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UK net zero scenarios & offshore

UKCS Technology Managers Network meeting

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10th June, 2021

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UK net zero by 2050

- Government agenda
- What needs to happen
- Deployment ramp-up (where, when)

Technologies

- Offshore electrification
  - O&G emission abatement – licence to operate
  - Long-term strategic play: Synergies with windpower and transmission infrastructure
- Carbon Capture and Storage
  - UKCS subsurface storage opportunity, offshore infrastructure and industry capability
  - Regional development roadmaps
- Hydrogen
  - Blue - valuable option to related with natural gas supply, and O&G repurposing, leveraging cost competitive CCS
  - Green - much needed, emerging solution to ‘transport’, ‘store’ and ‘utilise’ the fast growing offshore windpower
  - Infrastructure and market development

Government agenda

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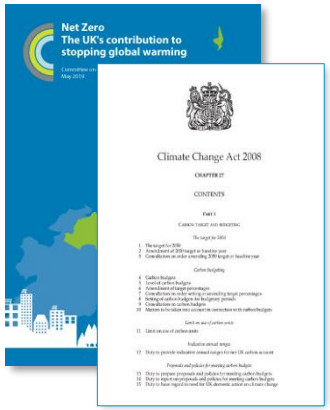
2018-19

Targets

Net Zero by 2050 (2019)



Strategies

UK Clean Growth Strategy

Carbon capture and storage

- **Business model consultation**
- **O&G infrastructure reuse**

Offshore wind power

- **Sector Deal - 30 GW by 2030, 75 GW by 2050**

Hydrogen economy

- **Hydrogen supply competition**
- **Industrial fuel switching**

Support

- Industrial cluster decarbonisation challenge
- Hydrogen competition funds
- RIOO-2 Network Innovation Competition (NIC)
- Other InnovateUK programmes
- SG Energy Transition Fund

2020

- Offshore windpower Round 4 (10GW)
- Scotwind leasing (10GW) underpinned by Scottish Sectoral Marine Plan (2020)
- **Raised overall windpower target to 40GW by 2030**
- **Of which 1GW floating**
- CCS Clustering sequencing plan published
- **Commitment to CCS infrastructure fund £1bn**
- Ofgem strategic infrastructure development to support Net zero (electricity, gas, network)
- **Local content targets**

2021+

Further acceleration

- North Sea Transition Deal
- CCS licenses ramping up (OGA)
- CCS business models – implementation
- Carbon budget 6 will accelerate ramp up (expected)
- SG Marine Plan-OW for O&G decarbonisation (expected)

UK net zero by 2050

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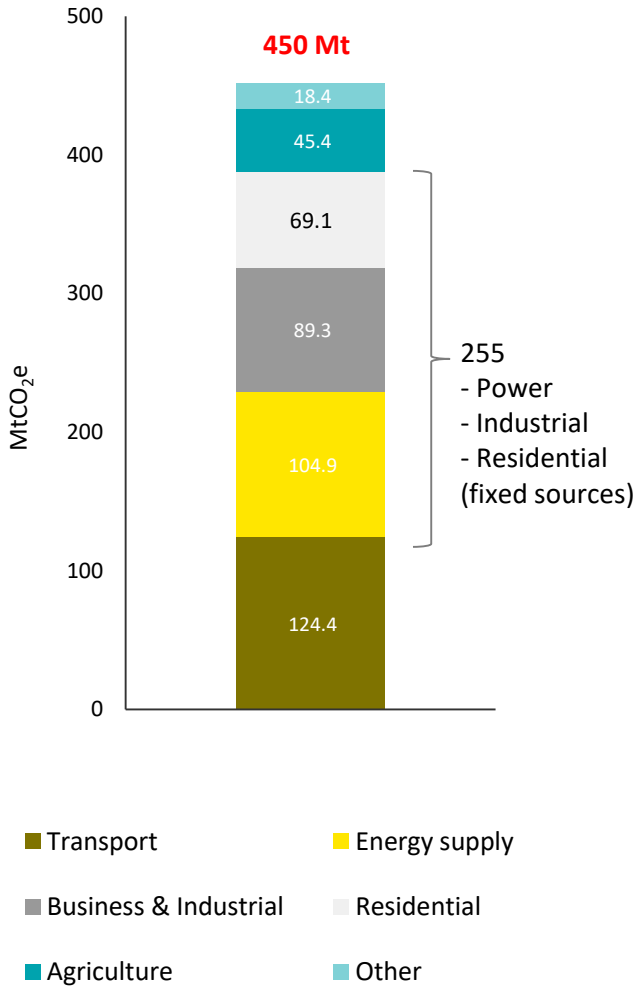
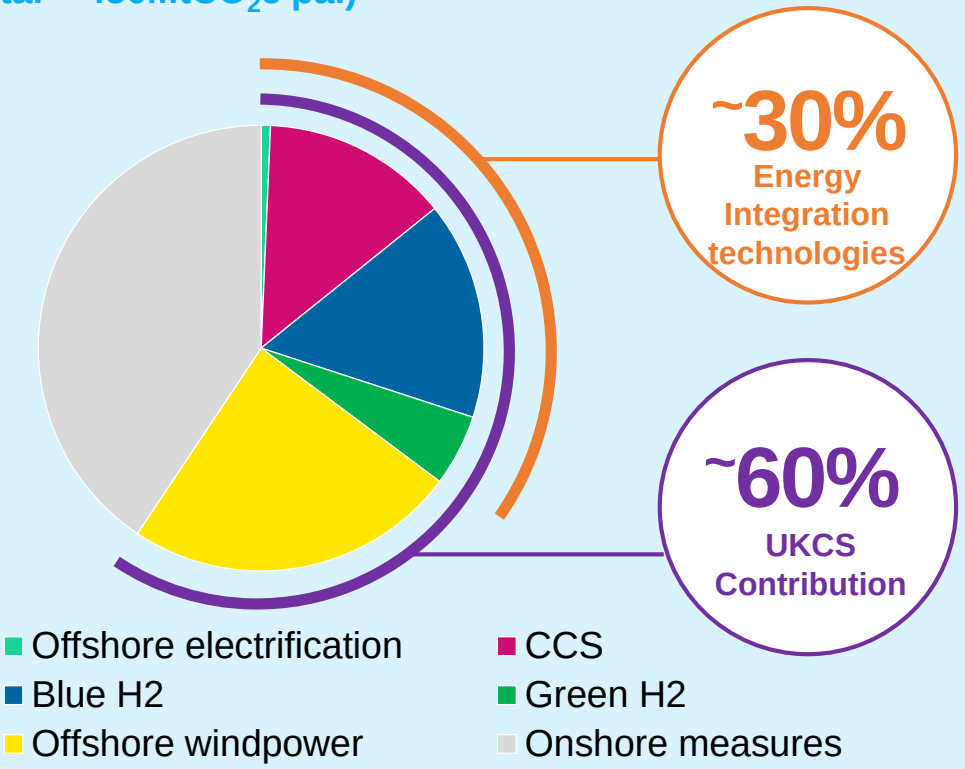


2050 net zero emission abatement from 2018 baseline (Total = 450MtCO$_2$e pa.)



Why do we need a mix of 'net zero' sources?

- **CCS**
- **Renewables**
- **Blue hydrogen**
- **Green hydrogen**

Opportunities will be regional

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Northern Scotland and Islands

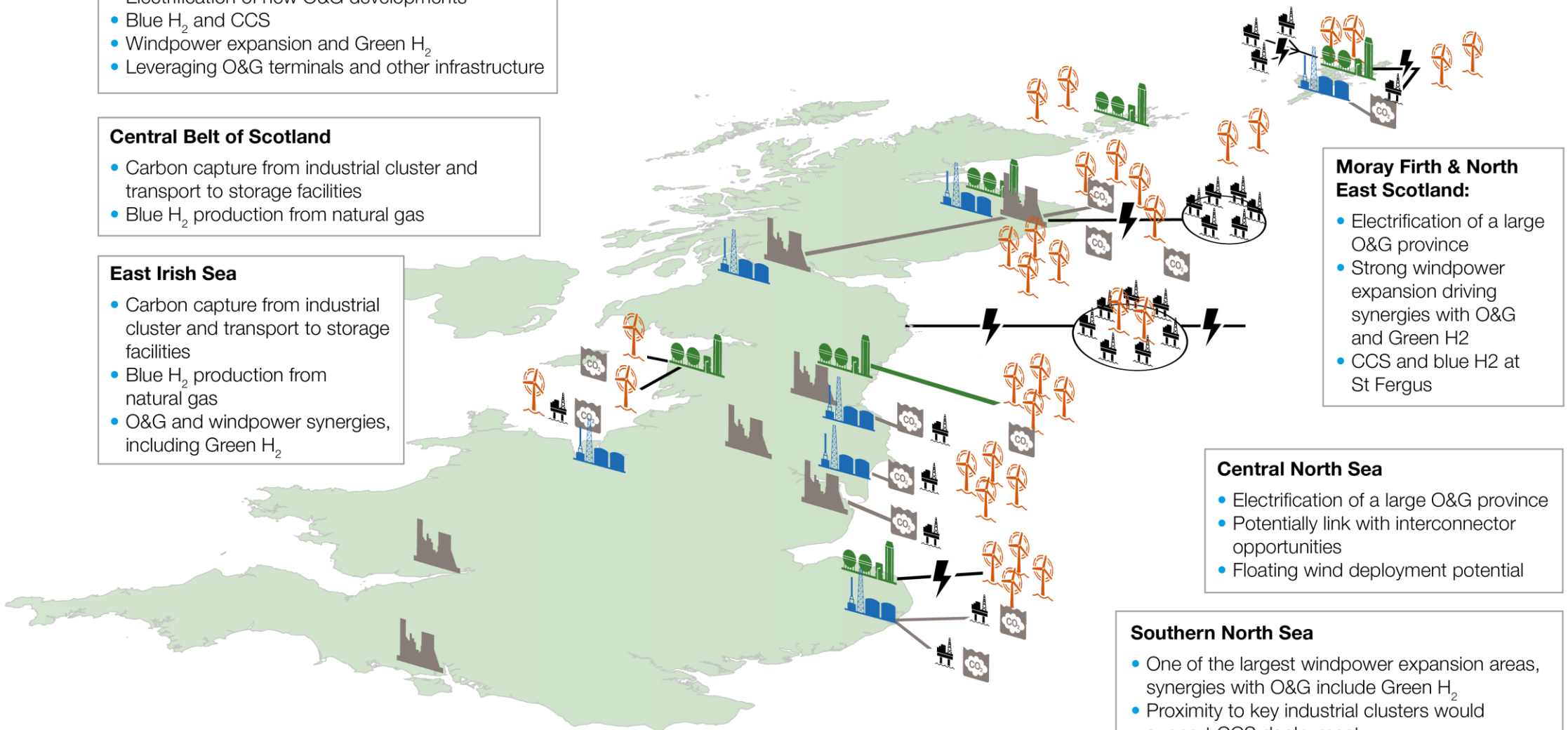
- Electrification of new O&G developments
- Blue H_2 and CCS
- Windpower expansion and Green H_2
- Leveraging O&G terminals and other infrastructure

Central Belt of Scotland

- Carbon capture from industrial cluster and transport to storage facilities
- Blue H_2 production from natural gas

East Irish Sea

- Carbon capture from industrial cluster and transport to storage facilities
- Blue H_2 production from natural gas
- O&G and windpower synergies, including Green H_2



Moray Firth & North East Scotland:

- Electrification of a large O&G province
- Strong windpower expansion driving synergies with O&G and Green H2
- CCS and blue H2 at St Fergus

Central North Sea

- Electrification of a large O&G province
- Potentially link with interconnector opportunities
- Floating wind deployment potential

Southern North Sea

- One of the largest windpower expansion areas, synergies with O&G include Green H_2
- Proximity to key industrial clusters would support CCS deployment
- UK natural gas production and imports would support Blue H_2

Phased ramp up

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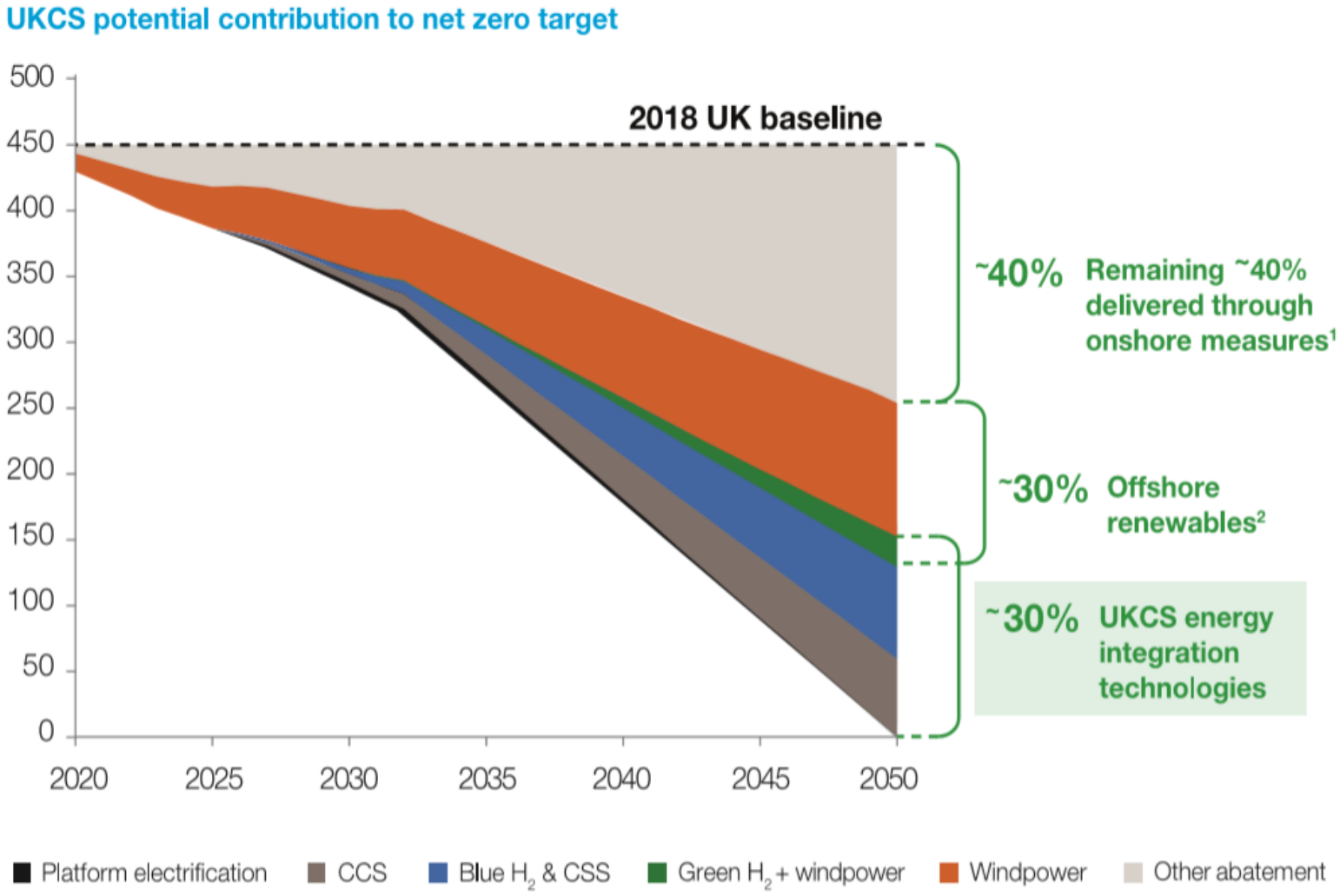
Offshore technologies will be key for UK net zero transition:

- **O&G electrification**
- **CO_2 storage**
- **Windpower**
- **Hydrogen**

Integrated developments to capture full benefits

Critical timeline to leverage O&G industry potential



Scenario: Three time scales

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2020's

- Offshore decarbonisation
- Leverage O&G industry capabilities
- Pilot new concepts (CCS, H2)

2030's

- Establish CO2 and H2 infrastructure
- CCS and blue hydrogen to scale
- Green H2 commercial pilots

2040+

- Strong offshore renewables expansions
- Floating windpower becomes mature
- Green hydrogen to scale
- H2 export starts

Accelerating early projects is critical

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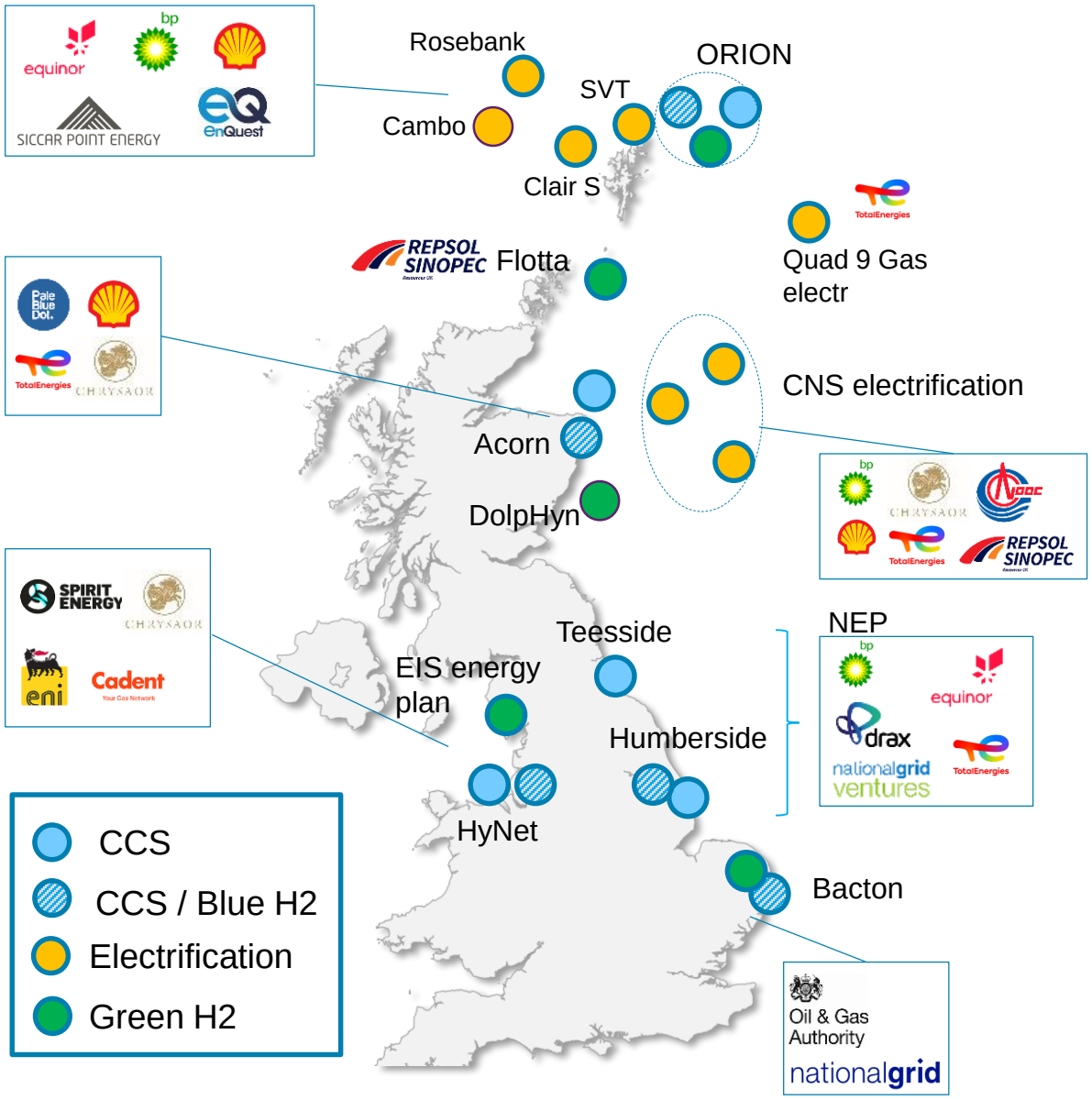

Vision & potential pathways

	2025	2030
Offshore Electrification	• >1 electrification scheme from windfarms operational in CNS • >2 greenfield electrifications (shore/wind) sanctioned in WoS	• 3MtCO2 pa emission reductions • £5bn Capex invested • 2GW of wind power growth stimulated
Carbon Capture & Storage	• CCS first injection at >2 pilots • >2MtCO2 pa injected • Commercial roll-out sanctioned at >4 industrial clusters	• >4 commercial scale CCS projects operating • 17 MtCO2 pa injected • £8bn Capex invested
Energy Hubs	• >2 Blue Hydrogen pilots operational • 2 more net zero Hubs identified with Blue / Green H2 plans	• Blue H2 commercial scale, 4GW methane reforming installed • 1GW green H2 capacity installed • £7bn Capex investment

20MtCO2 abatement and £20bn Capex by 2030
Supports delivery of UKCS net zero potential by 2050