

Ask ICIS: The outlook for hydrogen decarbonisation after COVID-19

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12 June 2020

Agenda



- 01** Achieving net zero in the UK with hydrogen and CCS
- 02** Outlook for hydrogen decarbonisation post-COVID-19
- 03** Q&A





Achieving net zero in the UK with hydrogen and CCS

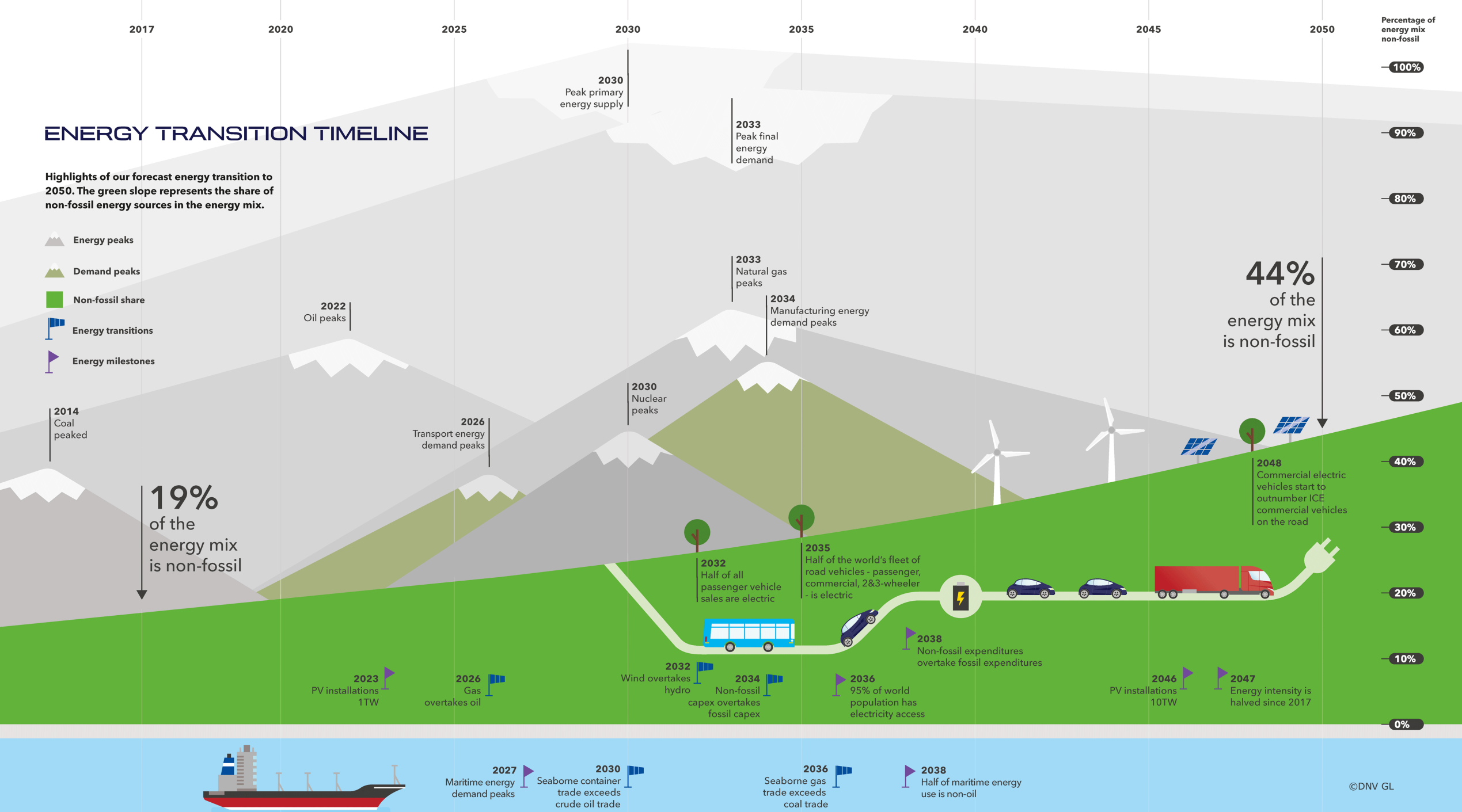
Corin Taylor, DNV GL

12 June 2020

ENERGY TRANSITION TIMELINE

Highlights of our forecast energy transition to 2050. The green slope represents the share of non-fossil energy sources in the energy mix.

- Energy peaks
- Demand peaks
- Non-fossil share
- Energy transitions
- Energy milestones



How far have we really reduced emissions in 30 years?



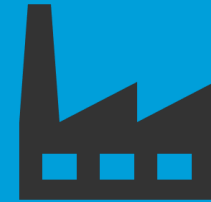
↓ 64%



↓ 16%



↓ 2%



- UK **consumption** emissions at 1990 levels
- Net imports of CO₂ around 4 tonnes per person – highest in the world
- 80 million tonnes of CO₂ a year imported from China

What does zero carbon mean in practice?



- Every furnace and kiln has to switch to electricity, hydrogen or bio sources, including those outside of clusters
- CO₂ captured from other industrial facilities
- Over 1 million jobs in energy intensive industry



2% vehicles

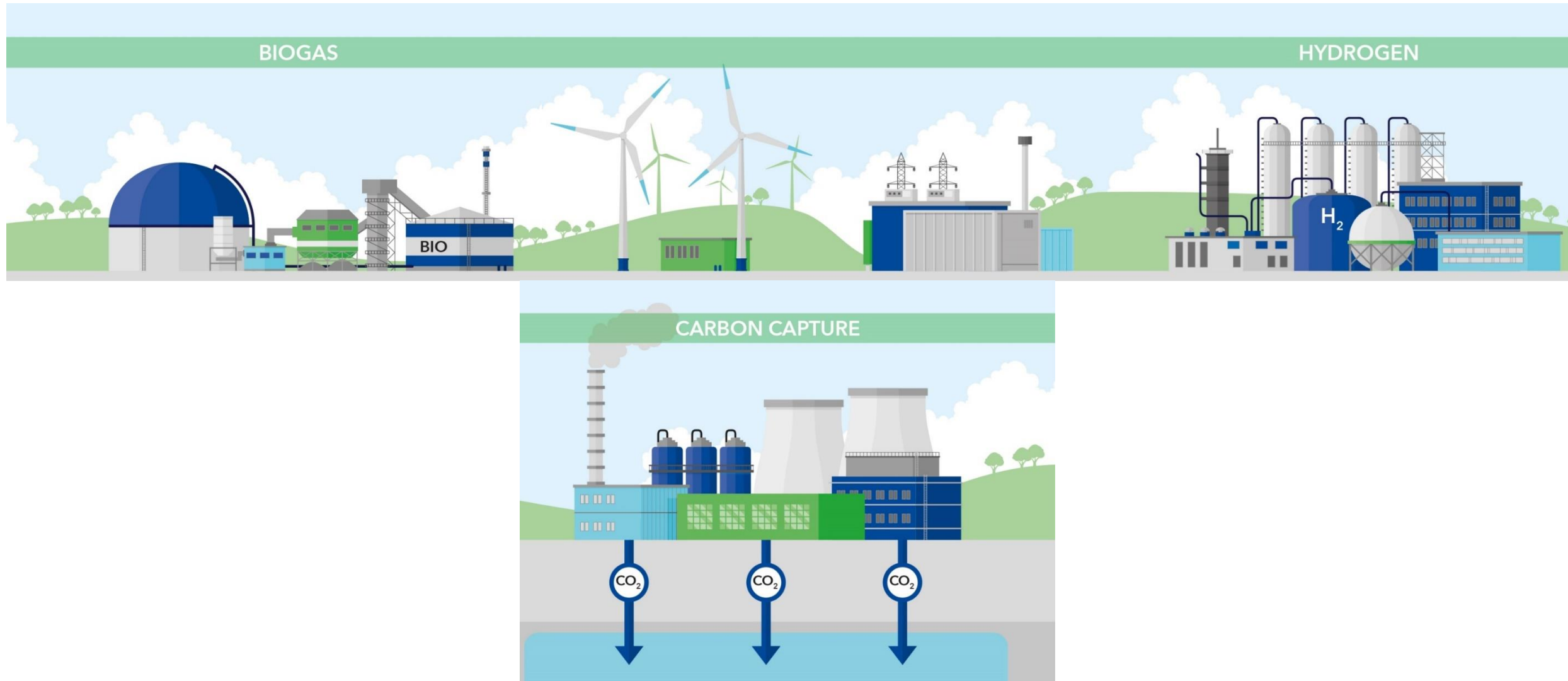
16% transport
CO₂

45% roadside
NOx



1 million
a year!

What is decarbonised gas?



And how can it help?



Biomethane: Direct replacement for natural gas

Hydrogen: Blend up to 20% with no changes to appliances

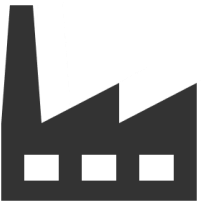
Hydrogen: Use 100% hydrogen with new appliances



Biomethane: Use as CNG in buses and trucks

Hydrogen: Use in fuel cell trucks, buses and ships

Hydrogen: Also potential in combustion engines with diesel



Hydrogen: Replace gas in industrial processes – heat and potentially feedstock

Carbon capture: Capture CO₂ directly from industrial processes e.g. cement



Carbon capture: Use CCS on gas-fired power to meet peak demand and manage cold winter weeks with little wind

Hydrogen: Use excess renewables to produce hydrogen and use hydrogen to provide power when needed

Thank you!

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The outlook for hydrogen decarbonisation after COVID-19

Simon Ellis

Head of Global Gas Analysis

12 June 2020

Global Industry Trends: Summary

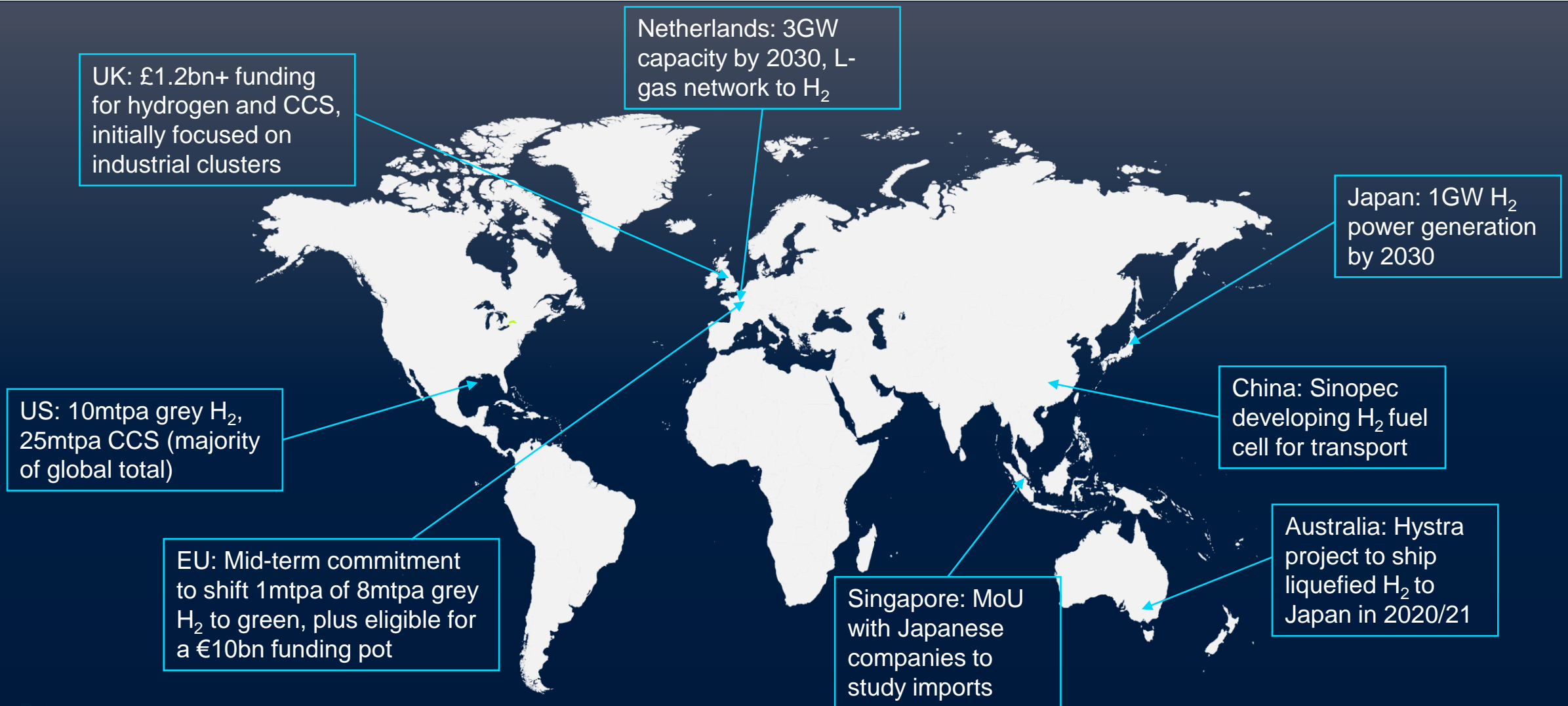
- Challenge to decarbonise grey hydrogen - H₂ (produced from methane without CO₂ abatement) as well as new heating, transport and industrial demand
- EU and UK have announced 2050 Net Zero goals but differ in H₂ strategy with UK focused on gradual blue-green transition
- Majors including Shell and BP also require abated H₂ to support net zero commitments while cross-industry Oil and Gas Climate Initiative promoting projects
- Long distance seaborne H₂ transport possible through liquefaction or as ammonia/methanol



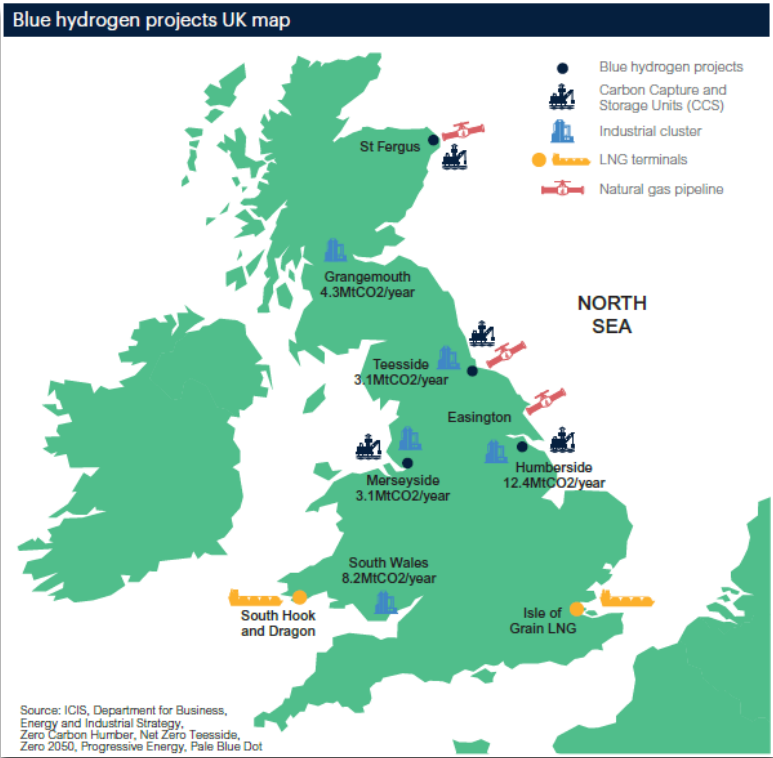
“ If the technology is deployed at scale, we estimate by 2050 ...a market size in excess of \$1tn per year. ”

Lydia Rainforth, CFA, Barclays Capital, March 2020

Global trends: Selected developments and policies



UK has backed blue hydrogen with CCS to decarbonise its industrial clusters



Key blue hydrogen or CCS projects in the UK			
Project	Location	Project leaders	Other stakeholders
HyNet	Merseyside	Progressive Energy	SNC-Lavalin, Johnson Matthey, Essar Oil, ENI, Cadent
Zero Carbon Humber	Humberside	Drax	Equinor, National Grid Ventures
Acorn	St Fergus	Pale Blue Dot	Chrysaor, Shell, Total, UK and Scottish Government
Net Zero Teesside	Teesside	Oil and Gas Climate Initiative (OGCI)	BP, ENI, Equinor, Shell, Total
Cavendish	Isle of Grain LNG Terminal	National Grid	ARUP, Cadent, SGN
Zero Carbon South Wales 2050 "Zero2050"	South Wales	National Grid, ARUP, Wales and West Utilities and Western Power Distribution	CR Plus, Regen, Progressive Energy, BMT Defence, Cardiff University, Digital Engineering, Burns and McDonnell

Sources: Pale Blue Dot, Acorn.au, Progressive Energy, Drax, National Grid, Net Zero Teesside.

With an abundance of natural gas, established pipelines and storage sites for both emissions and hydrogen, the UK is well-positioned to create blue hydrogen at scale.

Prospects for decarbonising the UK's Industrial Clusters
I.C.I.S White Paper, June 2020

Questions and Answers