>• Ensure resilience of new hydrogen supply and demand through the transition</li></ul>
	2	<b>Coordination</b>	<ul style="list-style-type: none"><li>• A coordinated transition which aligns the full hydrogen value chain (for each affected pipeline)</li><li>• A whole-systems approach must be taken, accounting for all parts of the energy system</li></ul>
	3	<b>Lowest Cost to Consumer</b>	<ul style="list-style-type: none"><li>• Lowest cost transition to consumers &amp; tax payers to enable net zero by 2050</li><li>• Reusing existing infrastructure, to save time and money</li></ul>
	4	<b>Start now</b>	<ul style="list-style-type: none"><li>• With the scale of the task ahead, we must begin to plan our transition now so that we make it as efficient as it can be</li></ul>

# Look Ahead

2022

Transition  
Projects

ProjectUnion

European Hydrogen  
Backbone

Regional Transition  
Projects

Hydrogen Grid  
R+D programme



Collaborative  
Projects

FutureGrid

Physical Trials

Policy

'hydrogen-ready' boilers  
consultation

Hydrogen Sector  
Development Action Plan

Outputs of consultations



# Quick poll - results

**What do you see as the biggest opportunities for you of transitioning the gas network?**

**Please explain**

# Q&A



# Thank you for joining us today

Keynote speech	Complete	<a href="#">Watch again</a>
Future of Gas	Complete	<a href="#">Watch again</a>
Innovation – broadening the horizon	Complete	<a href="#">Watch again</a>
Gas Market Plan	Complete	<a href="#">Watch again</a>
Transitioning to a hydrogen backbone	Thu 02 <sup>nd</sup> Dec 10.00 – 11.00	
Managing methane emissions	Thu 02 <sup>nd</sup> Dec 13.00 – 14.00	<a href="#">Register here</a>
Supporting regional hydrogen transitions	Fri 02 <sup>nd</sup> Dec 09.00 – 10.00	<a href="#">Register here</a>
Understanding the skills needed for a net zero world	Mon 06 <sup>th</sup> Dec 13.00 – 14.00	<a href="#">Register here</a>
Digital Strategy and Information Provision	Tue 07 <sup>th</sup> Dec 13.30 – 14.30	<a href="#">Register here</a>
Operating the network	Wed 08 <sup>th</sup> Dec 09.00 – 10.00	<a href="#">Register here</a>
FutureGrid 2021 Progress report	Tue 14 <sup>th</sup> Dec 10.00 – 11.00	<a href="#">Register here</a>
Annual Network Capability Assessment Report	Wed 15 <sup>nd</sup> Dec 10.00 – 11.00	<a href="#">Register here</a>

# What next?



You will receive the recording and material from today's session

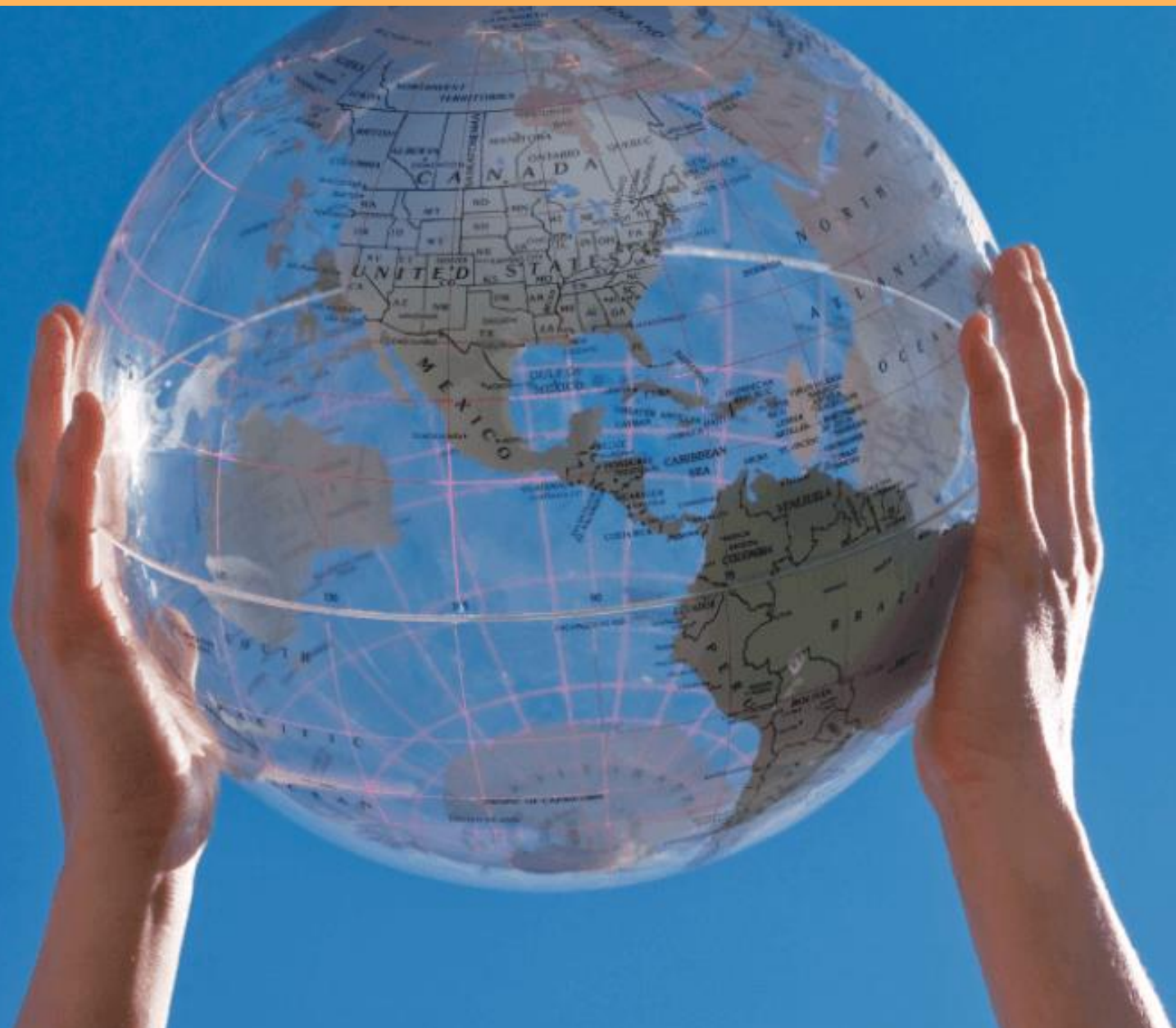


If you have any further questions or would like to discuss anything specific please get in touch with [Jennifer.Pemberton@nationalgrid.com](mailto:Jennifer.Pemberton@nationalgrid.com)



Feedback is important to us, therefore if you have not already taken part, we would like to put you forward for a survey

Thank you for joining us





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