



WESTMINSTER  
ENERGY FORUM



Freshfields Bruckhaus Deringer

OGUK



[www.westminsterenergy.org](http://www.westminsterenergy.org)

# Futures for Oil & Gas, CCUS & Hydrogen

## *Transitioning the UK Upstream*

0915-1300hrs, Tuesday 7th December 2021

Andy Samuel, CEO, **Oil & Gas Authority**

Mike Tholen, Director of Sustainability, **OGUK**

Arne Gurtner, Senior VP UK & I – E&P, **Equinor**

Minnie Lu, Director of Decommissioning, **Wood**

Mark Wilkie, Carbon Management Director, **Gaffney Cline**

Sophia Northridge, Head of CCUS Transport & Storage Strategy, **BEIS**

Christian Fjell, Director, **Altera Infrastructure**

Guy Philips, Business Development Manager, **Uniper**

Ross Glover, Development Director, **IGas Energy**

[www.westminsterenergy.org](http://www.westminsterenergy.org)

# 25<sup>th</sup> Jan –post-COP26 Review of Climate Strategy & Energy Transition Pathways

## **Update on the strategic role of the UK in support of International Climate Change Actions Plans**

Kate Hughes, Director - International Climate Change, **BEIS**

## **Sustainable Capital and Risk Mitigation for Net Zero Transformation – challenges and options ahead**

Claire Dorrian, Head of Sustainable Finance, **London Stock Exchange Group**

Lesley Harding, Head of Energy, **Liberty Global Group**

## **Climate Change & Public Health – UK & Global Impacts, Trends & Options**

Revati Phalkey, Head - Climate Change and Health Unit, **Public Health England**

## **The State and Context of the UK & Global Energy Transitions**

Dr. James Henderson, Director, Energy Transition Research Initiative, **Oxford Institute for Energy Studies**

Nick Stewart, Partner, **Baringa Partners**

Neil Kenward, Director of Strategy & Decarbonisation, **Ofgem**

## **Progress of COP26 policy pathways and goals for the remainder of the UK COP Presidency**

Chris Stark, CEO, **Committee on Climate Change**

Simon Sharpe, Deputy Director, Policy Campaigns at COP26 Unit, **UK Cabinet Office**



# WEF Events Diary 2022

|              |   |
|--------------|---|
| Jan 25, 2022 | <b>post-COP Annual Review, plus Assessment of Progress with the Global Energy Transition</b>  |
| Feb 24, 2022 | <b>Energy Markets &amp; Trading Update - UK &amp; Global Challenges and Uncertainties</b>     |
| Apr 6, 2022  | <b>Energy Sector Transformation – Net Zero Initiatives from Innovation to Delivery (1)</b>    |
| May 18, 2022 | <b>Energy Sector Transformation – Net Zero Initiatives from Innovation to Delivery (2)</b>    |
| May 24, 2022 | <b>Frontiers in Nuclear Risk, Regulation &amp; Insurance - No.4 (for NRI)</b>                 |
| Jun 7, 2022  | <b>Climate Policy &amp; Decision Making under Uncertainty – mid-Year Question Time</b>        |
| Jul 14, 2022 | <b>UK Net Zero Strategy, plus Insurance &amp; Industry Assessments of Global Climate Risk</b> |
| Sep 21, 2022 | <b>pre-COP Update on Key Trends &amp; New Updates in Climate Science</b>                      |
| Oct 20, 2022 | <b>UK Power &amp; Networks - System Review &amp; Strategic Pathways</b>                       |
| Nov 8, 2022  | <b>Frontiers in Nuclear Risk, Regulation &amp; Insurance - No.5 (for NRI)</b>                 |
| Nov 30, 2022 | <b>Transitioning the Upstream – the Future of Oil &amp; Gas, CCUS &amp; Hydrogen</b>          |



Oil & Gas  
Authority

# The UK Continental Shelf in Transition

---

## Delivering net zero

Andy Samuel - Chief Executive

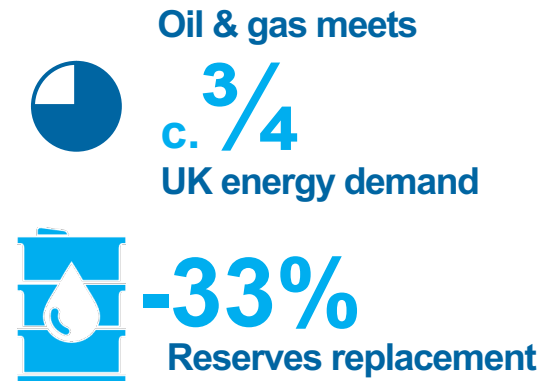
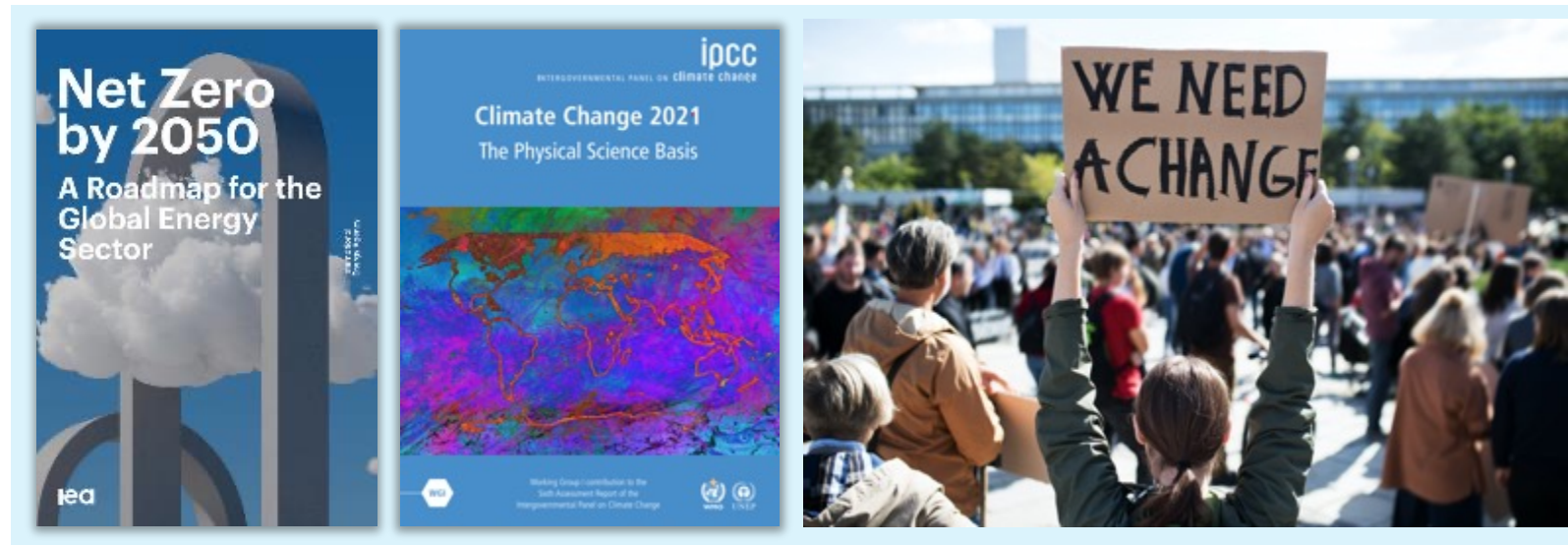
7 December 2021

© OGA 2021

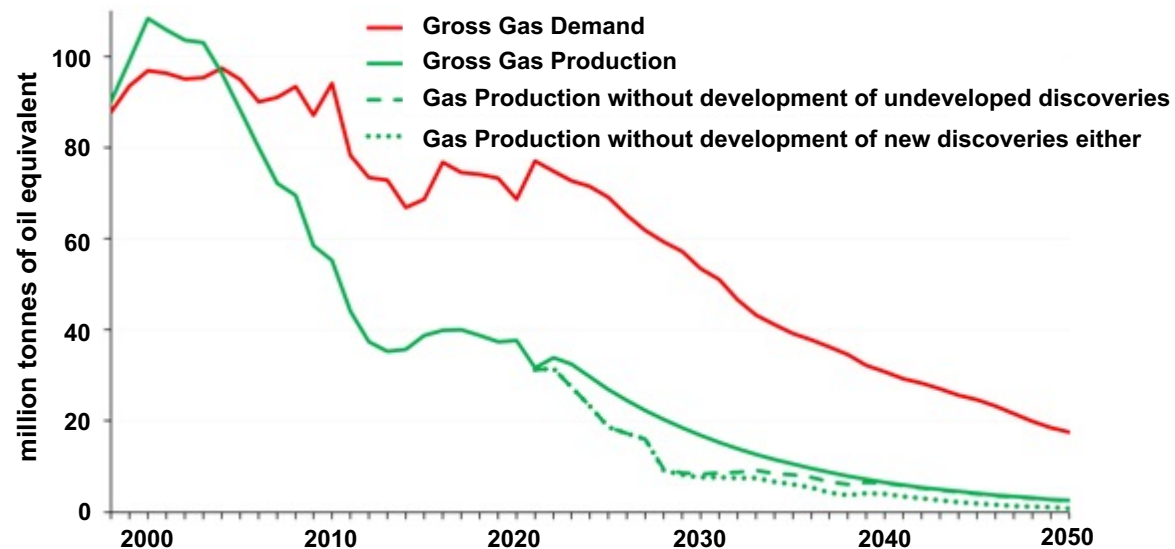
This presentation is for illustrative purposes only. The OGA makes no representations or warranties, express or implied, regarding the quality, completeness or accuracy of the information contained herein. All and any such responsibility and liability is expressly disclaimed. The OGA does not provide endorsements or investment recommendations. Oil and Gas Authority is a limited company registered in England and Wales with registered number 09666504 and VAT registered number 249433979. Our registered office is at 21 Bloomsbury Street, London, United Kingdom, WC1B 3HF



# Oil and gas under the spotlight



CCC Balanced Net Zero Pathway Demand and OGA Production projections

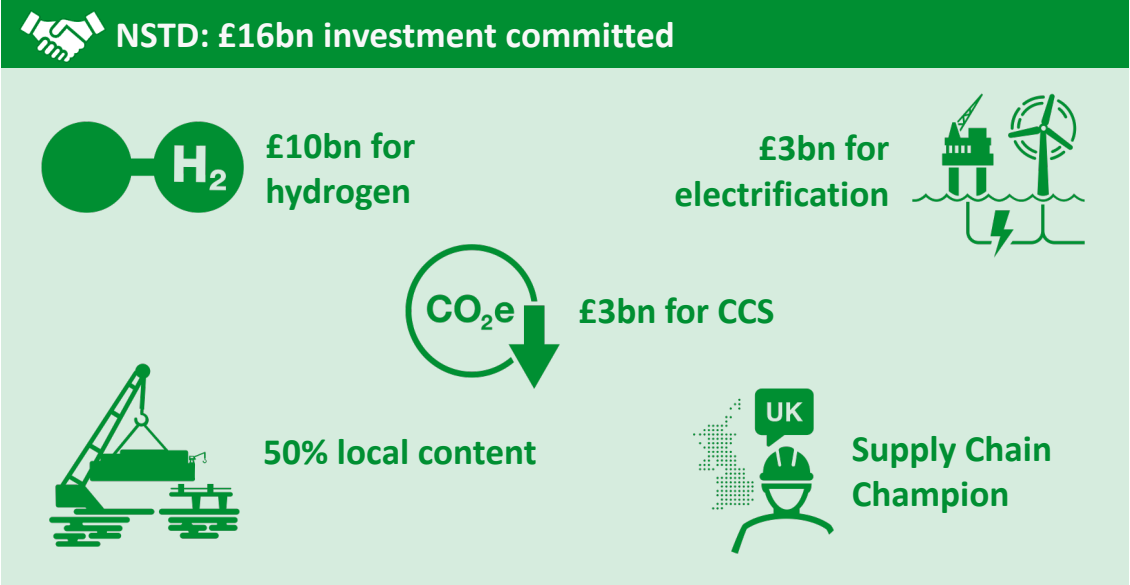


UK Gas Spot Price (UK GBP)

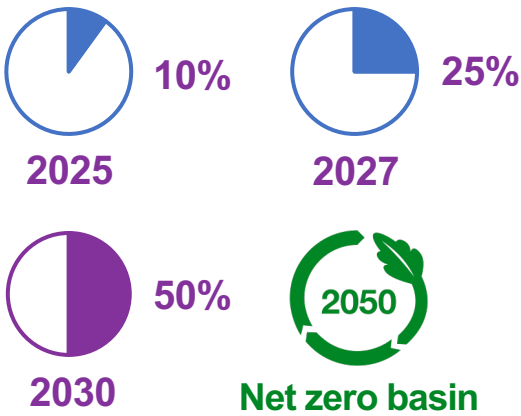


# North Sea Transition Deal

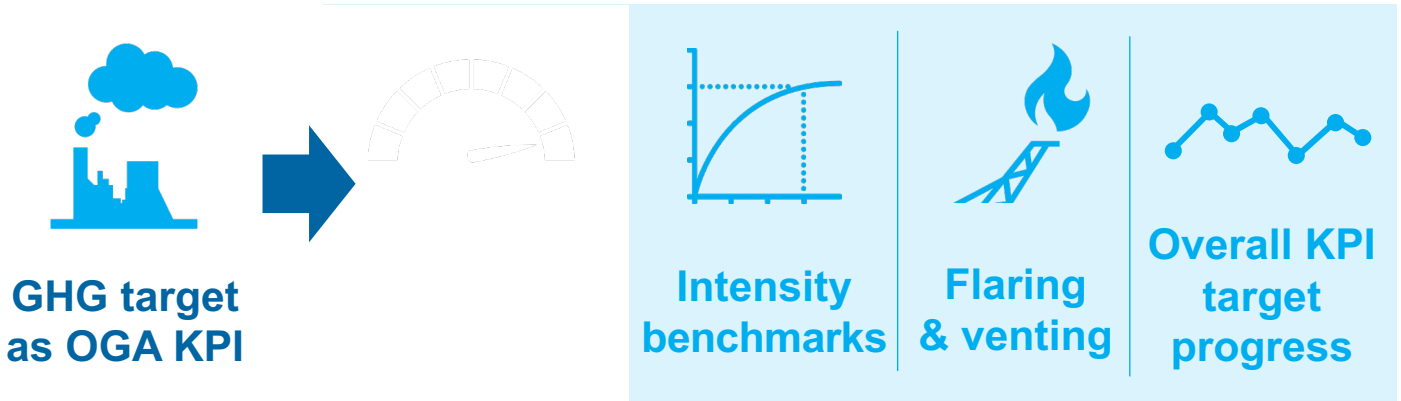
- Govt & industry commitment to transition
- First of kind for G7 country
- Future licensing climate checkpoint
- Quid pro quo



## Industry commitment to reducing upstream GHG emissions



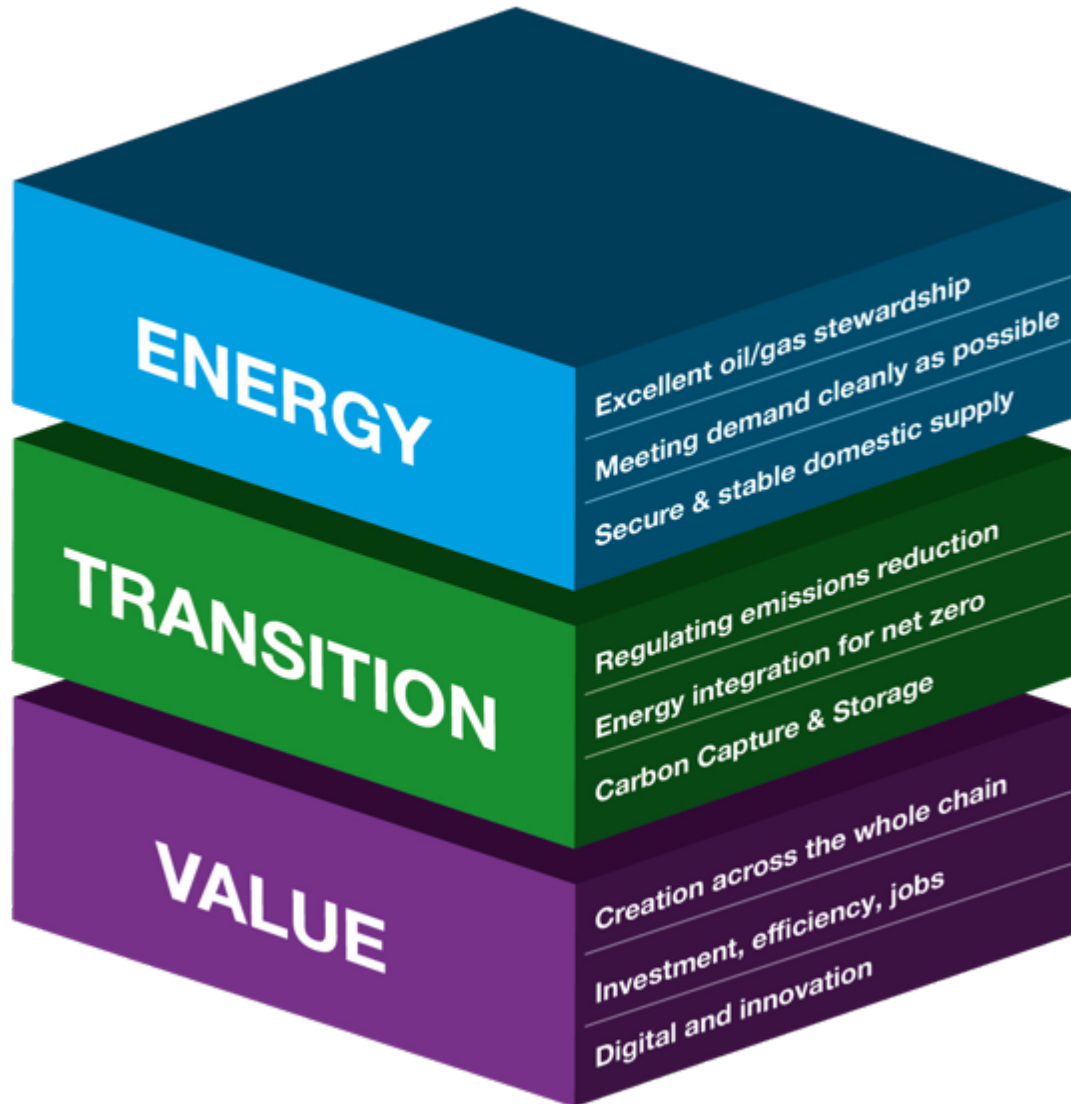
## OGA tracking and monitoring progress



# Our mission



Oil & Gas Authority



We regulate and influence the oil, gas and carbon storage industries. We help **drive North Sea energy transition**, realising the significant potential of the UK Continental Shelf as a critical energy and carbon abatement resource. We hold industry to account on **halving upstream emissions by 2030**.

We work with government, industry and other regulators to **accelerate the move to net zero** while meeting the UK's **energy demand and security**. We perform an effective net zero test and will not approve developments unless they pass it.

We aim to be a **value creator** in everything we do, encouraging and enabling economic benefit and **job creation** across the UK. We drive greater efficiency through **inclusive leadership**, data, analysis, stewardship and the use of our powers.

# Good business – not business as usual

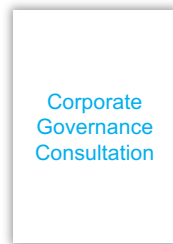


Oil & Gas Authority

## Framework



**OGA  
Strategy**



**Corporate  
Governance**



**ESG**



**Net zero  
expectation**



**New  
fields**



**Flaring &  
venting**

## OGA interventions & industry effort



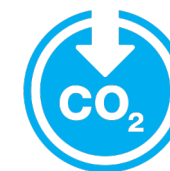
**22%**

Annual reduction  
in flaring volume



**10%**

Annual reduction  
in CO2 emissions



**983,000**

tonnes CO2  
avoided YTD



**80%**

OGA PE target  
retained



**11.2/boe**

Unit operating  
cost



**23%**

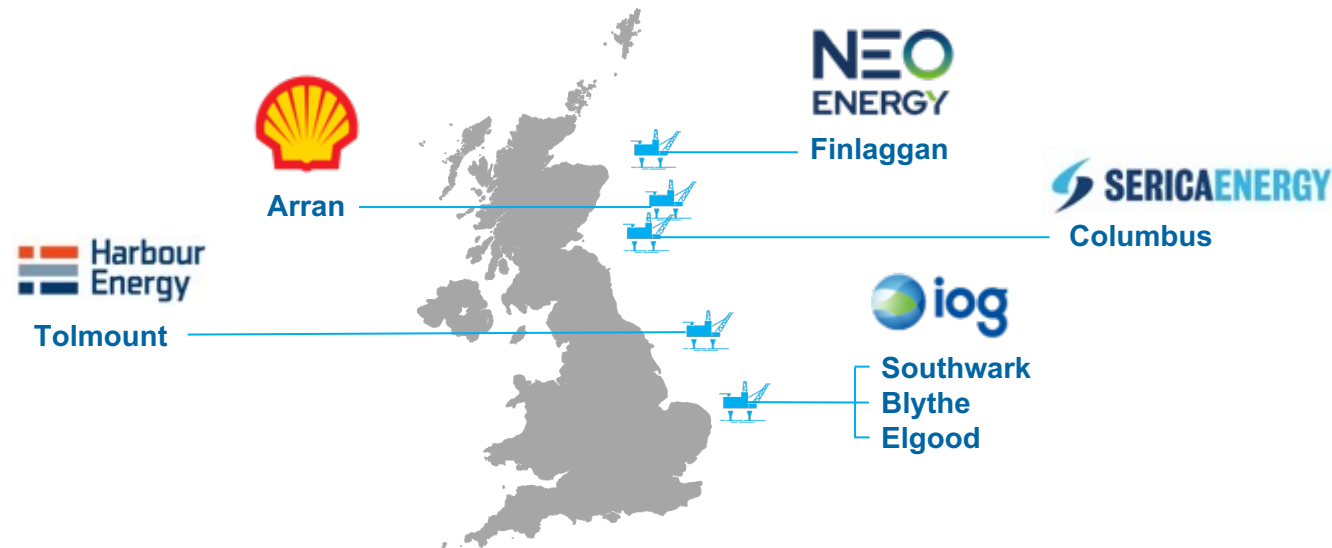
Decom cost reduction  
since 2017

# Importance of UK domestic gas supply

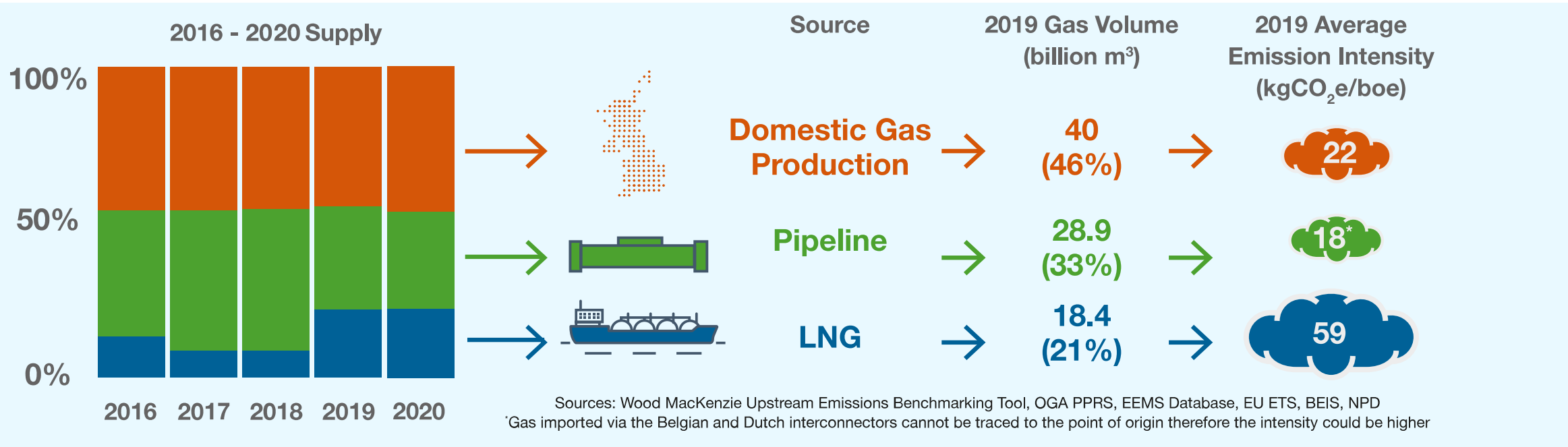
7



New gas/condensate fields expected/ onstream in near future



## UK's gas supply by origin



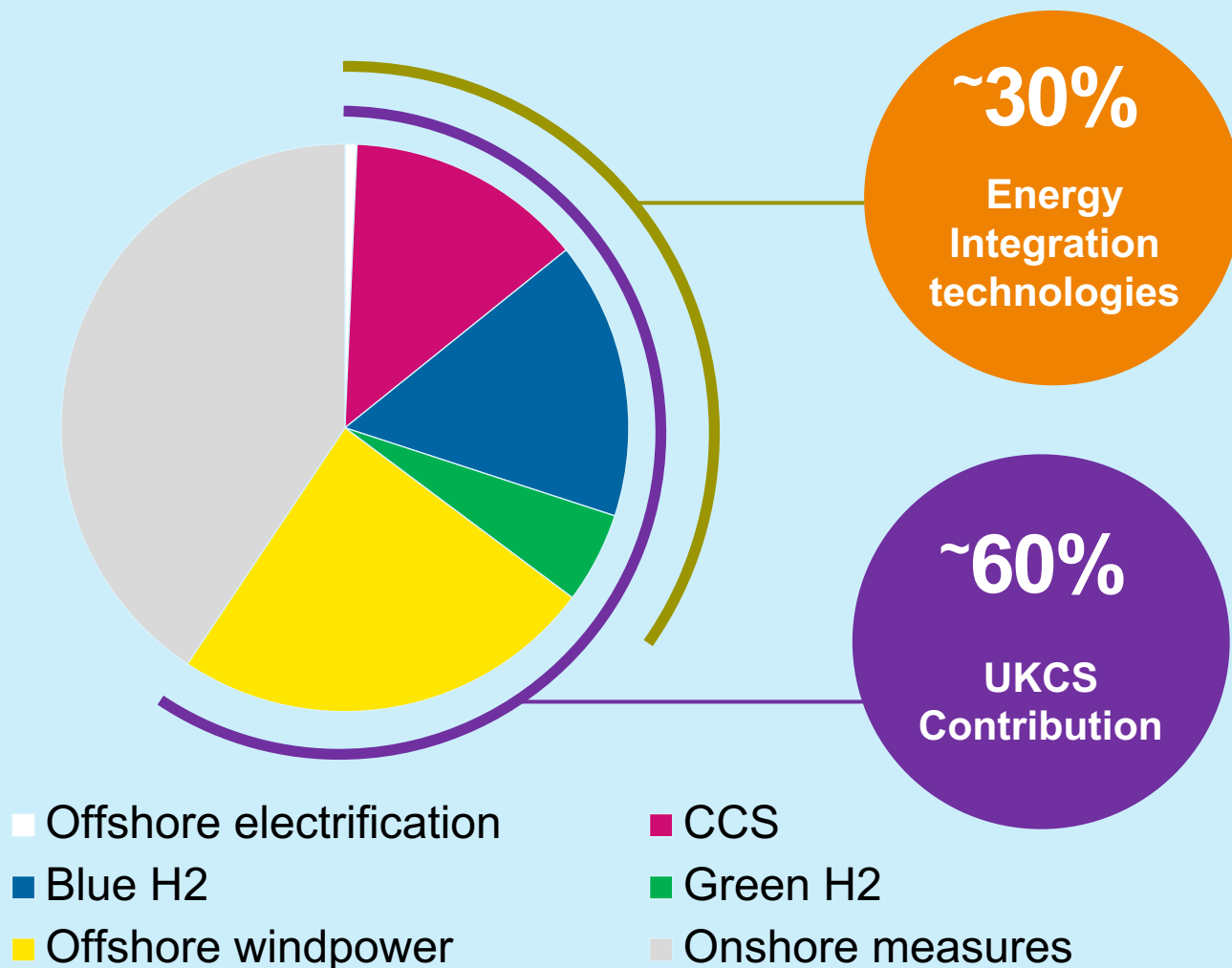


# Offshore contribution to UK net zero



Oil & Gas Authority

## 2050 net zero emission abatement from 2018 baseline



Oil & Gas  
Authority

## UKCS Energy Integration

Final report



Department for  
Business, Energy  
& Industrial Strategy

THE CROWN  
ESTATE

ofgem

August 2020



Oil & Gas  
Authority



Department for  
Business, Energy  
& Industrial Strategy

ofgem



Crown Estate  
Scotland

Oighreachd a' Chrùin Alba

THE CROWN  
ESTATE

# Growing number of energy integration projects

## Onshore CO<sub>2</sub> emissions

15 largest UK emitters (areas with 30km radius)



Source: NAEI 2019 data, OGA analysis

Note: total CO<sub>2</sub> emissions on the map account for ca.186 mtCO<sub>2</sub> (~40% of UK total)

**Hynet**

1 Mtpa from mid 2025;  
3+ Mtpa by 2030 (with blue H2)  
Re-uses existing infrastructure

## Offshore net zero projects (ongoing)

OGA awarded CCS licences

Further projects

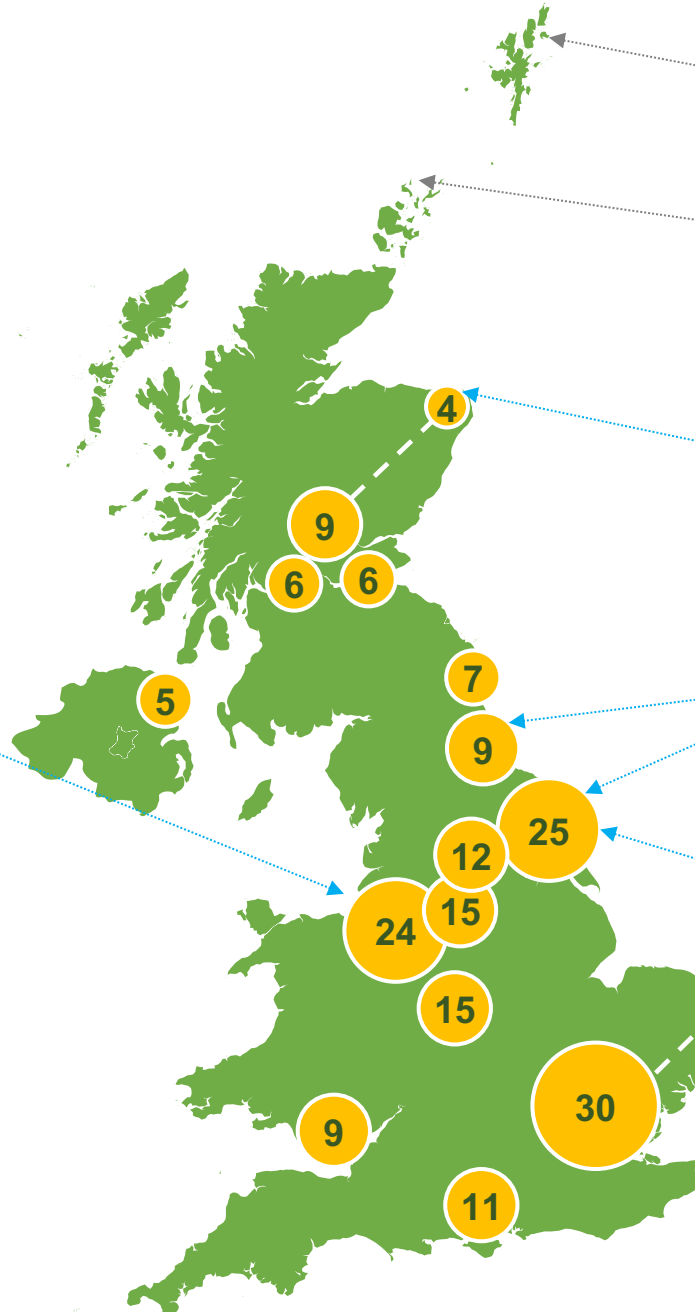
CCS

CCS / Blue H2

Green H2

Re-use/repurposing

Electrification/wind integration



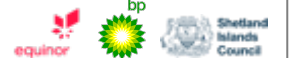
### Northern Horizons

10GW floating wind

Green hydrogen, synthetic fuel, ammonia



### ORION



Shetland renewable energy hub



### Flotta H2 Hub



### Acorn



### STOREGGA



2 Mtpa mid 2026 (with blue H2);  
7 Mtpa by 2030  
Re-uses existing infrastructure

### East Coast Cluster (Teesside, Humber and NEP)

4 Mtpa from 2026

10+ Mtpa by 2030

3.3GWe hydrogen production capacity



### V Net Zero (Humber)



3.6 Mtpa from 2027

11 Mtpa by 2030

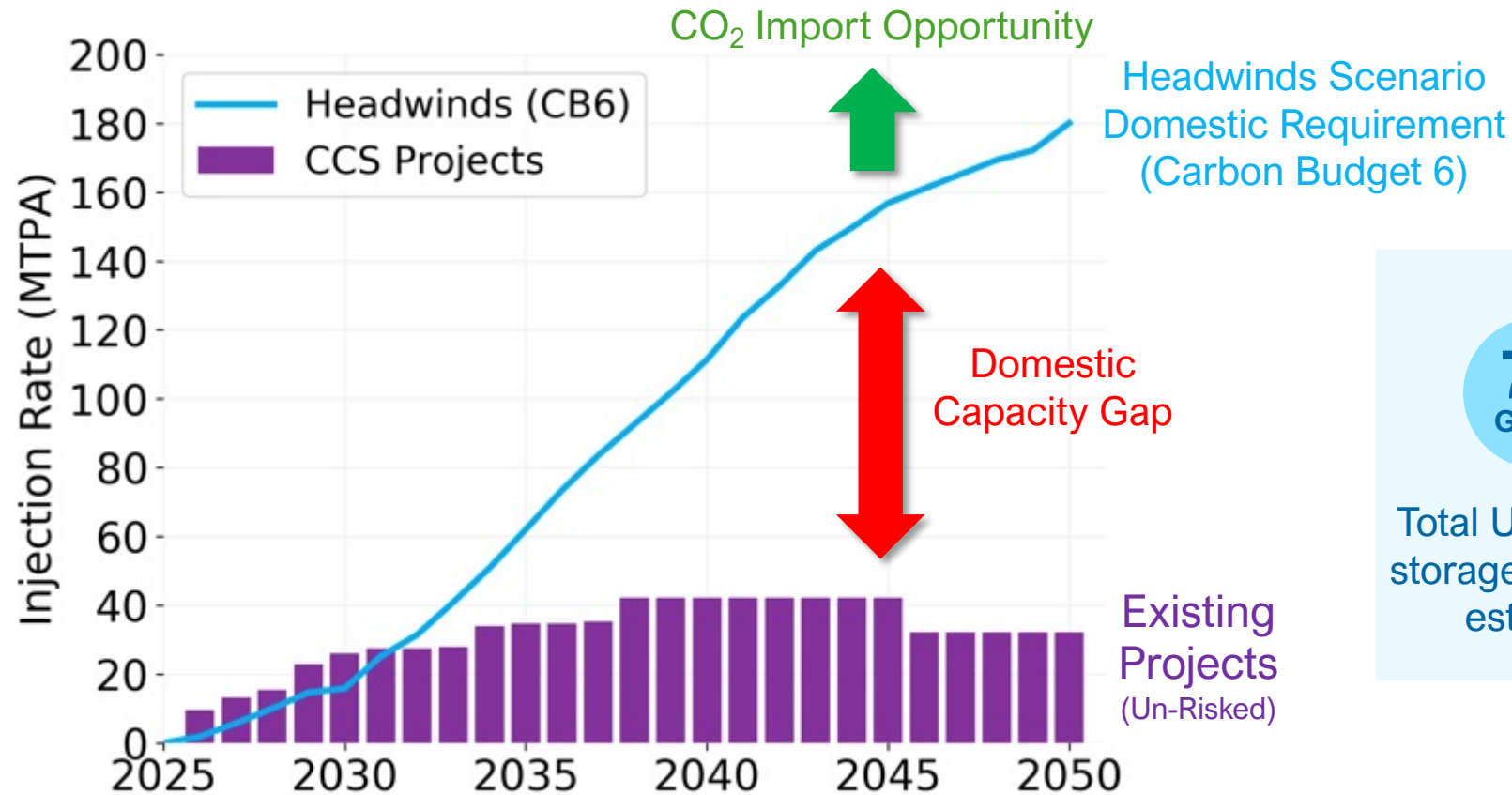
Re-uses existing infrastructure

### Bacton Hub



Early stage, potential for H2 supply into London area

# CCS – the time is now



**78**  
GtCO<sub>2</sub>

Total UKCS CO<sub>2</sub>  
storage resource  
estimate

**75-175**  
MtCO<sub>2</sub>

CCC estimate  
requirement  
in 2050



Spatial planning  
to high-grade  
future sites

Northern Endurance  
Partnership, Teesside



HyNet, North West England



Acorn, St Fergus



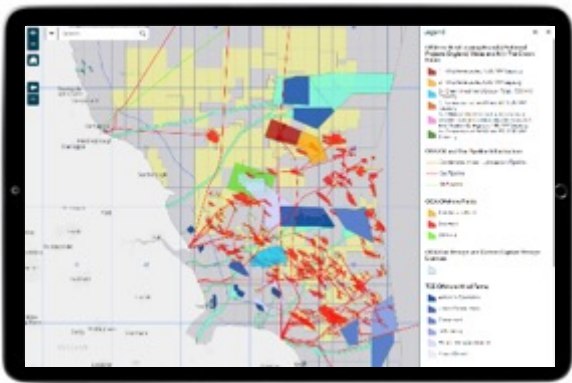
V Net 0, Immingham





# Power of data and digital

## Geographic Information Systems



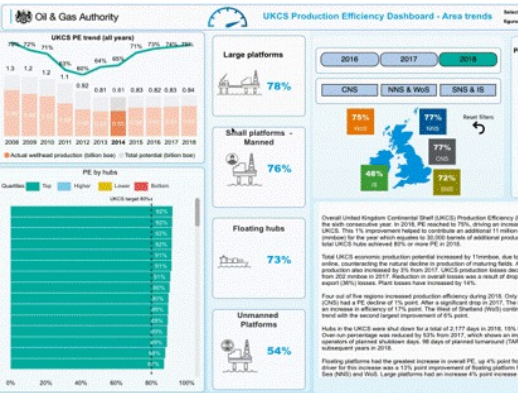
## Digital Energy Platform



- Open to all
- Cloud based
- View & download data
- Integrated with other data sources
- Authoritative

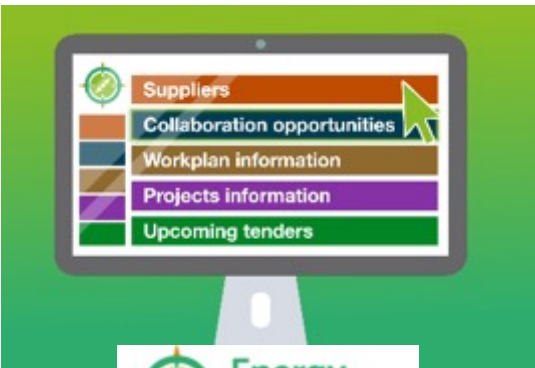
## Insights

Data collected, analysed and disclosed to encourage action



## Advancing the energy transition

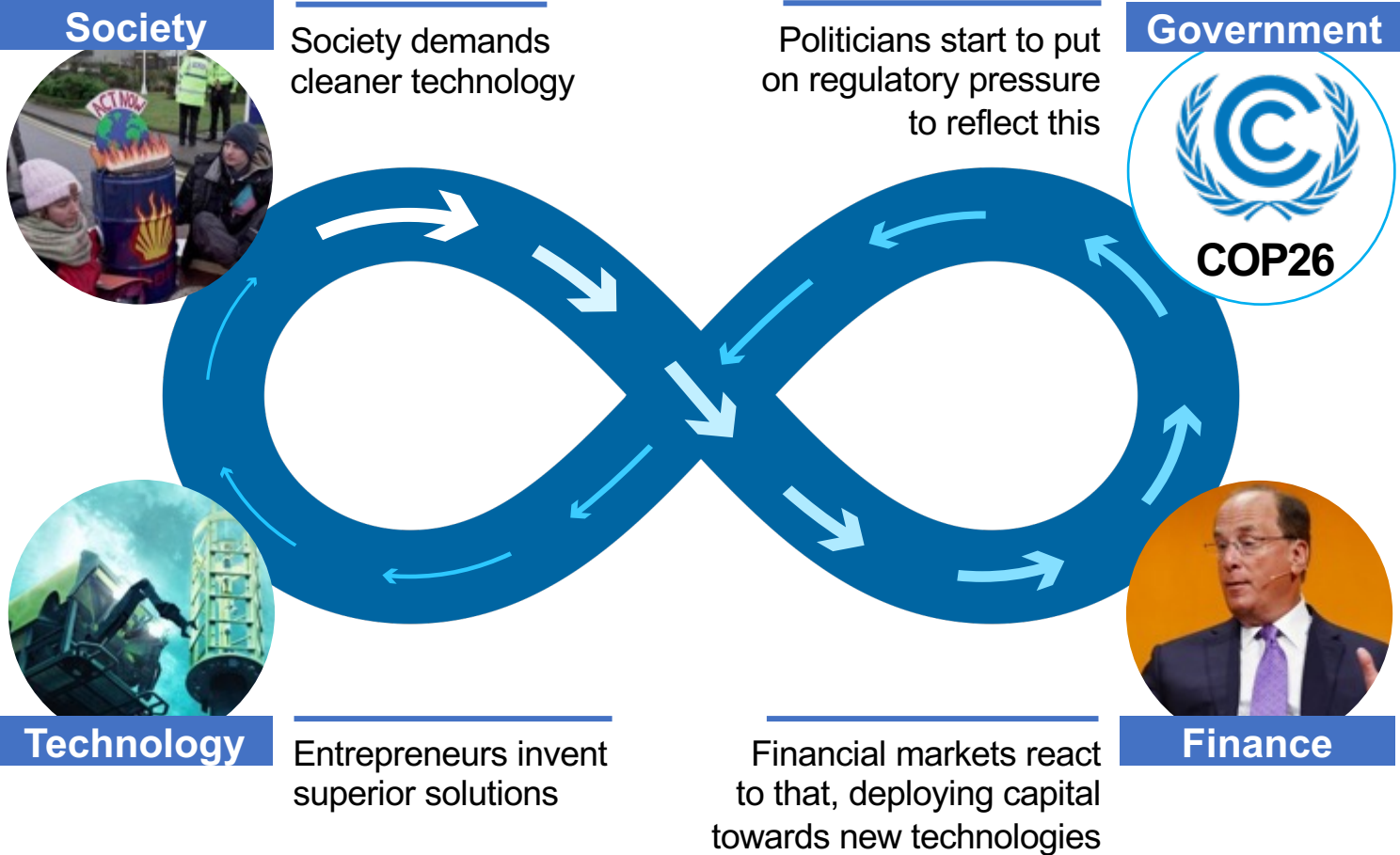
NDR and Energy Pathfinder providing transparency and visibility to unlock energy transition opportunities



# Leading with purpose



Oil & Gas Authority



**Climate change – Loss of Biodiversity – Social inequality**



**Unique opportunity post pandemic green and just recovery**



**Requires whole systems approach and down to all of us**

Modified from: World Economic Forum: The Speed of the Energy Transition



Oil & Gas  
Authority

# Thank you

---



# Living the Energy Transition, the greening of the North Sea

Michael Tholen – Sustainability Director

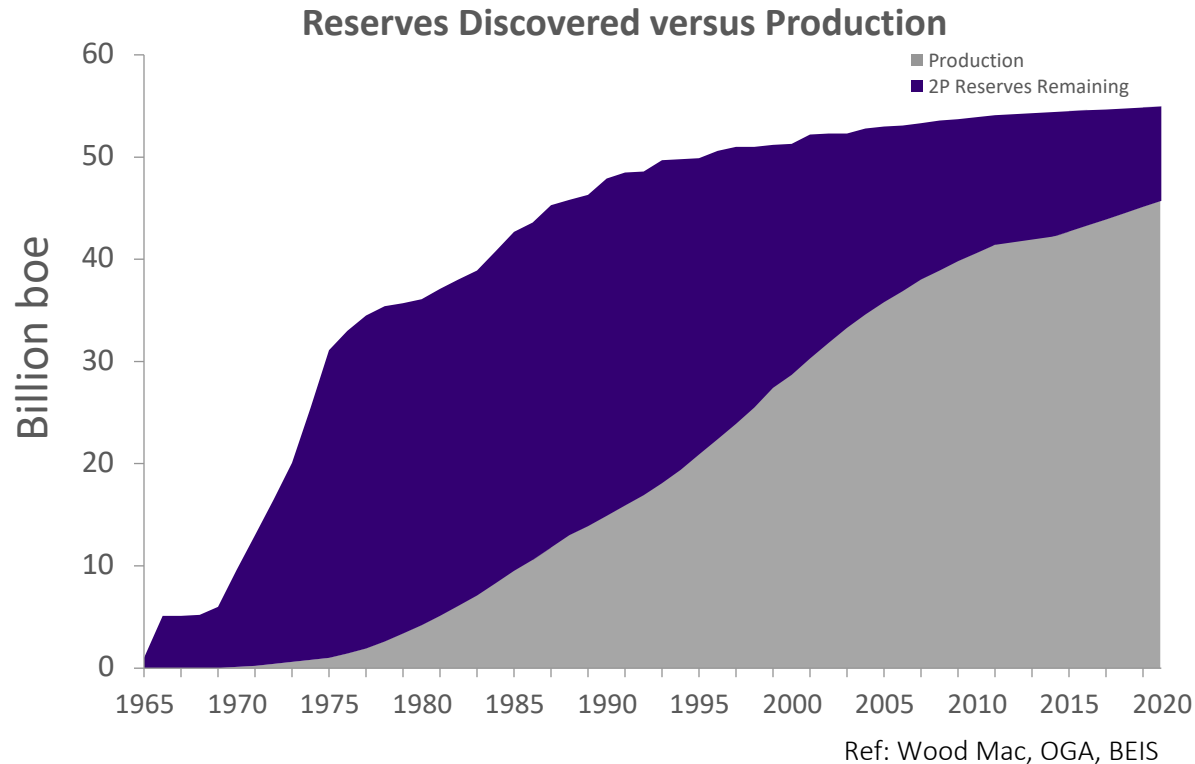
7 December 2021

# The future of the UKCS?

0.9 bln boe  
Consumption  
pa (UK)

0.57 bln boe  
Production  
UKCS in 2020

£14 bln  
Opportunities  
Awaiting  
Investment



46 bln boe  
Produced  
to-date

4.4 bln boe  
2P Reserves  
(1.1.21)

6.8 bln boe  
Contingent  
Resources  
(1.1.21)

3.7 bln  
(mean)  
Yet to Find



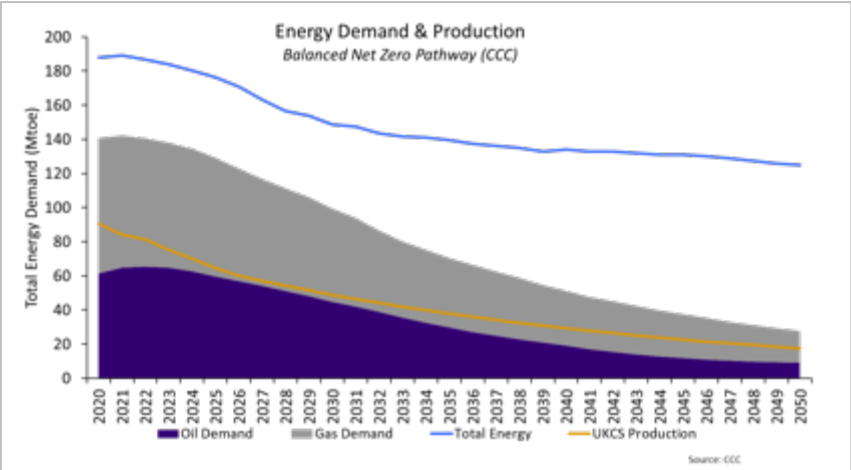
# Role of oil and gas in the UK's future

## Polarised debate



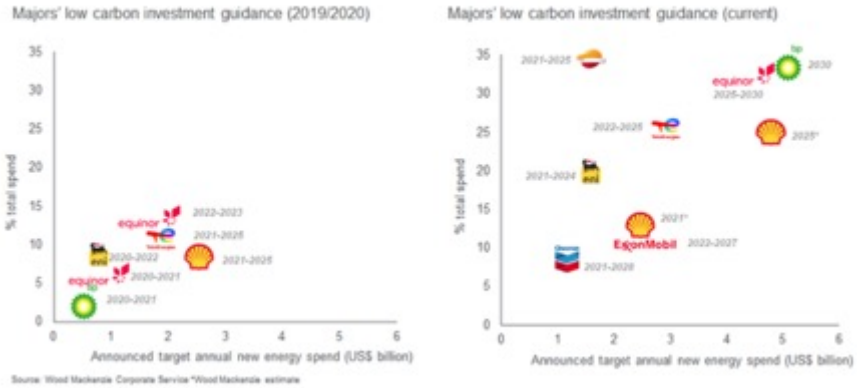
## UK is in unique position

Production forecasts are aligned to net-zero plans



## Majors expanding into new energy opportunities

Majors' spend on new energy has doubled in two years



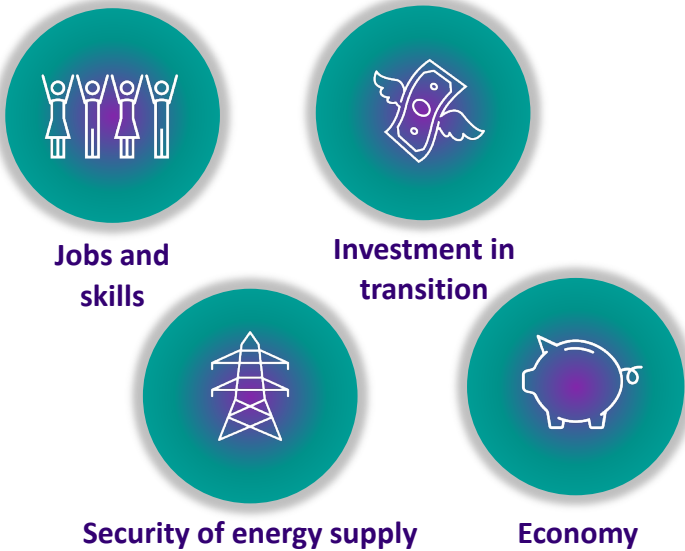
Source: Wood Mackenzie

## Industry acting to deliver transition

NSTD is a comprehensive plan of action, with Government support



The sector is important to:



# The North Sea Transition Deal - five commitments, that together align to create a transformative deal

***The North Sea Transition Deal***  
*is at the heart of UK energy policy. It will accelerate the energy transition, reduce UK emissions, and create new jobs across the UK*

- 60Mt reduction in UK GHG emissions by 2030
- £14-16 bln investment
- 40,000 new energy jobs
- +50% UK content inc. 30% local technology

The Deal will require an internationally competitive and level playing field as part of a broader energy framework



## **Supply Decarbonisation**

*cutting upstream Oil and Gas industry emissions through an ambitious production emissions reduction programme*



## **Carbon Capture & Storage**

*enabling large parts of UK industry and society to eliminate emissions*



## **Hydrogen**

*providing a realistic alternative for heating, heavy industry, and transport*

The above activities will be made reality by focussing on capabilities that underpin the growth of the UK economy



## **Supply Chain Transformation**

*Developing engineering, manufacturing, services and technology expertise to support the energy transition and create a globally competitive energy supply chain of international repute*



## **People & Skills**

*securing, stimulating, and creating tens of thousands of high quality jobs in industrial heartlands*

# The UK oil and gas sector is acting to reduce emissions and is on track to meet ambitious targets

## Methane Action Plan

- 50% methane emission reduction by 2030**  
Industry will halve methane emissions by 2030 (against a 2018 baseline) in accordance with overall emission reduction targets.
- UKCS methane intensity below 0.20% by 2025**  
Industry will adopt the 'stretch' OGCI methane intensity target of 0.20% by 2025 to drive short-term operational efficiency.
- Zero Routine Flaring before 2030**  
Industry will aim to meet the World Bank 'Zero Routine Flaring by 2030' initiative, with individual assets seeking to accelerate compliance where possible before 2030.
- Asset MAP**  
Operators will develop a Methane Action Plan for each individual asset by Q4 2022, including measurements and quantifications, flare and vent management plans, and abatement plans.
- Measuring methane**  
Operators will seek to validate methane quantification wherever practicable.
- International alignment**  
The industry will seek to align to international standards and reporting principles.

## Emissions Reductions Progress

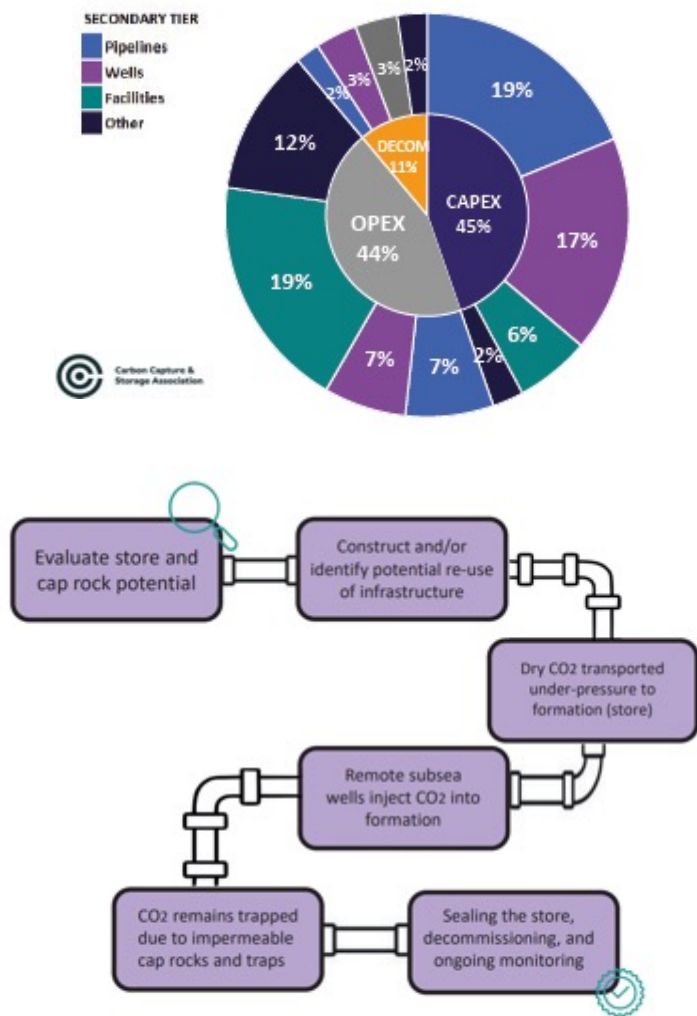


## Emissions Reductions Targets



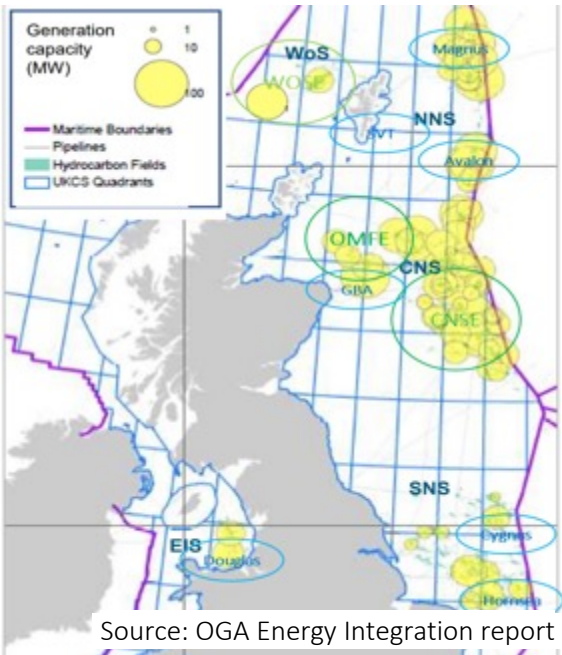


# Emerging opportunities – CCUS Opening up new avenues for exploration on the UKCS






# A wide range of electrification projects are being considered across UKCS cutting the emissions from oil and gas extraction

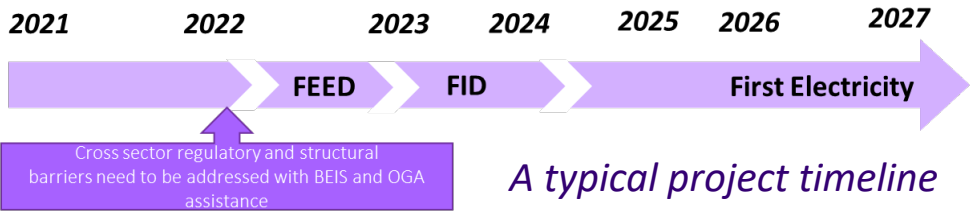
|                                |  |  |
|--------------------------------|--|--|
| Hub projects feeding clusters: | CNS-E  | <ul style="list-style-type: none"> <li>Reaching Concept/Select milestones</li> <li>Engaged with supply chain</li> </ul>                                  |
|                                | OMF-E formed   | <ul style="list-style-type: none"> <li>Maturing Integrated Concept with Wind Farm</li> <li>Engaging with supply chain</li> </ul>                         |
|                                | WoS-E  | <ul style="list-style-type: none"> <li>Working closely with Orion project</li> <li>Collectively engaged with CNS-E and OMF-E on common issues</li> </ul> |
| Independent regional projects: | <ul style="list-style-type: none"> <li>Ocean Wind</li> <li>CENOS</li> </ul>                | <ul style="list-style-type: none"> <li>Kellas</li> <li>Cerulean Wind</li> </ul>  |
| Standalone projects:           | <ul style="list-style-type: none"> <li>Cygnus</li> <li>Hornsea</li> <li>Douglas</li> </ul> | <ul style="list-style-type: none"> <li>Magnus</li> <li>Sullom Voe Terminal</li> <li>Avalon</li> <li>Greater Buchan Area</li> </ul>                       |



Whilst projects have specific issues, which will be worked on an ongoing basis, there is increasing commonality across projects, which we are looking to address on a unified basis. For example:

-  **Measures to achieve synergies with windfarms & timing of dedicated licence rounds e.g. INTOG**
-  **Opportunities to streamline infrastructure deployment and onshore access**
-  **Clarity on regulatory treatment e.g. “private wired arrangements” and power price**

## Industry are working with Government and Regulators to address the barriers to electrification



A typical project timeline

# OGUK

[www.oguk.org.uk](http://www.oguk.org.uk)  
[info@oguk.org.uk](mailto:info@oguk.org.uk)  
#OGUK

© 2021 The UK Oil and Gas Industry Association Limited, trading as OGUK



## Exploration and production in the North Sea: Reflections post-COP26

Arne Gürtner  
Senior Vice President  
Exploration and Production International UK



COP26





## Oil and gas in the North Sea

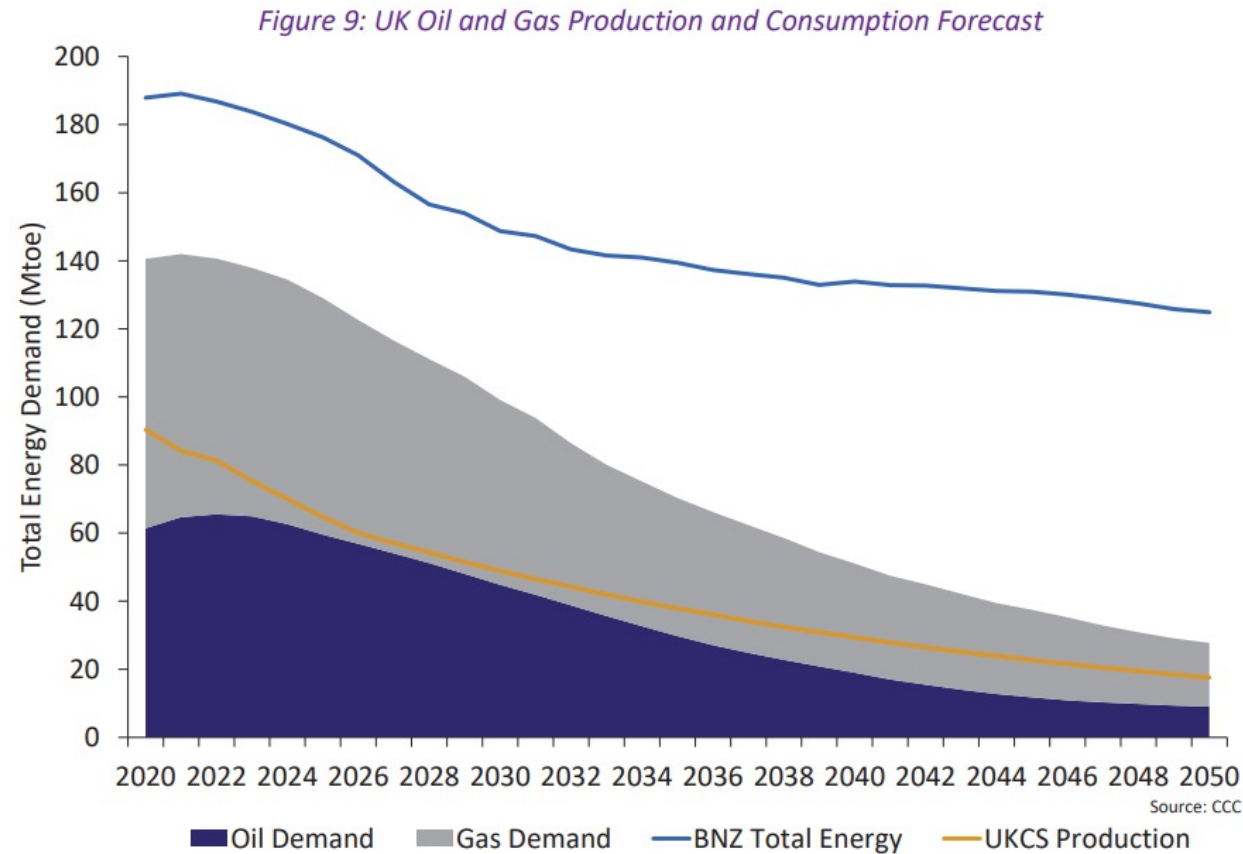
- 2015: one of the most active offshore drilling regions in the world
- UK estimated to consume 18.3 billion boe of oil and gas until 2050, with 45 per cent forecast to be met by ongoing production from the UKCS
- UK will import 36 per cent of its oil and 63 per cent of its gas requirements in 2050
- Norway total investments in oil and gas activity in 2022 estimated at NOK 154.4 billion (£12.8bn)
- In the UK, £3.7 billion was invested in 2020



Sources: CCC, Statistics Norway and OGUK  
Economic report 2021

# The role of oil and gas in the transition

Emission reductions will be driven by cuts in demand, not supply





## What is the industry doing?

- UKCS in decline, but oil and gas supply needed while the UK transitions to a net-zero carbon future.
- Reducing the emissions related to developing oil and gas
  - Flaring reduction
  - Decarbonising O+G production
  - Methane action plan
- Investing in low-carbon and renewable energy production
- UK on track to reduce emissions by 50% in 2030, and 90% by 2040





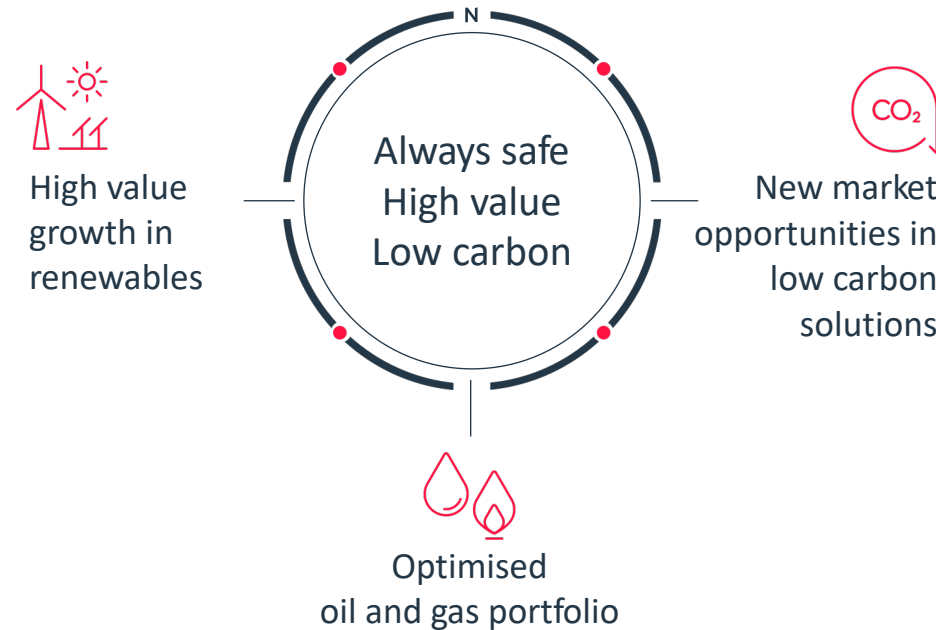
# Equinor: A leading company in the energy transition

Turning natural resources into energy for people, and progress for society





## Why we are changing

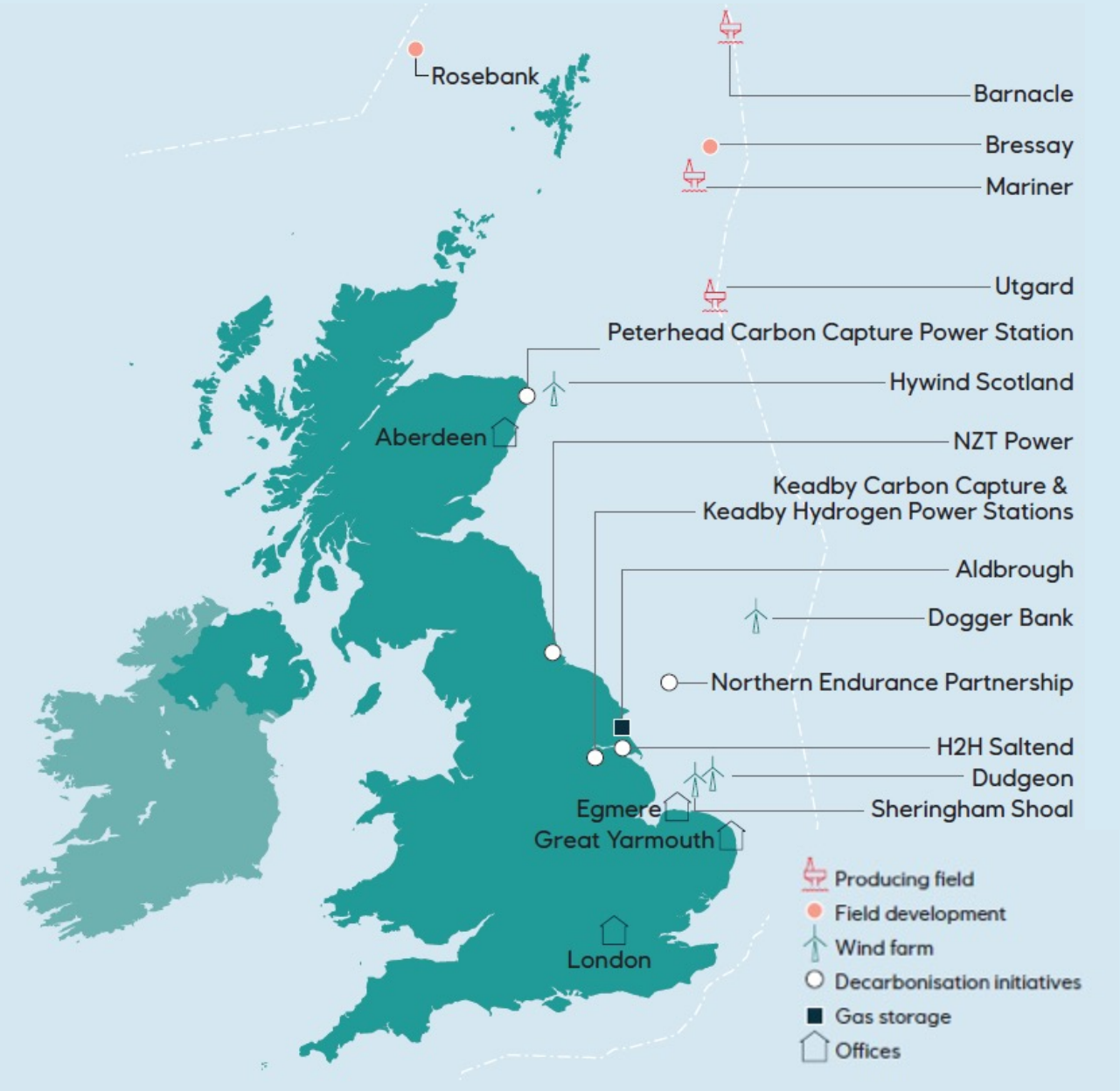
-  Creating value through the energy transition
-  Net-zero ambition gives new industry opportunities
-  Technology excellence and innovation define winners
-  Market dynamics set margins under pressure

## Accelerating our transition

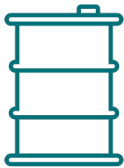


## How we will get there - together

-  Safe and secure operations
-  Guided by our values
-  Building on competencies and our experience
-  Together as one team – engaging partners and society



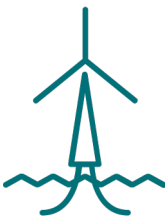
Providing local jobs



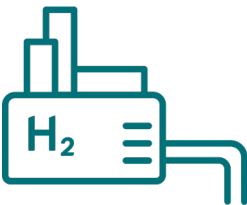
Supplying UK with oil and gas



Developing domestic energy supplies



Investing in renewables

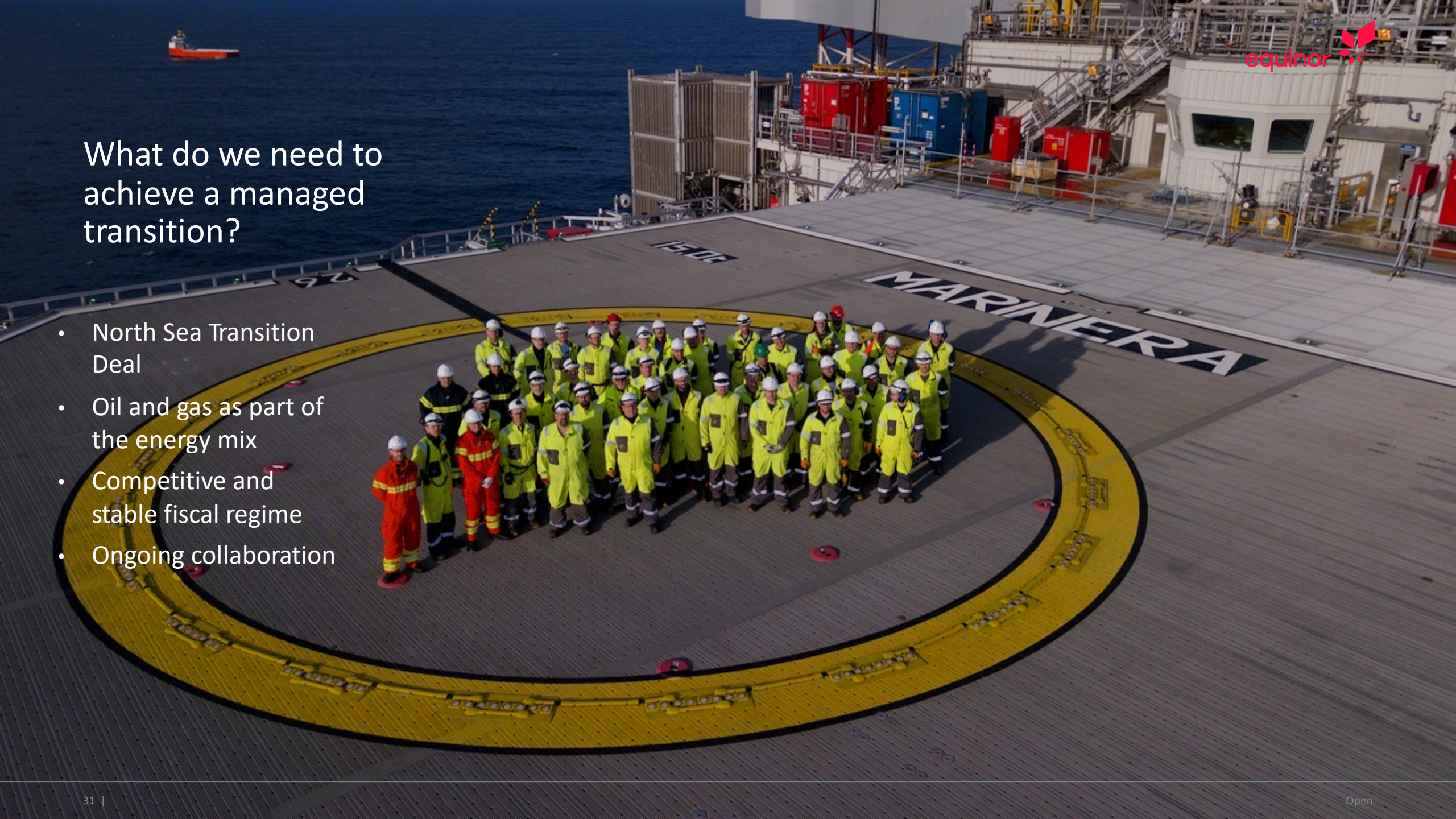


Reducing emissions through low carbon projects such as Hydrogen and CCS



# What do we need to achieve a managed transition?

- North Sea Transition Deal
- Oil and gas as part of the energy mix
- Competitive and stable fiscal regime
- Ongoing collaboration







equinor

# Exploration and production in the North Sea: Reflections post-COP26

Arne Gürtner

Senior Vice President

Exploration and Production International UK



wood.

# Net Zero Decommissioning: Making it a Reality

WEF: Transitioning the Upstream

Dr Minnie Lu, Decommissioning Director, Wood

7 December 2021



An offshore oil rig is silhouetted against a vibrant sunset sky with orange and red clouds. The rig is located in the lower-left portion of the frame, with its lights glowing. The rest of the image is dominated by the large white text overlay.

**Our challenge is not to  
consider the possibilities of  
a net-zero decommissioning  
era, but to make it a reality.**

# Our decommissioning imperatives

**Integrate decarbonisation into decommissioning design and engineering**



**Repurpose assets and infrastructure to decarbonise industry and maintain energy security**





# Decarbonising the decommissioning process

**Reduce the carbon intensity of late life production**

**Evaluate the carbon intensity of decommissioning activities**

**Commit to a strategy that puts carbon emission reductions front and centre**



# Repurposing assets and infrastructure

**Re-use and repurpose infrastructure for CCS and hydrogen production:**  
**decarbonise industrial clusters**

**Repurpose offshore infrastructure, platforms and cables:**  
**unlock platform electrification**

**Re-use components and equipment before recycling or disposal:**  
**promote a circular economy**

# And we're not starting from scratch...

## Jacky

Enabling net-zero decommissioning with installment of the North Sea's first integrated wind & solar energy pod providing 100% of load requirements through to removal

## Hynet

Consenting and FEED for the UK's first hydrogen distribution pipeline infrastructure, leveraging the Liverpool Bay oil and gas fields and related infrastructure

## Acorn

Supporting the FEED for the Acorn project, set to capture carbon at the St Fergus gas terminal and use existing infrastructure to transport and store it under the sea

An offshore oil rig is silhouetted against a vibrant sunset sky with orange and red clouds. The rig is located in the lower-left portion of the frame, with its lights glowing. The text is overlaid on the right side of the image.

**Our challenge is not to  
consider the possibilities of  
a net-zero decommissioning  
era, but to make it a reality.**

**wood.**



WESTMINSTER  
ENERGY FORUM



Freshfields Bruckhaus Deringer

OGUK



[www.westminsterenergy.org](http://www.westminsterenergy.org)

# Futures for Oil & Gas, CCUS & Hydrogen

## *Transitioning the UK Upstream*

0915-1300hrs, Tuesday 7th December 2021

Andy Samuel, CEO, **Oil & Gas Authority**

Mike Tholen, Director of Sustainability, **OGUK**

Arne Gurtner, Senior VP UK & I – E&P, **Equinor**

Minnie Lu, Director of Decommissioning, **Wood**

Mark Wilkie, Carbon Management Director, **Gaffney Cline**

Sophia Northridge, Head of CCUS Transport & Storage Strategy, **BEIS**

Christian Fjell, Director, **Altera Infrastructure**

Guy Philips, Business Development Manager, **Uniper**

Ross Glover, Development Director, **IGas Energy**

[www.westminsterenergy.org](http://www.westminsterenergy.org)

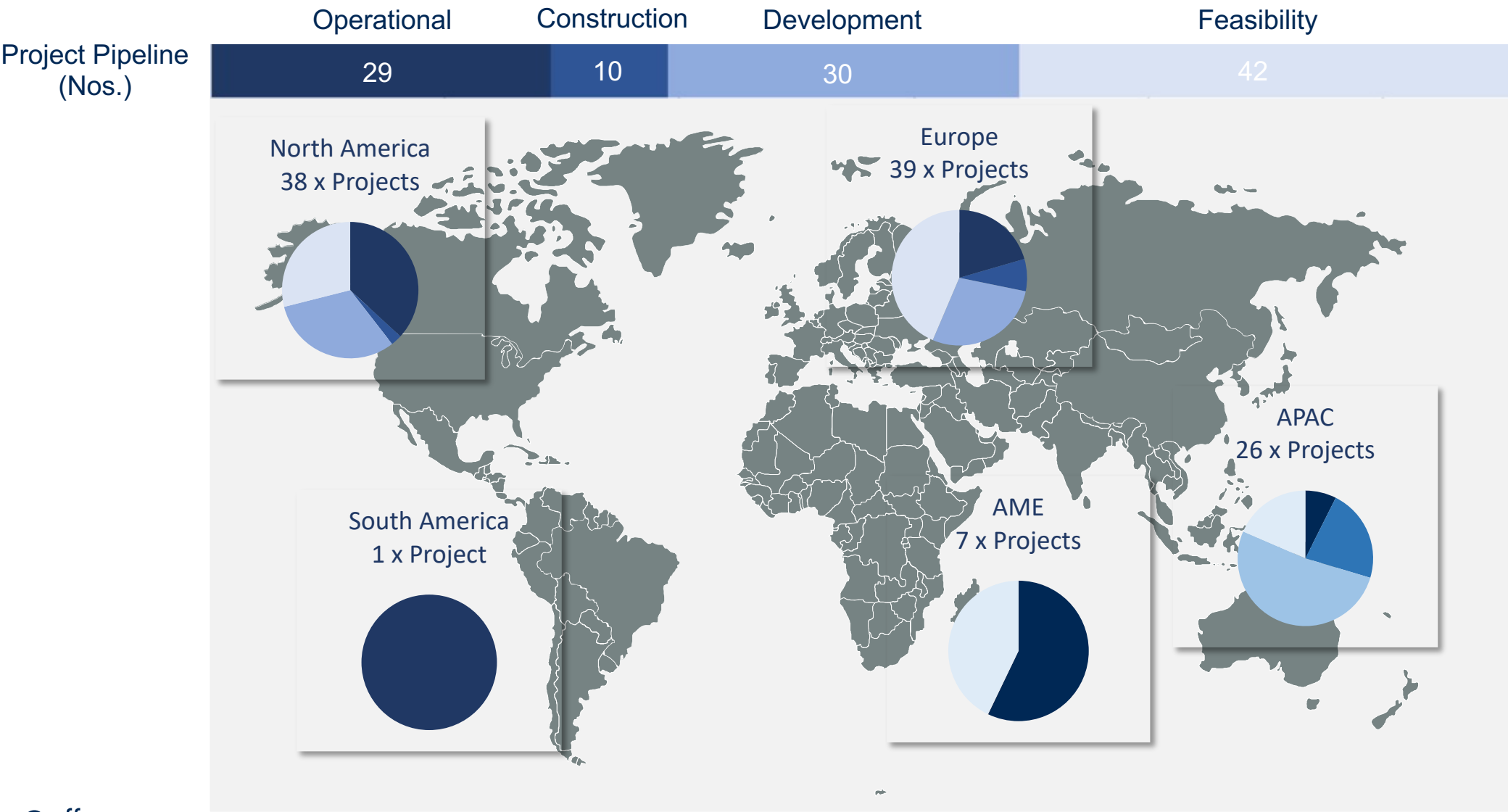
wood.



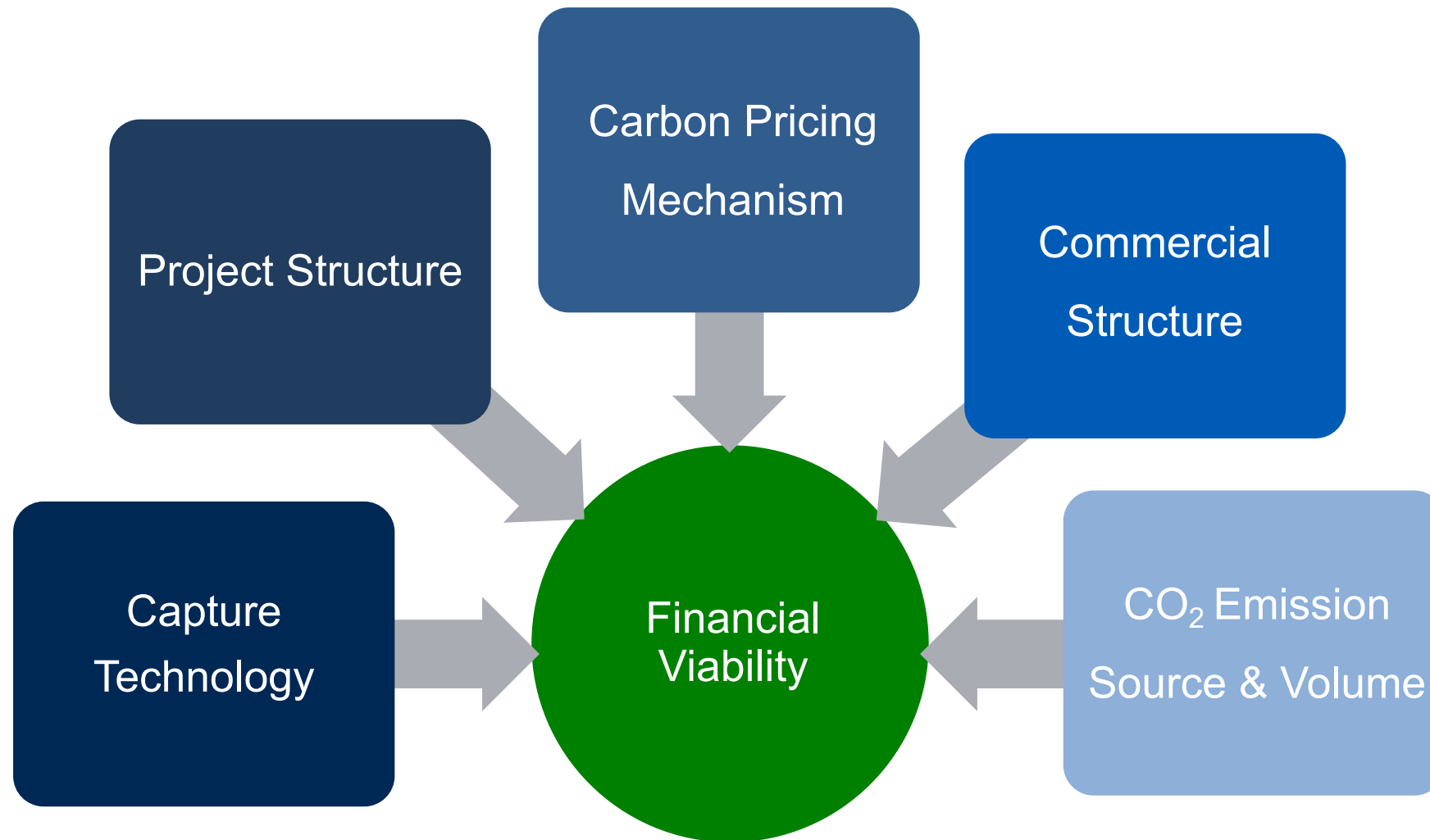
# Essential Elements for Investment in CCUS

7 December 2021

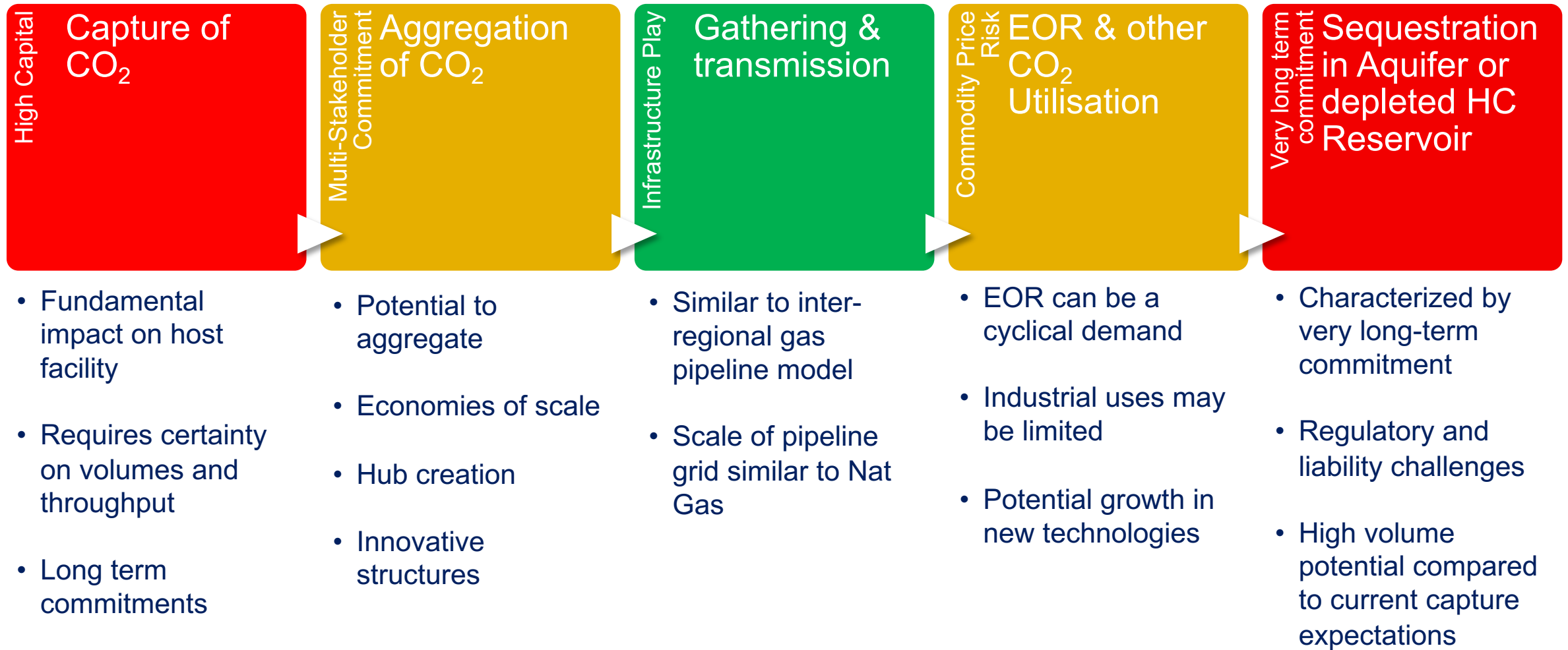
# Emerging Global CCUS Project Pipeline



# Key Sensitivities to Financial Viability



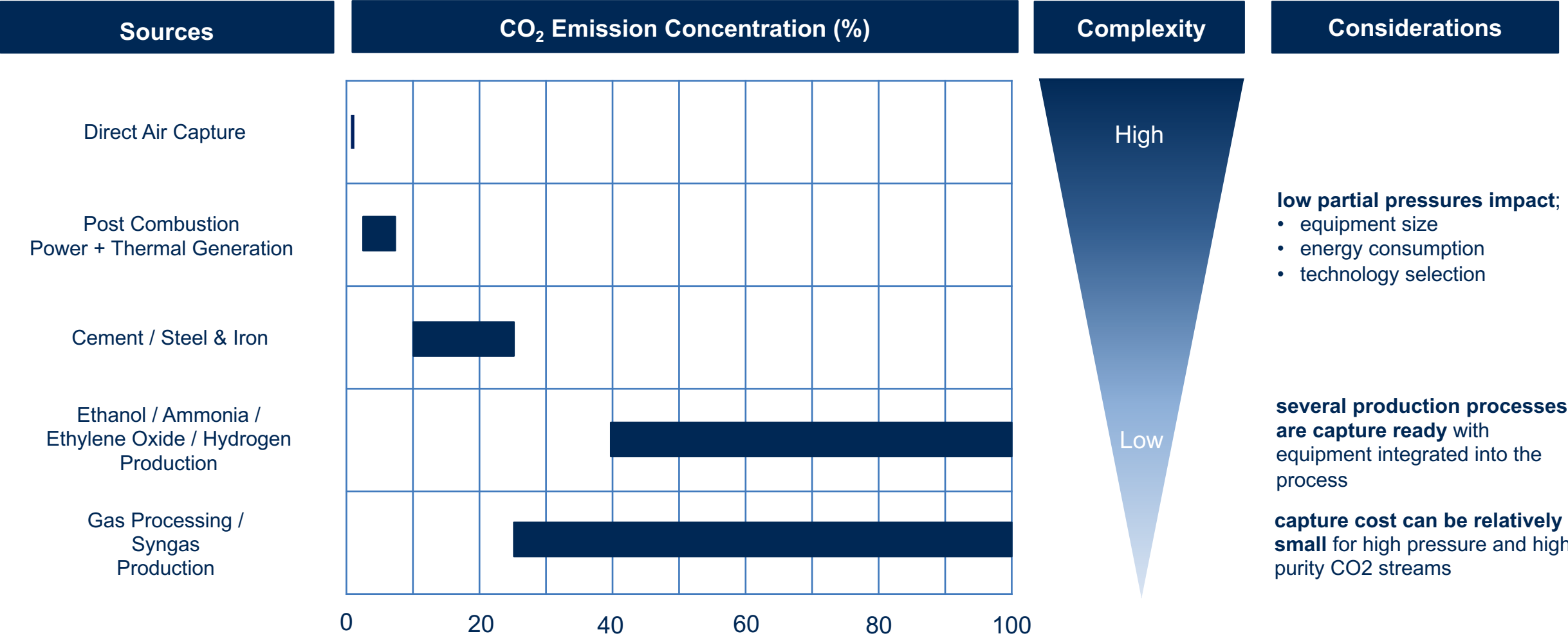
# Emerging Business Models Along CO<sub>2</sub> Value Chain



Investor Risk: ■ Low ■ Medium ■ High

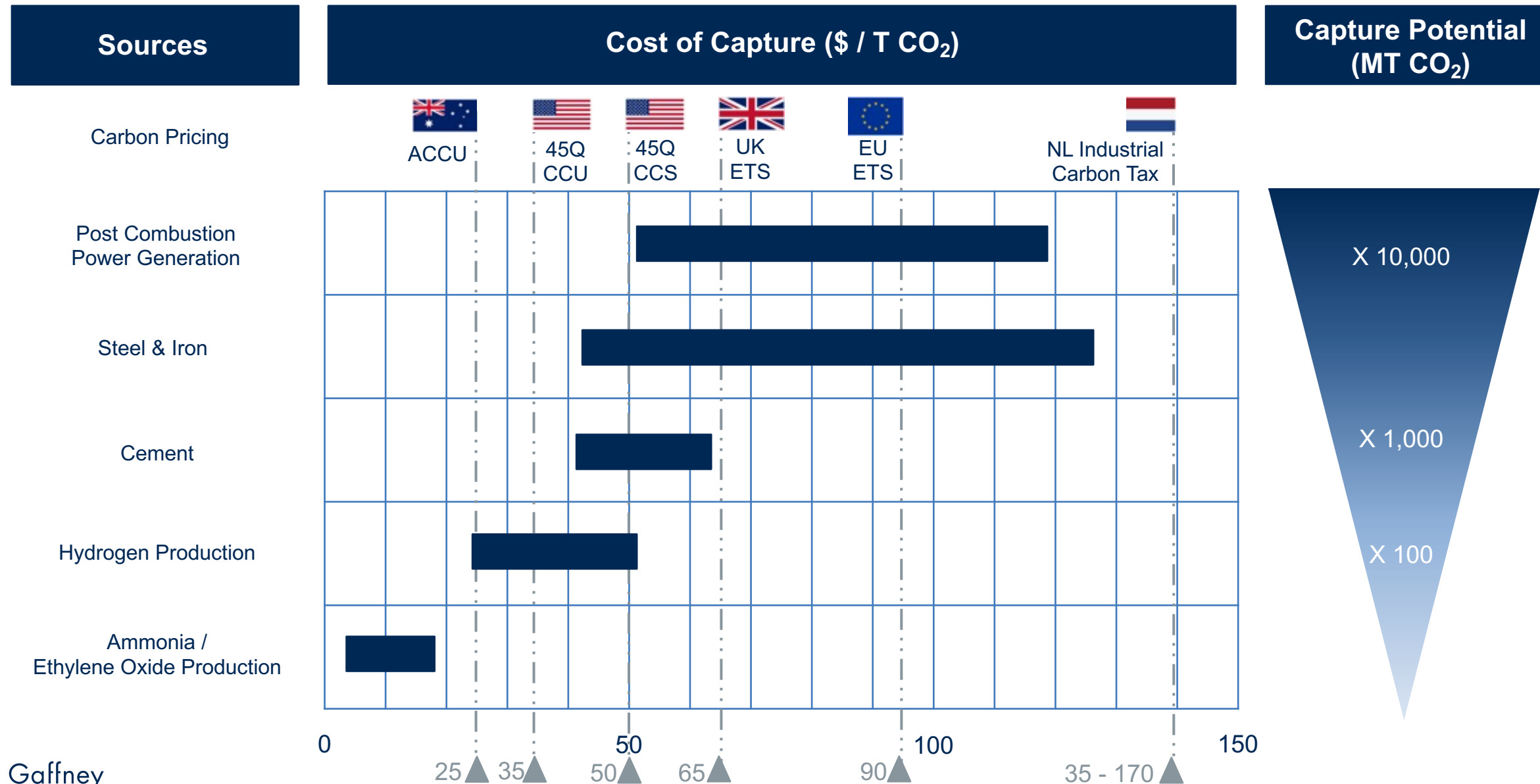
# Emitter Source Profiles

capture cost is largely driven by emission stream pressure + CO<sub>2</sub> concentration

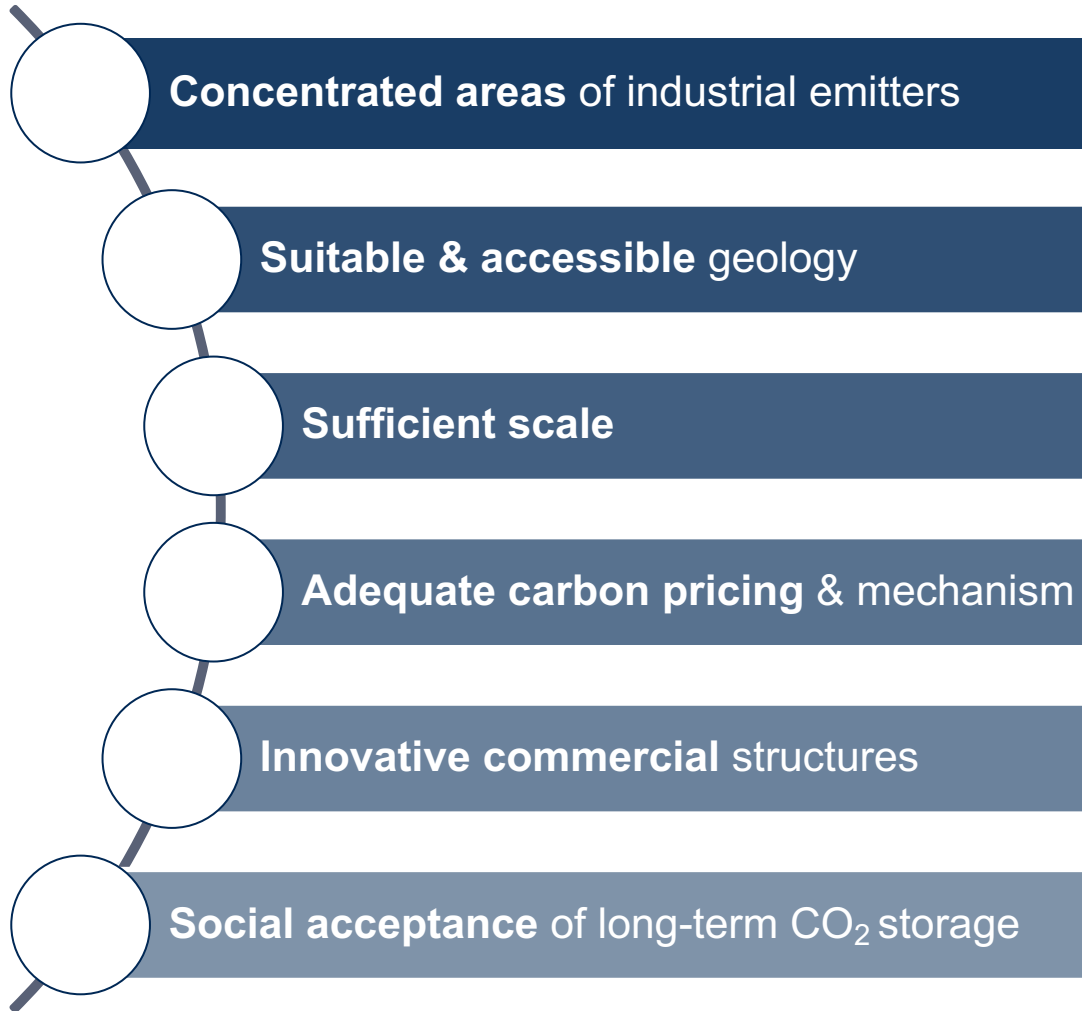




# CO<sub>2</sub> Capture Potential Sensitivity to Carbon Price



# Essential Elements for Investment in CCUS



# Gaffney Cline

[mark.wilkie@gaffneycline.com](mailto:mark.wilkie@gaffneycline.com)



---

# Government CCUS Deployment Strategy and Upstream sector integration

Dr Sophia Northridge  
Head of CCUS Transport & Storage Strategy

Transitioning the Upstream – the Future of Oil & Gas, CCUS & Hydrogen





### November 2020

- Ten Point Plan for a green Industrial Revolution

### December 2020

- Energy white paper: Powering our net zero future
- Carbon Capture, Usage, and Storage (CCUS) Business Models

### February 2021

- CCUS Cluster Sequencing Consultation

### May 2021

- Carbon Capture, Usage, and Storage (CCUS) Business Models
- Carbon capture, usage and storage (CCUS) supply chains: a roadmap to maximise the UK's potential
- Design of the Carbon Capture and Storage (CCS) Infrastructure Fund
- Cluster sequencing for carbon capture, usage and storage (CCUS) deployment: Phase-1

### July 2021

- Carbon capture, usage and storage: amendments to Contracts for Difference regulations.

### August 2021

- Carbon capture, usage and storage (CCUS): offshore decommissioning regime for CO2 transport and storage
- Carbon capture, usage and storage (CCUS): duties and functions of an economic regulator for CO2 transport and storage
- Hydrogen Business Model Consultation

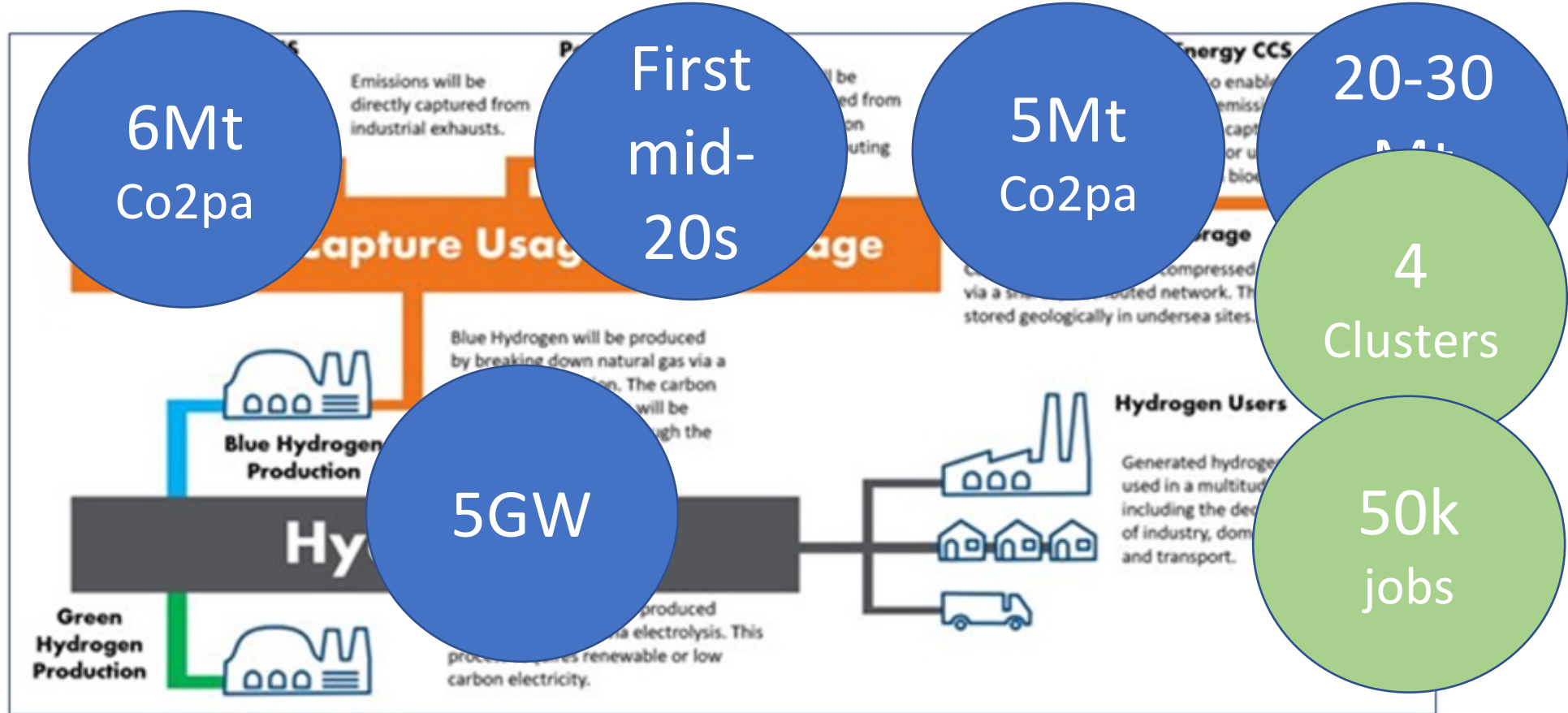
### October 2021

- Carbon capture, usage and storage (CCUS): business models
- Net Zero Strategy: Build Back Greener
- Cluster Sequencing Announcement

### November 2021

- Update on Track-2 process
- Cluster sequencing for carbon capture, usage and storage (CCUS) deployment: Phase-2
- Carbon capture, usage and storage (CCUS): ICC and DPA business models update
- Design of the Carbon Capture and Storage (CCS) Infrastructure Fund





# North Sea Transition Deal



The main commitments of the North Sea Transition Deal are:

- **Emissions reduction targets:** 10% by 2025, 25% by 2027, 50% by 2030, 90% by 2040.
- **Deliver investment** of up to £14-16bn by 2030 into new energy technologies.
- **50% local UK content across the lifecycle for all related new energy transition projects and decommissioning by 2030.**
- **60Mt reduction in greenhouse gas emissions**, including 15Mt through the decarbonisation of UKCS production **by 2030.**
- **Supporting up to 40,000 direct and indirect supply chain jobs** in decarbonising UKCS production and the CCUS and hydrogen sectors.
- **Government investment of £6.3 million in the Global Underwater Hub, and a further £2 million to implement the Deal.**

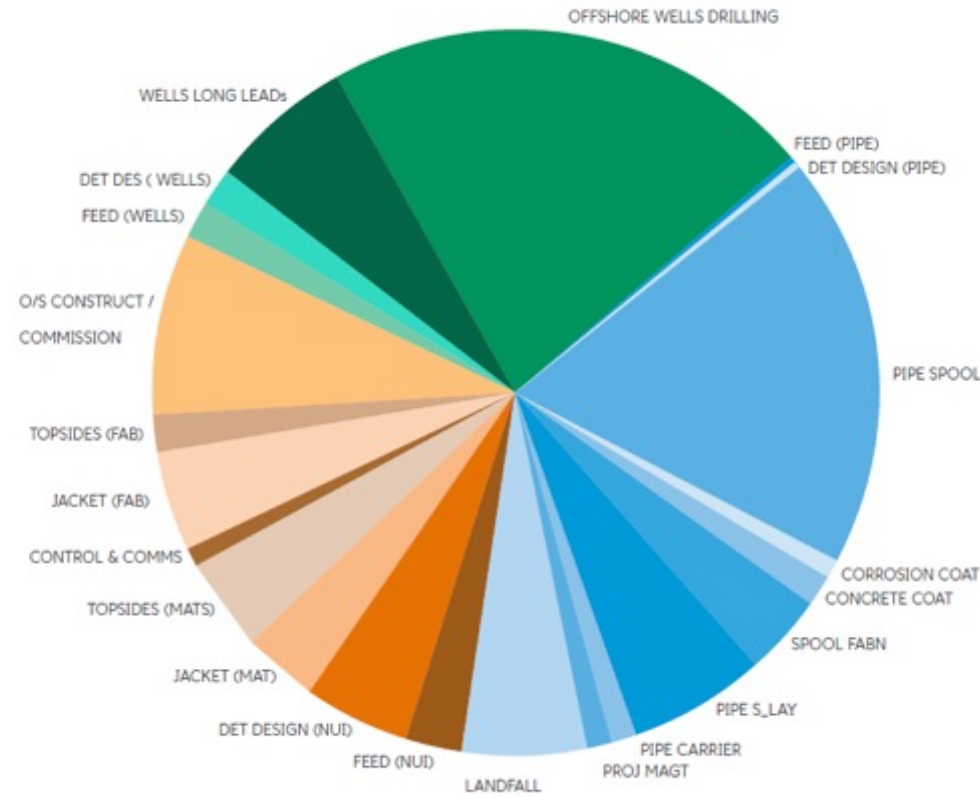
# Cost Breakdown of Single Store

From CCSA's Supply Chains Excellence for CCUS report, 2021

Pipe activity – blues

Platforms – oranges

Wells – greens

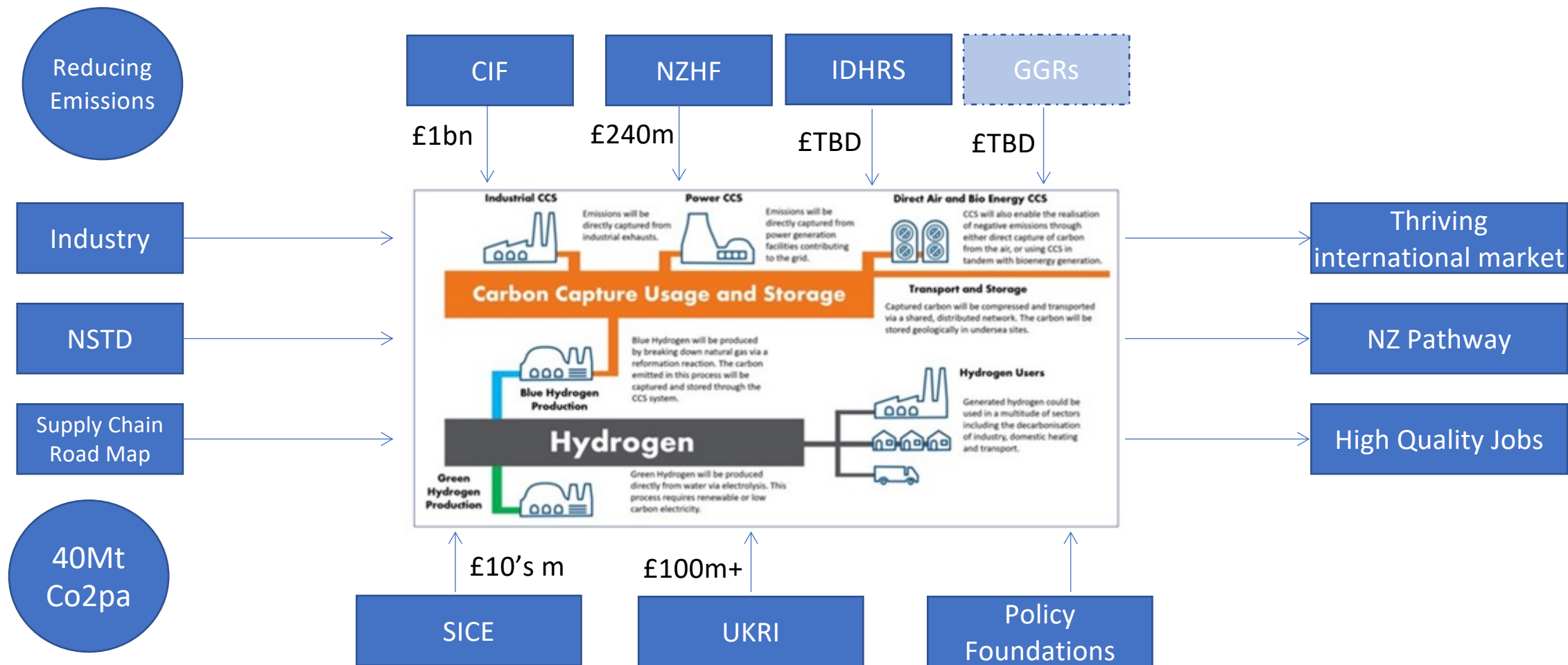


Transitioning the UK's Oil and Gas Sector 28/07/2021

**Total 2017 cost: £357m**

| Cost £m 2017              |             |
|---------------------------|-------------|
| Feed (Pipe)               | 0.845       |
| Det Design (Pipe)         | 1.56        |
| Pipe Spool                | 65.6        |
| Corrosion Coat            | 2.925       |
| Concrete Coat             | 4.55        |
| Spool Fabn                | 12.91875    |
| Pipe S_Lay                | 21.9375     |
| Pipe Carrier              | 3.9         |
| Proj Magt                 | 4           |
| Landfall                  | 20.3125     |
| Feed (NUI)                | 8.45        |
| Det Design (NUI)          | 16.9        |
| Jacket (MAT)              | 11.57       |
| Topsides (MATS)           | 14.95       |
| Control & Comms           | 3.12        |
| Jacket (Fab)              | 16.25       |
| Topsides (Fab)            | 5.46        |
| O/S Construct/ Commission | 28.6        |
| Feed (Wells)              | 6.283333333 |
| Det Design (Wells)        | 6.283333333 |
| Wells Long Leads          | 22.36       |
| Offshore wells drilling   | 78          |





Transitioning the Upstream – the Future of Oil & Gas, CCUS & Hydrogen

# Large Scale CCS infrastructure

Westminster Energy Forum – December 7th 2021

---

**Christian Fjell**

Director, Sustainability – Altera Infrastructure

---



**The  
Stella Maris CCS  
Project**



# Höegh LNG and Altera at a glance

## Altera

24

Shuttle  
Tankers

9

FPSO

&

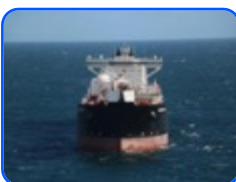
3

FSO

10

Towing  
Vessels

- Industry leader and pioneer in harsh weather FPSOs
- Industry leader and market segment developer of Dynamically Positioned Shuttle Tankers
- 30+ years of experience



## Höegh

10

FSRU

&

2

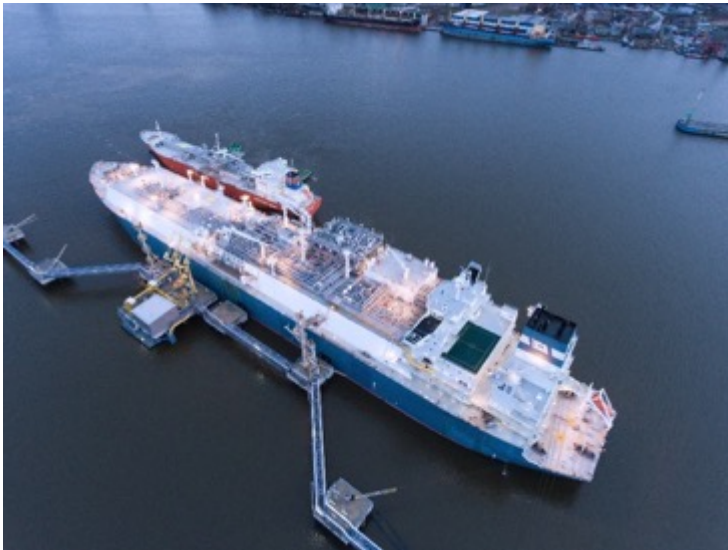
LNGC



- Industry leader in the FSRU market
- 45+ years of gas handling experience
- Developend floating LNG import terminals worldwide
- Part owner & ship managmmnt of small LNG carrier fleet

**Our collective competence and experience in these three industry segments makes us unique and puts us in a stellar position to lead our industry to a sustainable CCS future.**

# Offshore CO2 transport, injection and storage - FPSO, shuttle and FSRU business “in reverse”



Collection, Processing and Export



Transport and DP offloading



Offshore Injection and storage

## O&G competence used to realize CCS



# Stella Maris –Think Big

To get CCS costs down, large scale flexible solutions are required!

10 Mt CO<sub>2</sub> / year

Infrastructure will include:

- Carbon Collection Storage Offloading units (2-3) to be located at key location(s) as export hubs
  - Capable of receiving various grades of CO<sub>2</sub> from multiple emitters
- A fleet of large CO<sub>2</sub> shuttle carriers (3-4)
  - 50 000m<sup>3</sup> – low pressure tanks
- Offloading and continuous injection of CO<sub>2</sub> offshore
- Zero emission capable
- Scalable Worldwide – design one – build many
- Solution deployed for large scale emitters, clusters and/or nation states in 2025
- One stop-shop from collection to storage
- Cooperate close with industry and policy makers nationally and internationally

## Infrastructure/ownership



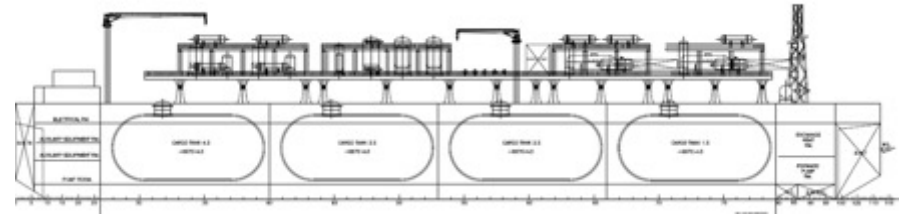
## Industrial partners



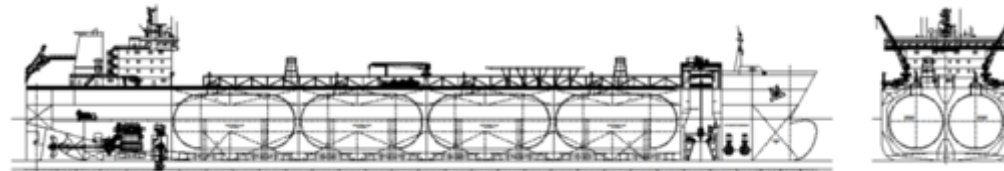
# And for the Engineers in the audience

This is how the assets looks on the drawing board.

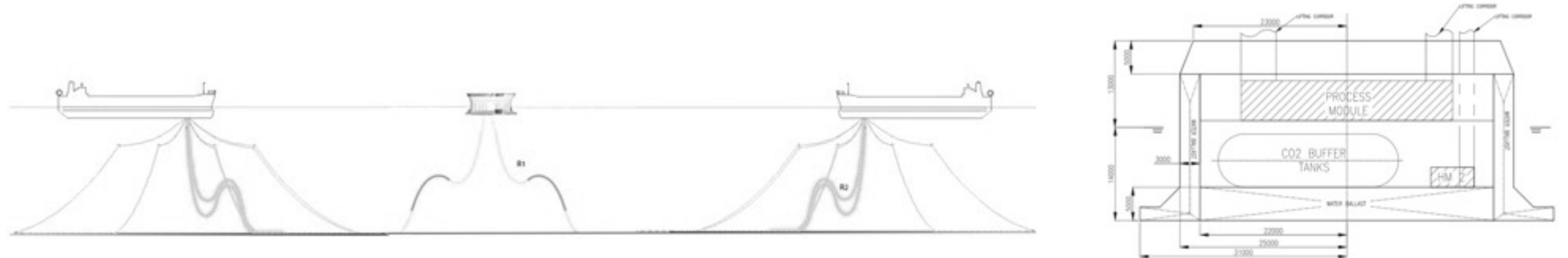
HUB



Transport



Injection

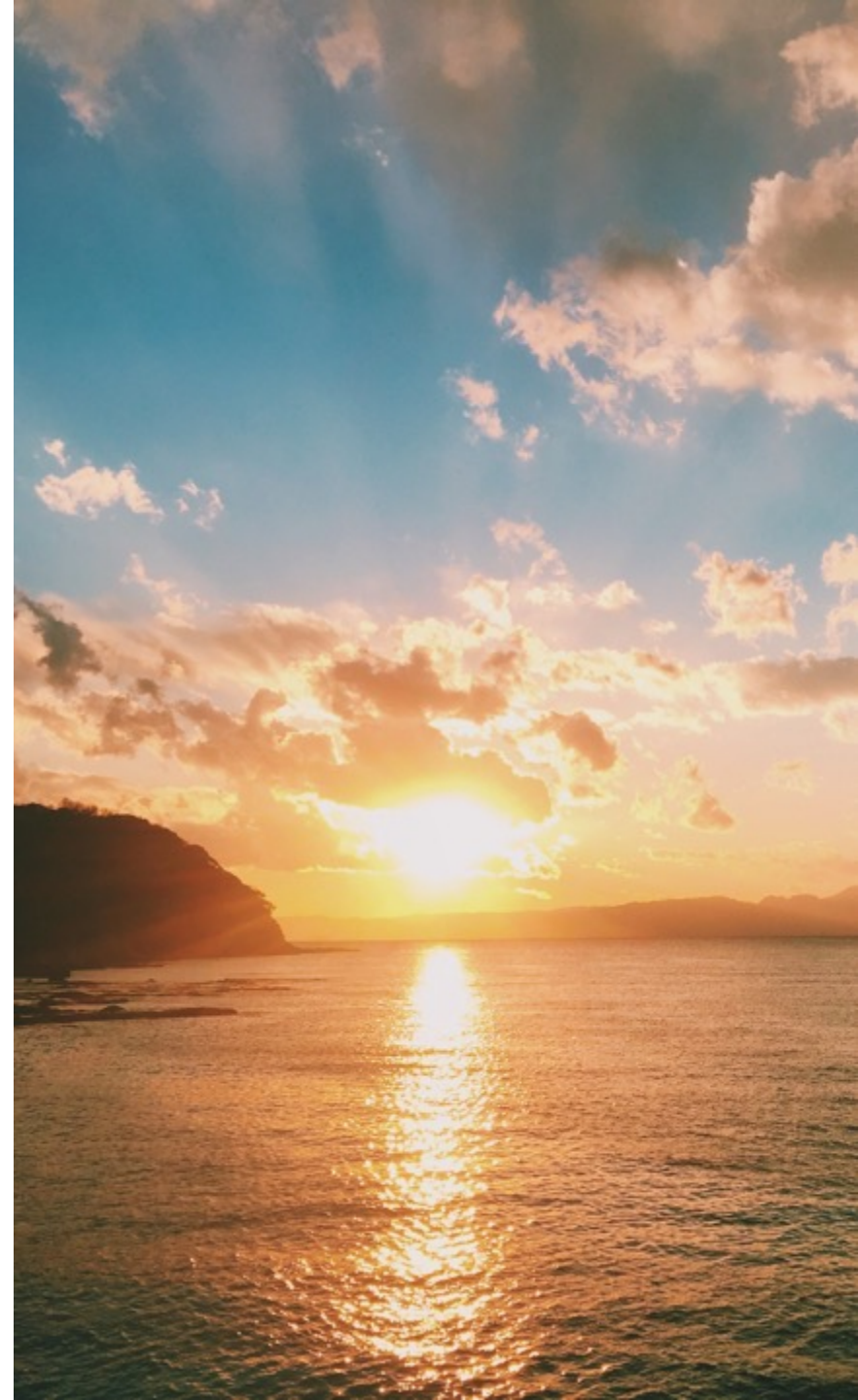




# Opportunities for large scale CCS in UK

Utilizing Maritime solutions can:

- Increase resilience of UK Pipeline based projects.
- UKCS has a competitive advantage for receipt of international CO2 volumes.
- Cost effective enabler for emitters outside the scope of current cluster developments.
- Rapidly accelerate CCS capability



# What is needed?

Development of business models that accommodate maritime (NPT) solutions.

Clarity around the Regulatory Framework for licensing of storage sites.

Early commitment to international agreements facilitating cross border transportation and storage.

Access rights to cluster infrastructure.





# Stella Maris – Large Scale, Flexible, Scalable Maritime CO<sub>2</sub> Logistics Solution

## The CCS industry challenge is best solved in partnership

During the next year we will;

- finalize technical concept for the Stella Maris logistical solution
- establish cooperation & partnerships to deliver Stella Maris
- market our solution to individual companies, industry clusters and national authorities
- Become a one-shop-stop provider of a competitive and cost-efficient CO<sub>2</sub> solution from collection to storage.





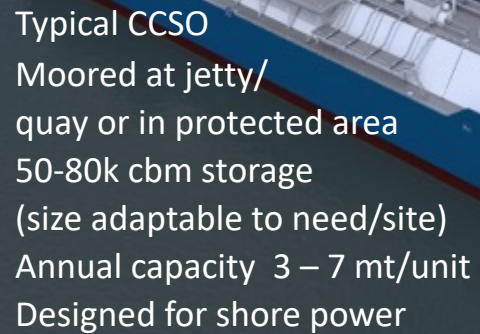
**The  
Stella Maris  
Project**



# Detailed Overview of Stella Maris

# Barriers for realizing large scale CCS

| Barriers  | Proposed Solution   |
|---|---|
| High cost of capturing and conditioning for emitters  | Centralizing conditioning of CO2 in a Carbon Collection Storage and Offloading (CCSO) hub – More flexibility on-site capture design |
| High logistics costs  | Hub and spoke approach – collecting smaller volumes, and gathering and conditioning for large scale transfer to offshore reservoir  |
| High cost of land use (regional variance), and size restriction of large vessels in various ports | CCSO Hub can be floating  |
| Availability, cost and capacity of pipeline infrastructure  | Maritime transport  |
| CO2 Transport condition in large quantities   | Low pressure CO2 tanks  |
| Maintaining continuous reservoir injection  | Offshore intermediate buffer storage by optimising use of the CO2 carriers.   |



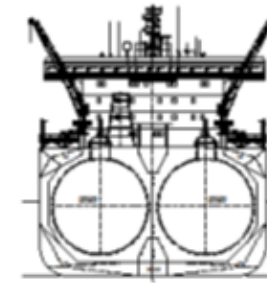
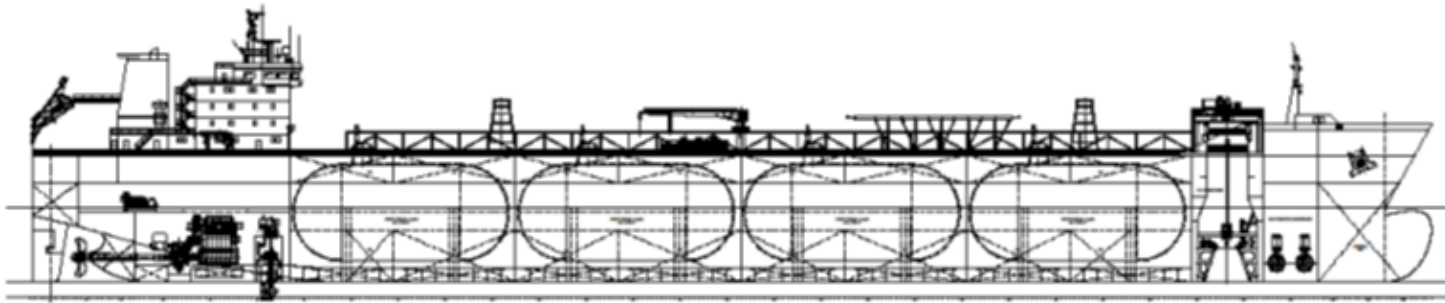
- High- & low-pressure gas from pipelines
- Medium & low-pressure liquid from trucks, rail, ships, barge
- Various qualities with different levels of impurity

|              |       |
|--------------|-------|
| Length o.a.  | 220m  |
| Breath (M)   | 58m   |
| Depth (M)    | 24,5m |
| Design Draft | 13m   |

|              |       |
|--------------|-------|
| Length o.a.  | 220m  |
| Breath (M)   | 58m   |
| Depth (M)    | 24,5m |
| Design Draft | 13m   |



# CO2 Shuttle Carriers



## Principal dimensions:

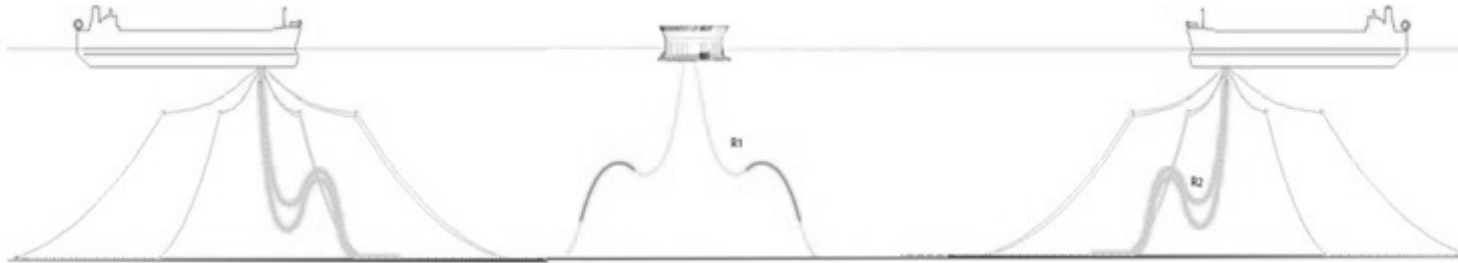
|               |         |
|---------------|---------|
| Length o.a:   | 238m    |
| Breadth (M):  | 38m     |
| Depth (M):    | 22m     |
| Design draft: | 13m     |
| Cargo cap:    | 50k cbm |

- New, state of the art CO2 shuttle carrier design
  - 50,000 cbm - low pressure tanks
  - CO2 stored and transported as liquid at 6,5 barg & -47°C
  - Zero emission capable
  - Electric Power distribution
  - Battery hybrid installation
  - LNG/Bio gas as fuel (base case)
- Optional:
- Size to meet needs
  - Direct injection capability

## Key Innovations

- Low pressure CO2 tanks
- Dynamically positioned CO2 carrier
- Equipment for offshore loading of CO2
- Power Source for injection unit

# Floating Injection Unit (FIU)



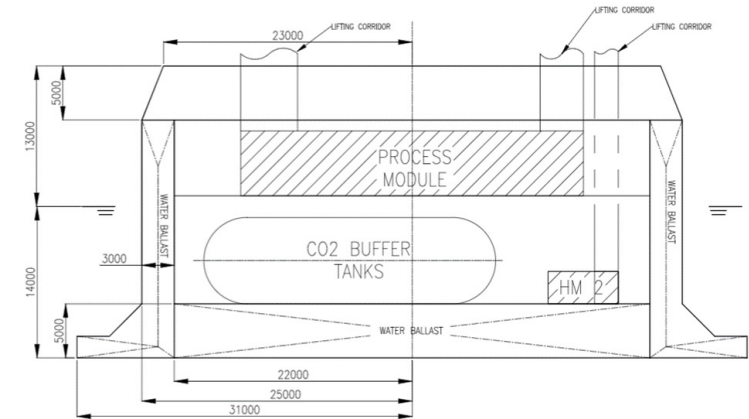
- Allows continuous injection
- Heating and injection modules below deck
- Power from Shuttle carrier (+ battery back-up)
- Unmanned and operations from shore, communication via shuttle carrier
- CO<sub>2</sub> heated and injected into reservoir in dense phase (>5°C & 65 -160 barg)

## Principal dimensions:

|                     |     |
|---------------------|-----|
| Hull Diameter       | 50m |
| Bilge Box diameter: | 62m |
| Main Deck diameter  | 50m |
| Hull Depth:         | 22m |
| Design draft:       | 13m |
| Draft loaded        | 14m |

## Alternatives:

- Injection facilities on an existing offshore installation or on new fixed offshore structure
- Direct injection from shuttle carrier

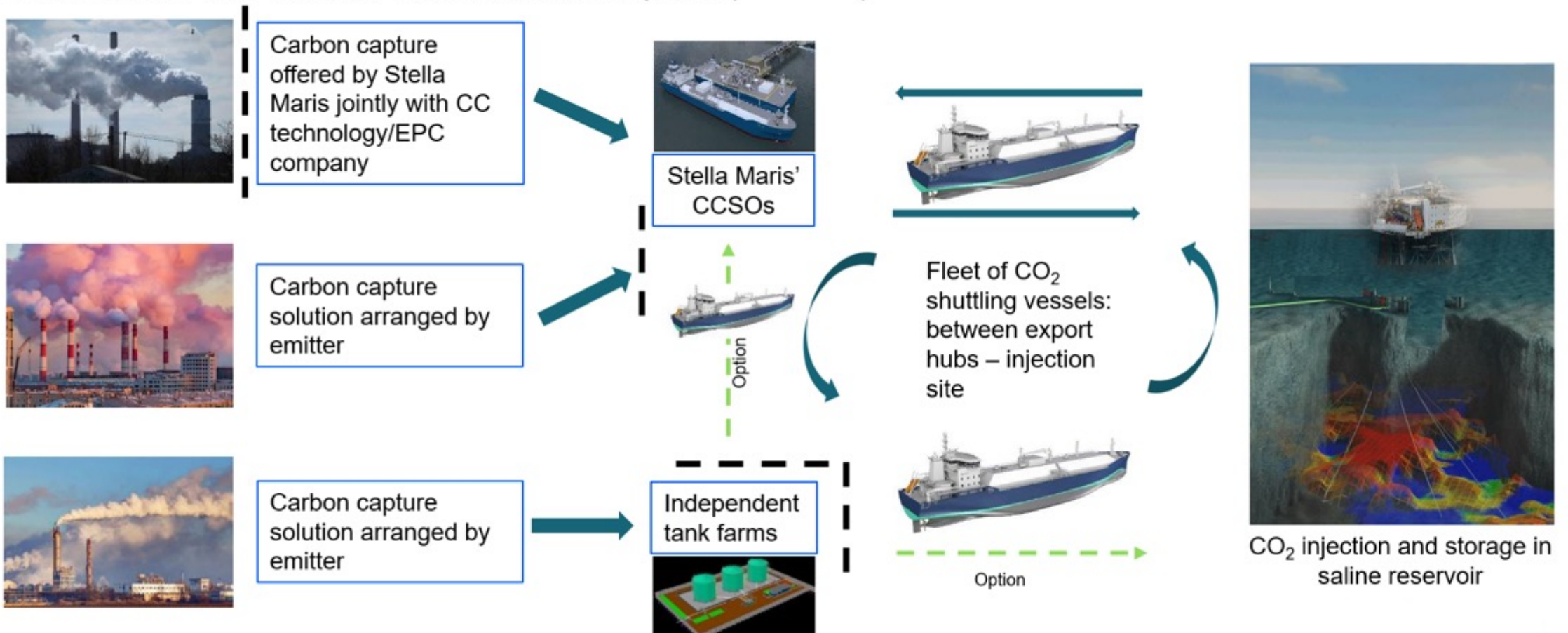


## Key Innovations

- Power from CO<sub>2</sub> Shuttle Carrier
- Normally Unmanned
- Equipment for offshore loading of CO<sub>2</sub>
- Zero emission capable

# Several models possible with different services and collection/transfer points

Flexible model with different collection/transfer points( — — — )







# **Industrial Clusters and Hydrogen Production: uncertainties and opportunities ahead**

Guy Phillips, Business Development Manager, Hydrogen  
WEF, 7 December 2021

# Agenda

---

1. About Uniper and hydrogen
  2. Uniper Humber Hub development
  3. Cluster development perspectives
-

# Uniper at a glance

**12,000** employees  
in over 40 countries.

**MDAX**

MSCI Germany

**50.97** billion euros in  
sales (2020)

**998** million euros  
Adj. EBIT (2020)

**~ 35 GW**  
generation capacity





# Uniper supports market development of all types of hydrogen that help to reduce carbon emissions

## Project Air (Perstop)

Green H<sub>2</sub> for chemical >25MW

## Barsebäck

Green H<sub>2</sub> for industry

## Flotta Hydrogen Hub

Green H<sub>2</sub>

## Power-To-Gas Hamburg

Green H<sub>2</sub> – 1.5 MW

## Wilhelmshaven

Green H<sub>2</sub> for steel, >400MW  
Ammonia imports

## Humber Hub

Green + blue H<sub>2</sub> for industry 700MW<sub>th</sub>

## North Wales

Green + blue H<sub>2</sub> for industry and fuel switching, >200MW<sub>th</sub>

## Project Cavendish

Blue H<sub>2</sub> for fuel switching >700MW<sub>th</sub>

## Hydrogen to Maasvlakte

Green H<sub>2</sub> for industry >100MW

## Raahe

Green H<sub>2</sub> for direct reduction of iron (DRI)  
~ 500 MW

## Oskarshamn

Pink H<sub>2</sub> - 0.7 MW

## Hamburg

Green H<sub>2</sub> for industry

## Huntorf (CHESS)

Green H<sub>2</sub> for power, transport, storage  
>30MW (→ 300MW)

## Power-To-Gas Falkenhagen & Store&Go methanation

Green H<sub>2</sub>, 2 MW

## Bad Lauchstädt

Green H<sub>2</sub> for chemical >30MW

## Scholven

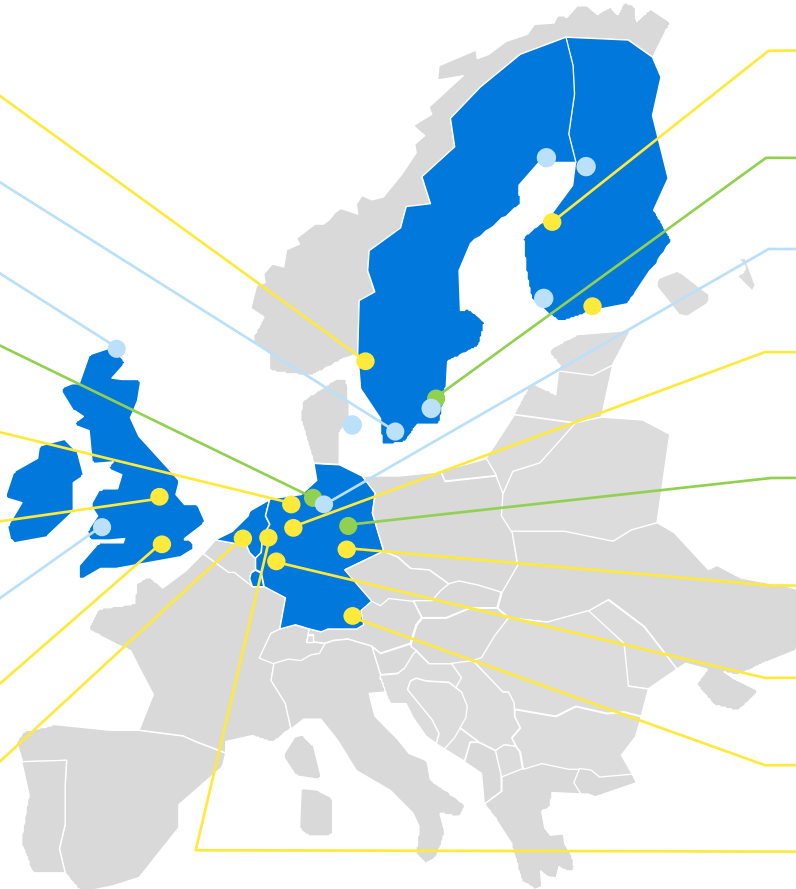
Green H<sub>2</sub> based gas turbine

## Bierwang

H<sub>2</sub> storage in subsurface porous rock formations

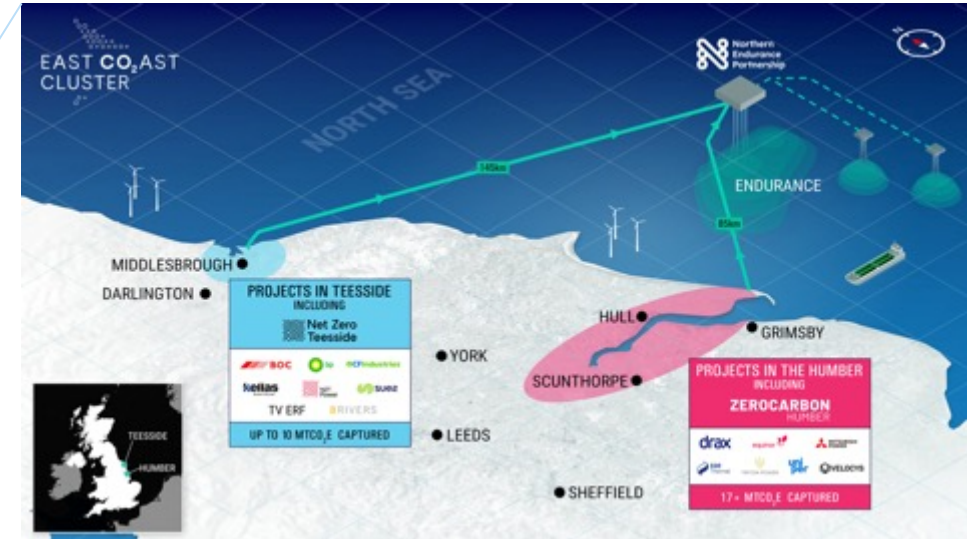
## GETH2 (Epe)

H<sub>2</sub> storage in subsurface salt caverns

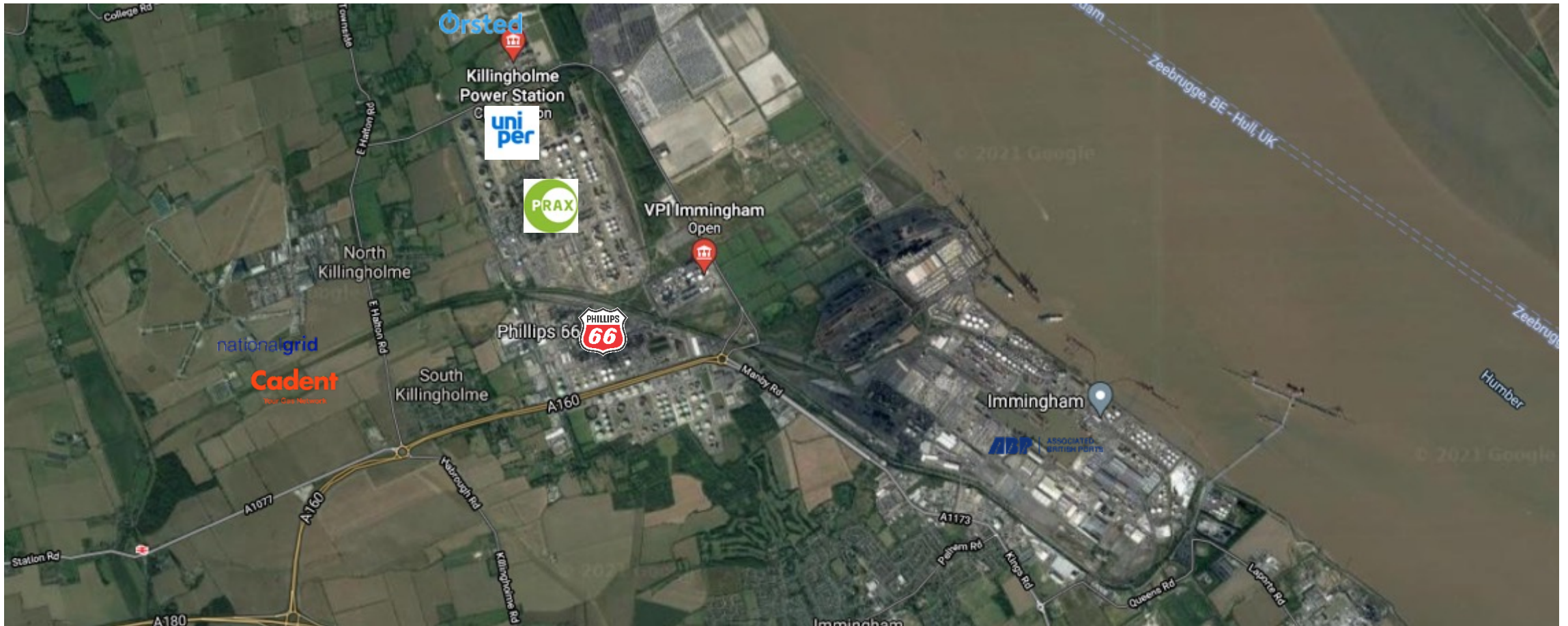


# Large scale hydrogen deployment will start in industrial clusters

THE UK'S LARGEST CLUSTERS BY INDUSTRIAL EMISSIONS ONLY

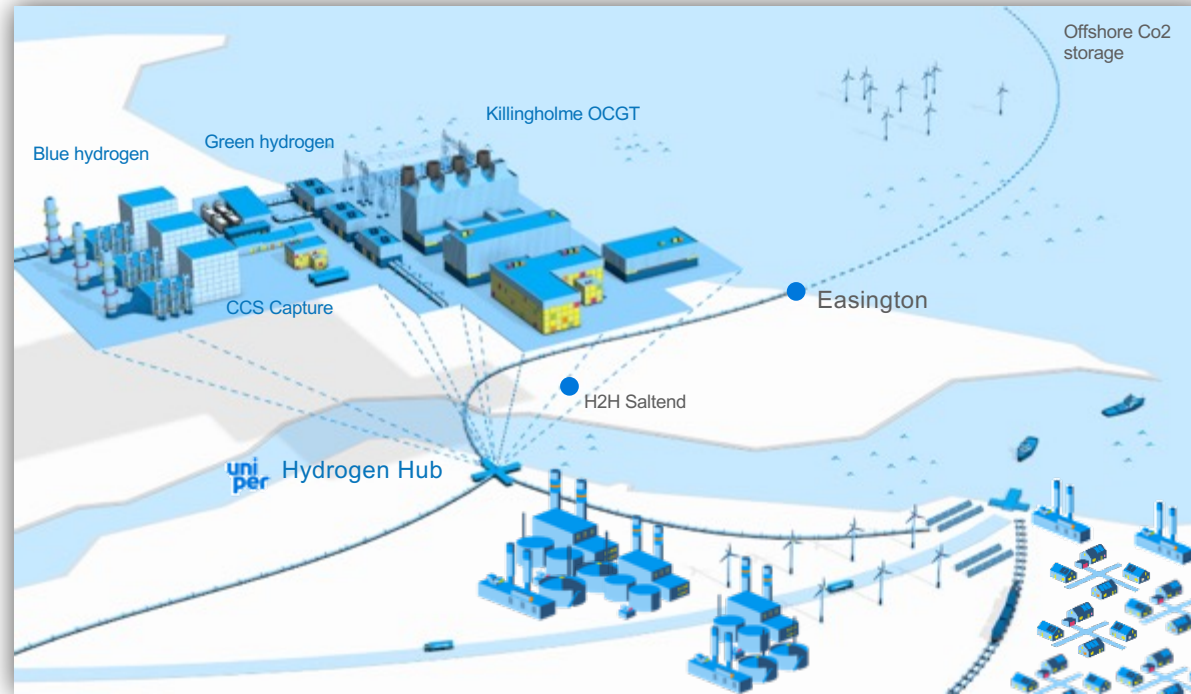
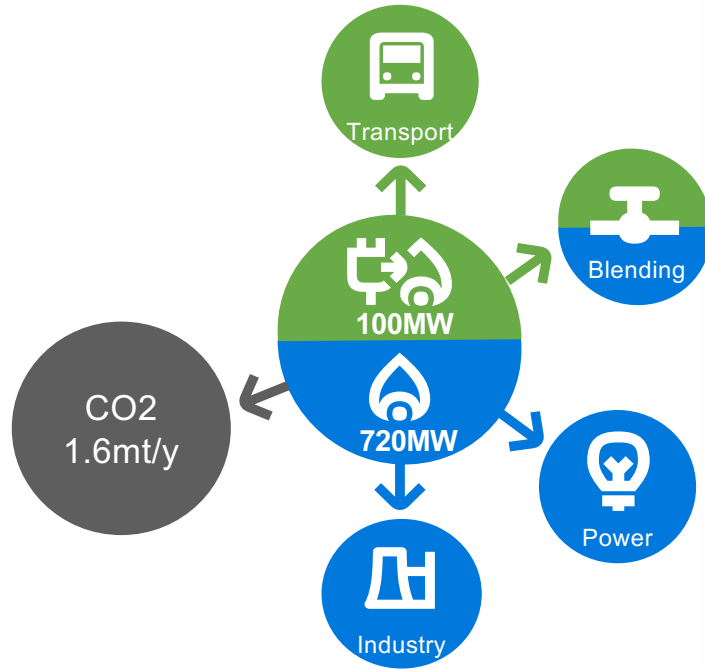


# Uniper is focussed on hydrogen supply to South Humber / Immingham industrial area





# Humber Hub



**ZEROCARBON**  
HUMBER

**EAST CO<sub>2</sub>AST**  
CLUSTER

Concept development  
EIA  
Business Model Development

FEED

FID & EPC

COD Green

COD Blue

2021

2022

2023

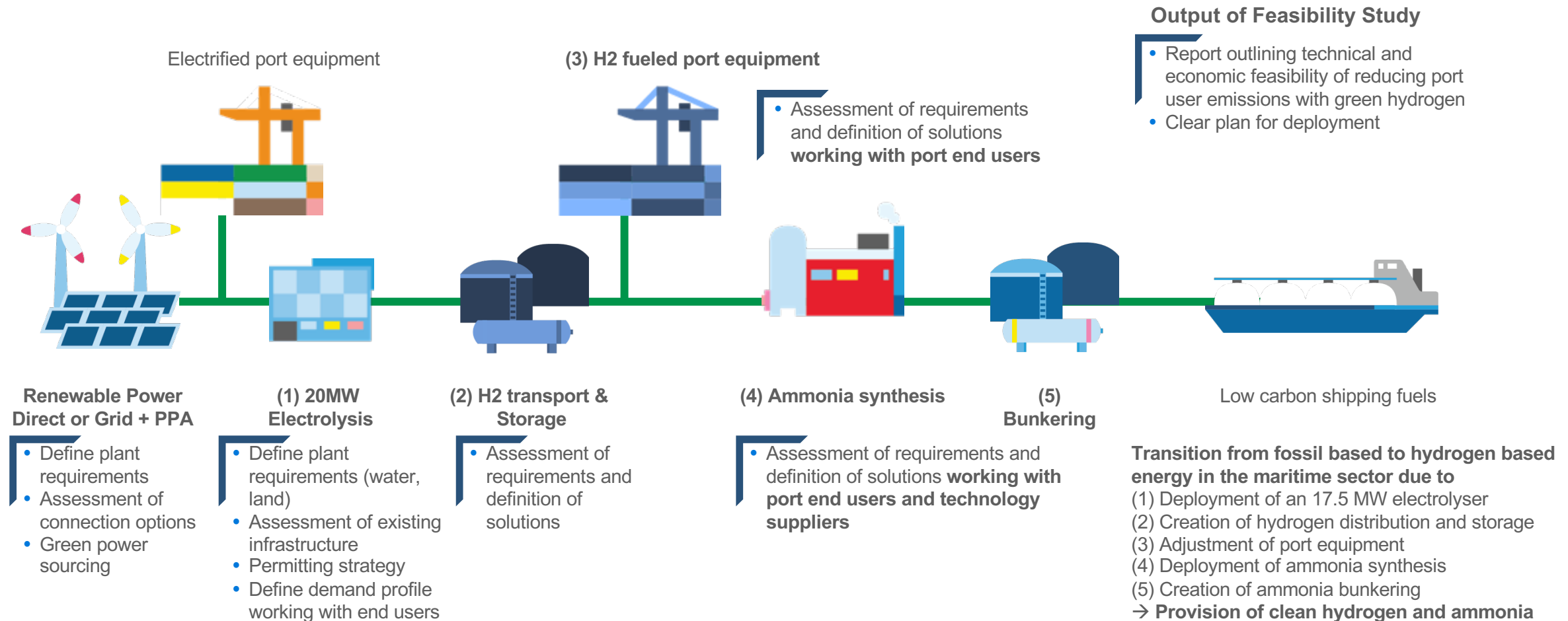
2024

2025

2026/27

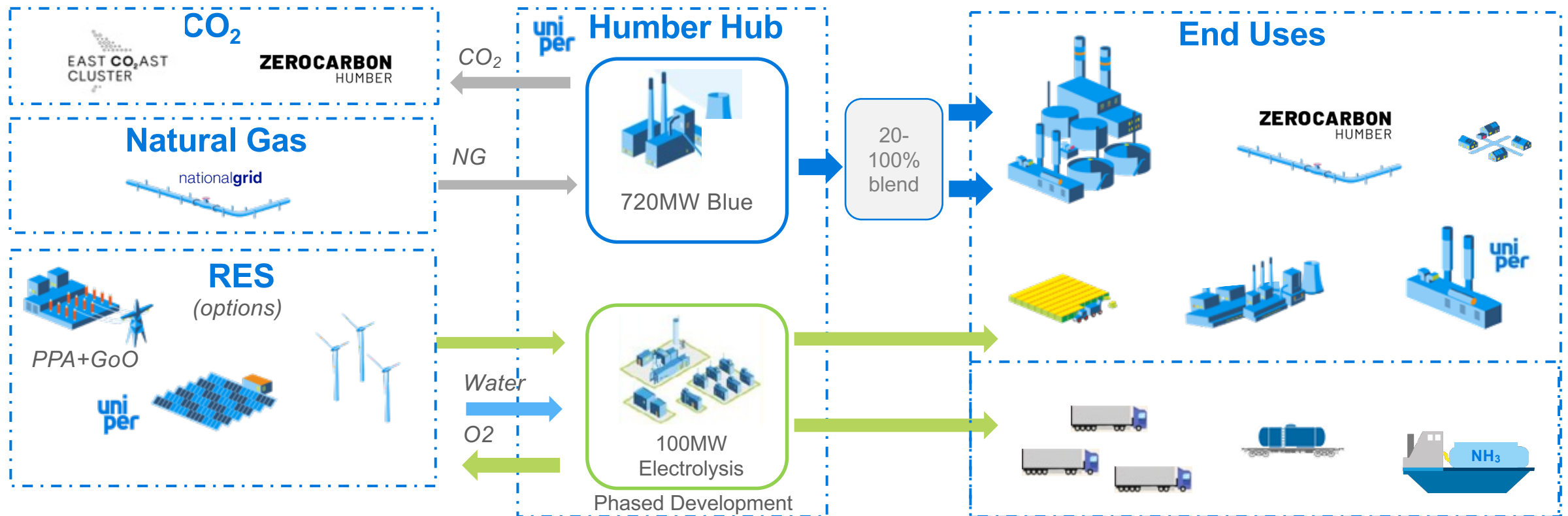


# Mayflower: port decarbonisation with green hydrogen



# Humber Hub Technical Concept

**Humber Hub** combine Uniper's interests in the regional collaboration projects Zero Carbon Humber (ZCH) and Project Mayflower (Mayflower), in a phased development of both blue and green hydrogen production facilities at Killingholme power station site.



# Killingholme: all the right ingredients for large scale hydrogen production

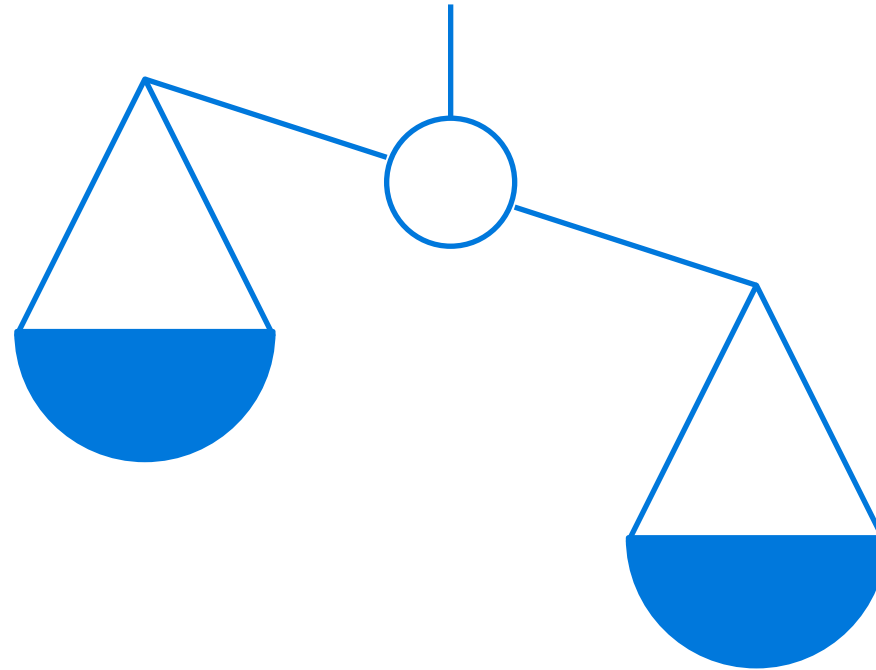




# Collaboration versus competition in industrial clusters

## Funding opportunities

- Targeted, with specific criteria (e.g. ISCF, IETF, Industrial Fuel Switching)
- Promotes and enables partnerships and cooperation
- Resource intensive process



## Cluster sequencing

- Competition for initial business model funding and CO2 storage capacity
- Can narrow focus on own decarbonisation initiatives
- Resource intensive process

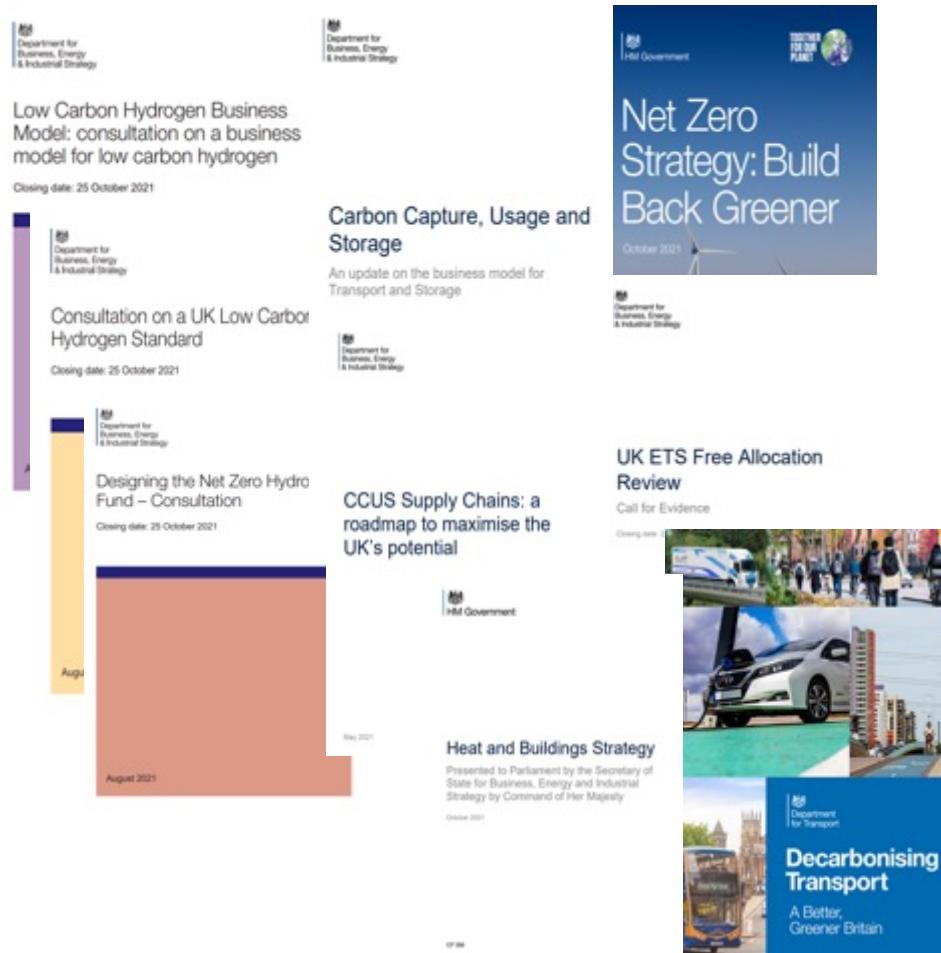


# Managing production and demand risk in an emerging market



- No wholesale market; multiple offtake routes increases project complexity
- Industry; different customer decarbonisation ambitions, requirements and timelines
- Power; co-located production or regional pipeline supply?
- Transport; timing of deployment and hydrogen quality
- Regional hydrogen networks; will they come forward, when and on what terms?
- Gas blending; destination for surplus hydrogen if there is a business model

# Project risk as hydrogen and CCS policy develops



- Sufficient incentive to support first mover project in a long term competitive market
- Initial hydrogen production business model accommodates some demand risk
- Visibility of future support to enable follow on projects, future expansion and supply chain growth
- Clarity on how business models interact (e.g. CO2 transport and storage with hydrogen production and future hydrogen network regulation)
- Demand side policy essential to stimulate fuel switching whilst minimising carbon leakage

If you need any further information, please contact us:

Guy Phillips  
Uniper Hydrogen UK Limited  
[guy.phillips@uniper.energy](mailto:guy.phillips@uniper.energy)  
[www.uniper.energy](http://www.uniper.energy)

This presentation may contain forward-looking statements based on current assumptions and forecasts made by Uniper SE management and other information currently available to Uniper. Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. Uniper SE does not intend, and does not assume any liability whatsoever, to update these forward-looking statements or to conform them to future events or developments.



**IGas**  
Energy

# Diversifying Onshore E&P



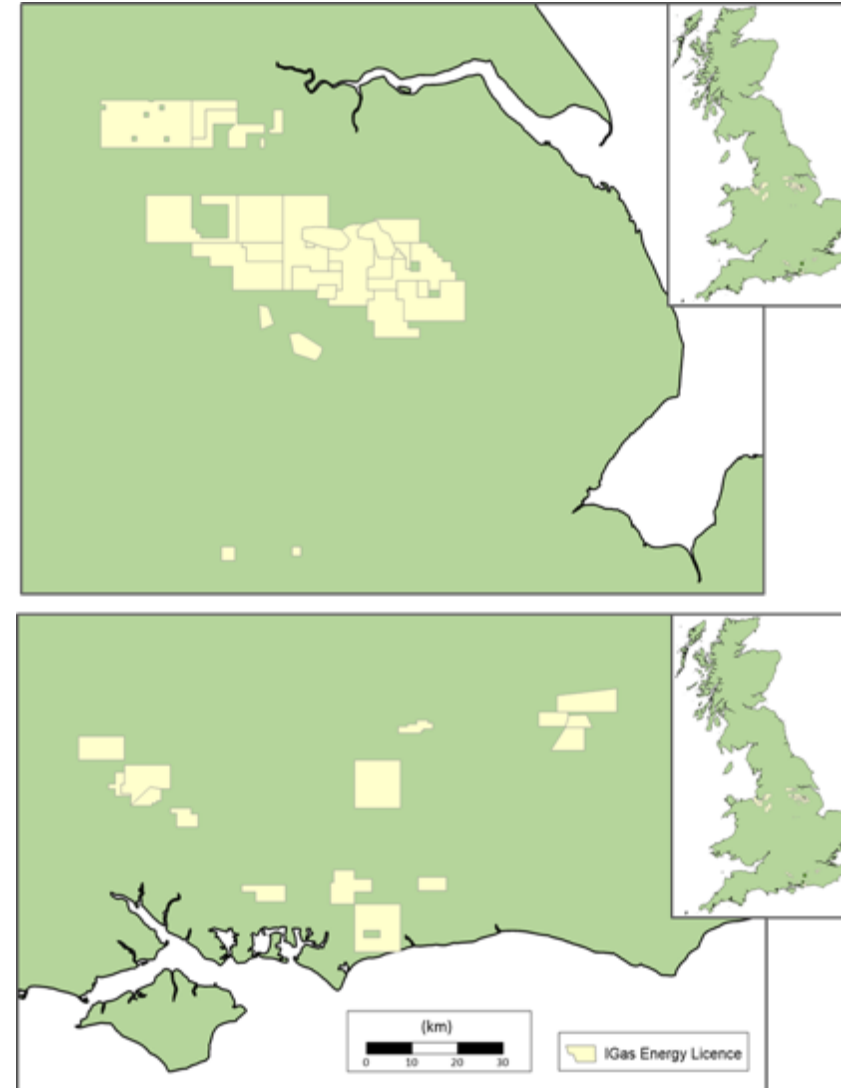


# IGas Energy Plc

Trusted onshore operator



- UK producer of oil, gas and electricity
- Operator of c.90 sites across 28 fields: East Midlands and South East
- Committed to safe and responsible development
- ISO 14001 and 9001 accredited: Environmental Management System and Quality Management System
- Experienced and skilled workforce of c.150 people
- Diversify into the wider UK energy market whilst leveraging our core competencies as an UK onshore operator



# Embarking on the energy transition

## Driven by policy, investor sentiment and future opportunity



*“Provide opportunities for oil and gas companies to repurpose their operations away from unabated fossil fuels to abatement technologies such as carbon capture, utilisation and storage (CCUS) or clean energy production such as renewables and hydrogen”*

Source: Energy White Paper



# Why we are diversifying



- National Policy
- Regulatory pressures
- Decreasing pools of capital for oil & gas
- ESG requirements of listed businesses
- Shareholder desire



- Large and low cost pools of capital for the low carbon projects/businesses
- Lower project specific risks (or more acceptance of risk)
- Lower regulatory risk



# Leveraging existing skillsets and assets



- Areas of diversification seek to capitalise on:
  - Existing skill sets
  - Existing assets
  - Existing stakeholder relationships (landowners, regulators etc)

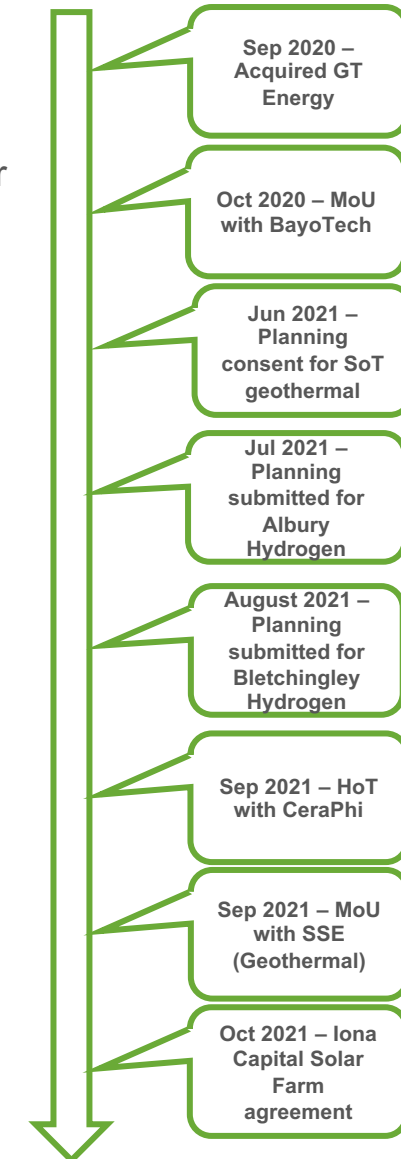


# Progressing Diversification

## Leveraging existing assets and skill set



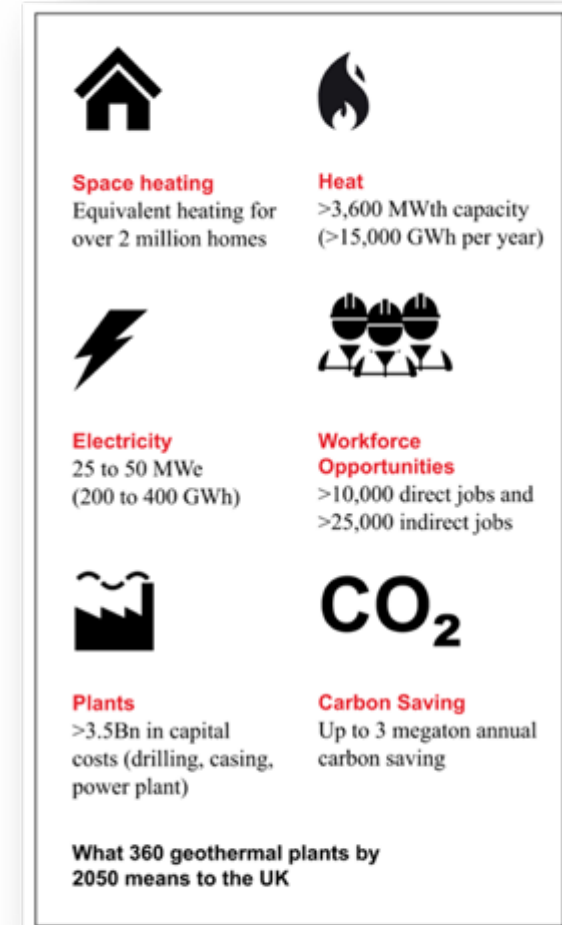
- Greenfield deep geothermal development
  - Pathfinder Stoke-on-Trent geothermal project will supply Stoke City with renewable heat for generations
  - Rapidly expanding pipeline of developments
- Repurposing existing assets
  - HoT with CeraPhi for repurposing wells for future geothermal energy production
  - Initial screening has identified several assets as suitable for carbon sequestration
    - Low cost sequestration solution for otherwise stranded regional carbon emitters
    - Net Zero RISE - Working with consortium including Newcastle, Durham, Oxford and Bristol Universities
- New development on or adjacent to our sites:
  - Renewable energy development at or adjacent to existing sites – Solar development with Iona Capital
  - Energy storage



# Geothermal

## Gathering pace

- Planning consent granted for flagship Stoke-on-Trent project
  - MoU with SSE to deliver network
  - SSE intends to invest £750m over the next 5 years in distributed energy infrastructure – geothermal is core
  - High level of Government interest: ministerial round table/Westminster Hall debate
- Working groups within BEIS looking at support mechanisms
  - Several existing funds identified
  - Long term downstream support dedicated to geothermal for the first 30 deep geothermal projects will unlock a geothermal industry
- April 2021 ARUP and the REA publish new report on the economic and environmental importance of UK deep geothermal
  - Geothermal has the backing of business, academics and NGOs
  - Estimates UK could deliver 360 geothermal projects by 2050
- Growing development pipeline of potential projects across the UK:
  - Manchester
  - Newcastle
  - Southampton
  - Bournemouth



# Hydrogen

## Two active projects

- Existing production sites in Surrey
- Aim to produce fuel cell quality hydrogen for local use by buses and/or HGVs
- Albury well site – 1000kg/day
  - Producing gas in its current configuration since 2018, various planning permissions date back to 1987
  - Grey – H<sub>2</sub> Planning and permit applications submitted, consultation completed.
  - Blue; via either
    - Potential sequestration onsite in separate geological interval.
    - Sale of CO<sub>2</sub> to local users
- Bletchingley well site – initially 2000kg/day
  - Producing since 2009; first field exploration in 1960s.
  - Grey – H<sub>2</sub> Planning application submitted
  - Blue ; via either
    - Potential sequestration onsite in adjacent reservoir.
    - Sale of CO<sub>2</sub> to local users





# Summary

---



Shareholder and management commitment to the journey is crucial

- An honest appraisal of differentiators
- Start wide then focus

Consistent policy is key:

- Our fields, wells and other infrastructure are valuable assets in achieving the energy transition
- Policy should encourage all project sizes, not just 'mega' projects as smaller scale projects will:
  - Be deployed more rapidly than mega projects;
  - Can be pathfinders for testing business models, regulation; and
  - Can build resilience to new energy networks.



WESTMINSTER  
ENERGY FORUM



Freshfields Bruckhaus Deringer

OGUK



[www.westminsterenergy.org](http://www.westminsterenergy.org)

# Futures for Oil & Gas, CCUS & Hydrogen

## *Transitioning the UK Upstream*

0915-1300hrs, Tuesday 7th December 2021

Andy Samuel, CEO, **Oil & Gas Authority**

Mike Tholen, Director of Sustainability, **OGUK**

Arne Gurtner, Senior VP UK & I – E&P, **Equinor**

Minnie Lu, Director of Decommissioning, **Wood**

Mark Wilkie, Carbon Management Director, **Gaffney Cline**

Sophia Northridge, Head of CCUS Transport & Storage Strategy, **BEIS**

Christian Fjell, Director, **Altera Infrastructure**

Guy Philips, Business Development Manager, **Uniper**

Ross Glover, Development Director, **IGas Energy**

[www.westminsterenergy.org](http://www.westminsterenergy.org)

wood.