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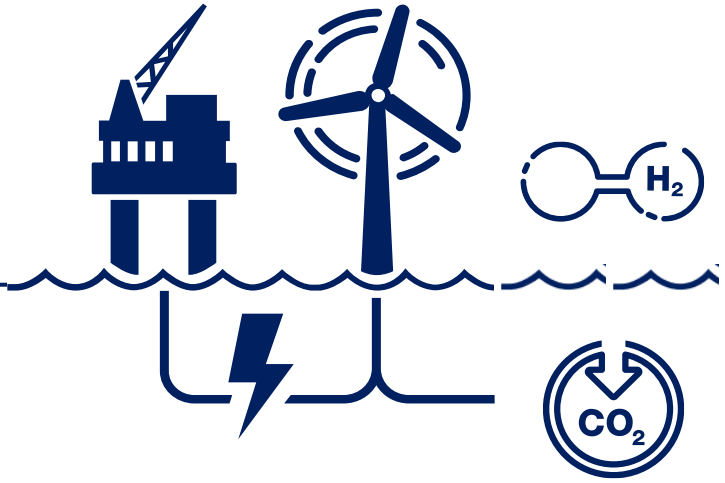
Offshore Energy Integration



The UKCS ‘net zero’ transition

Dr Carlo Procaccini

Chief Technical Officer

St. Andrews, 22nd November 2023

The NSTA

North Sea Transition Authority

We regulate and influence the oil, gas, offshore hydrogen 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**.

ENERGY SECURITY

Helping meet UK energy demand

Oil and gas licensing and stewardship

EMISSIONS REDUCTION

Regulating for emissions reductions

Driving electrification and ensuring zero routine flaring

ACCELERATING THE TRANSITION

CCS and hydrogen licensing and stewardship

Promoting energy integration

Providing open data access

Hydrocarbon opportunities

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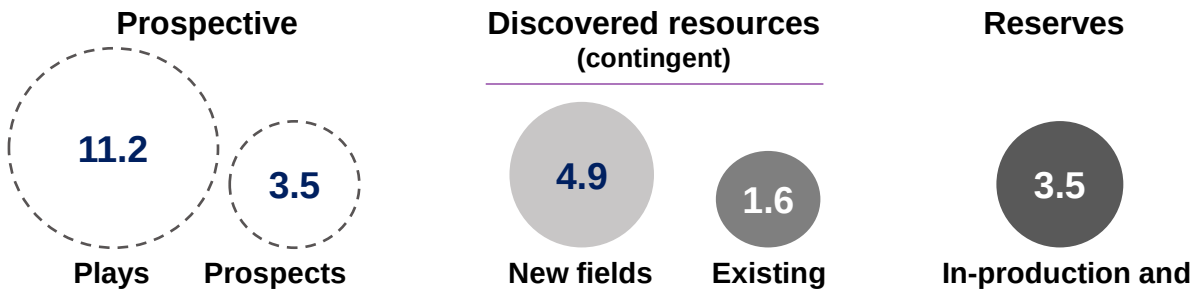
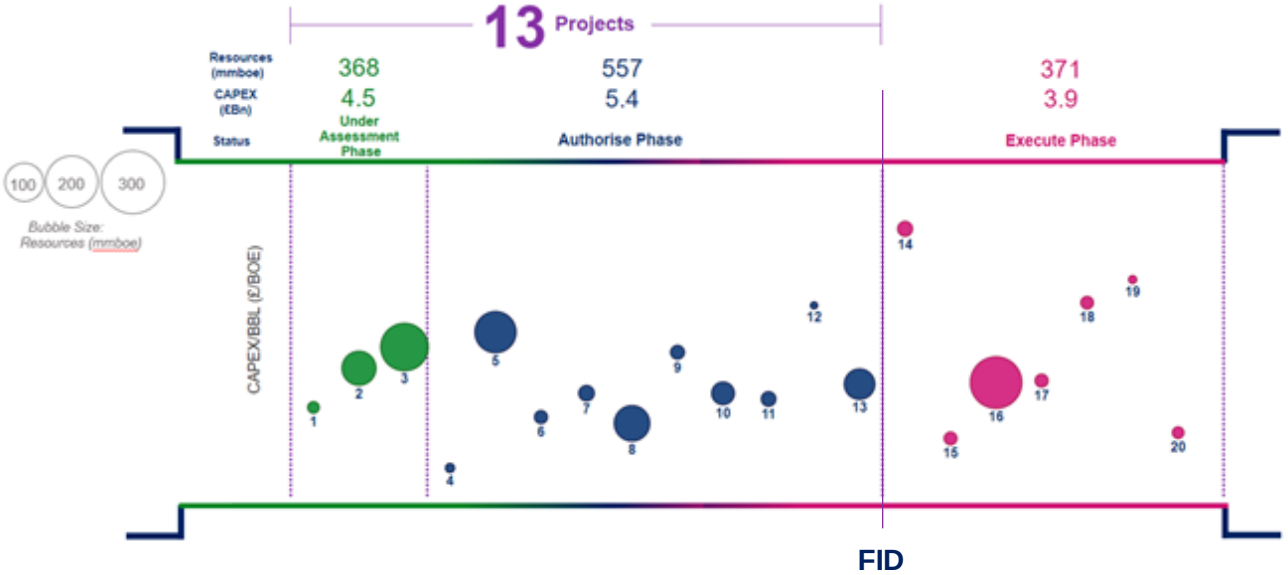
Resource & Reserves (P50, bnboe)



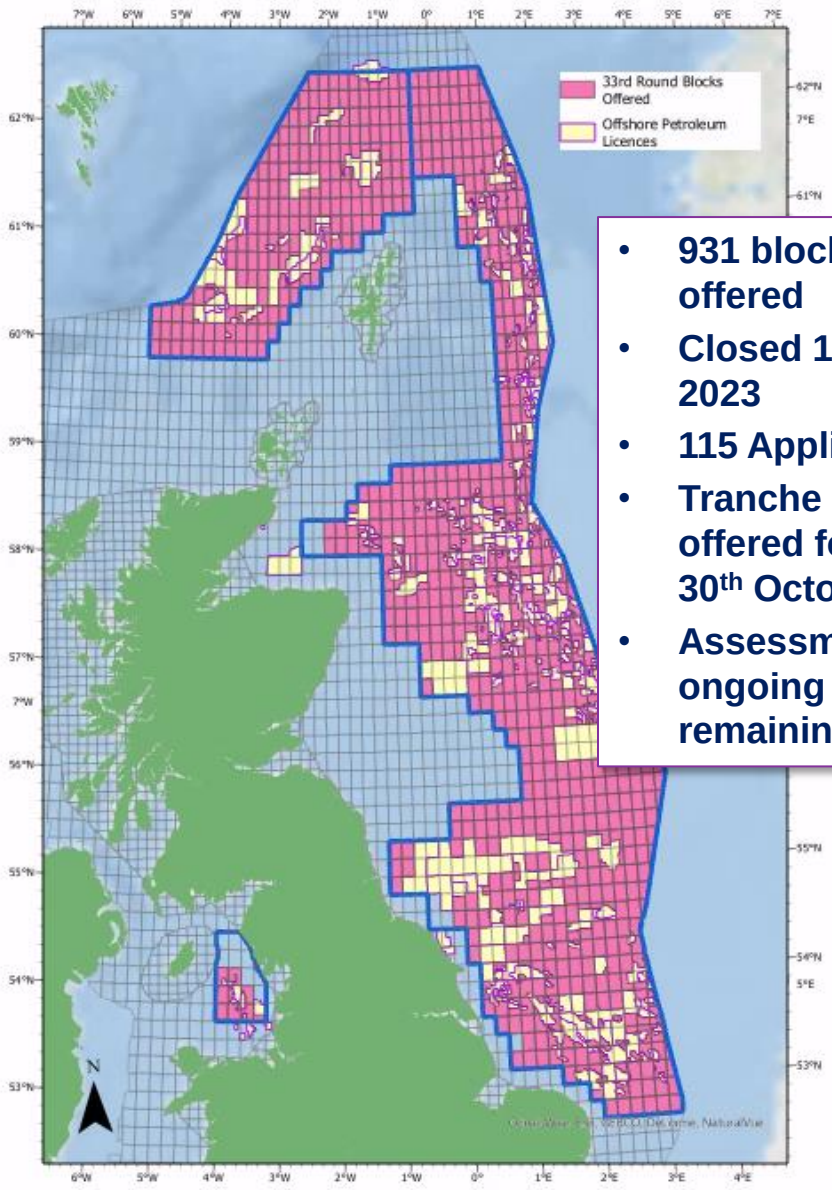
Reserves and Resources 2022 report (nstauthority.co.uk)

Development project pipeline



Revised Field Development Plan (FDP) Guidance (nstauthority.co.uk)

33rd Offshore Petroleum Round



- 931 blocks/parts offered
- Closed 12th January 2023
- 115 Applications
- Tranche 1 licences offered for award 30th October 2023
- Assessment ongoing for remaining areas

Demand outstrips domestic supply

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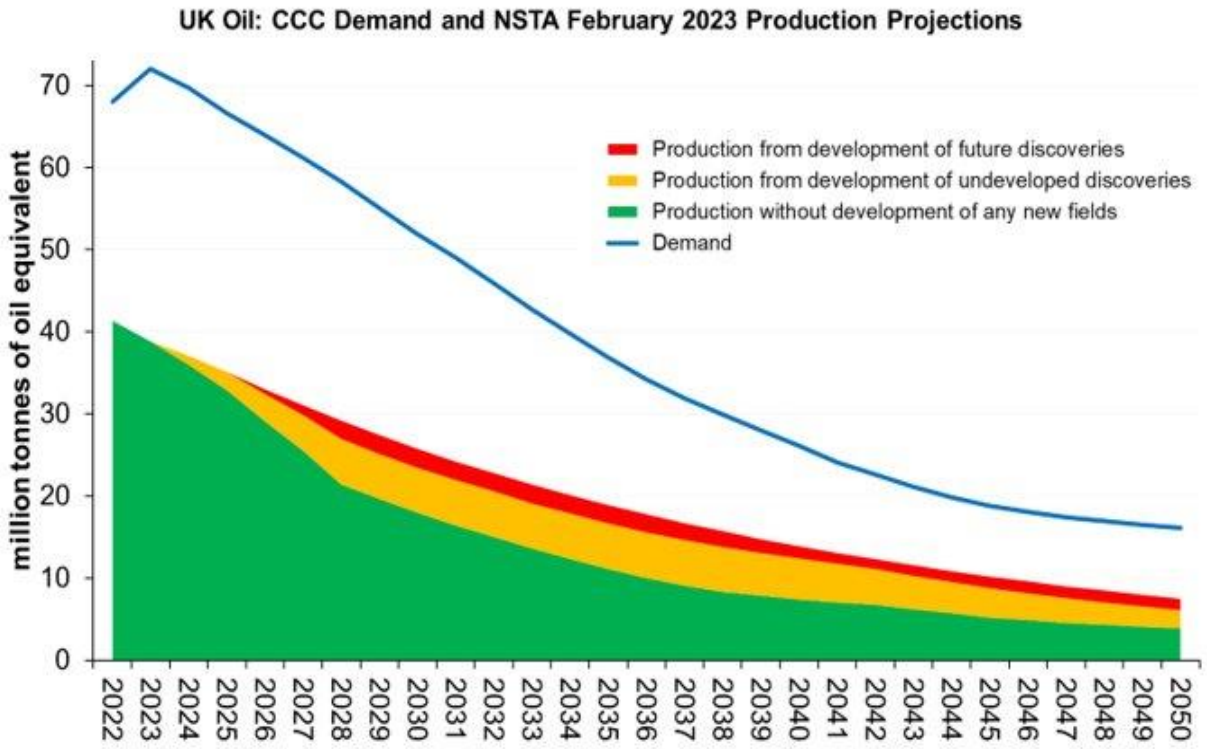
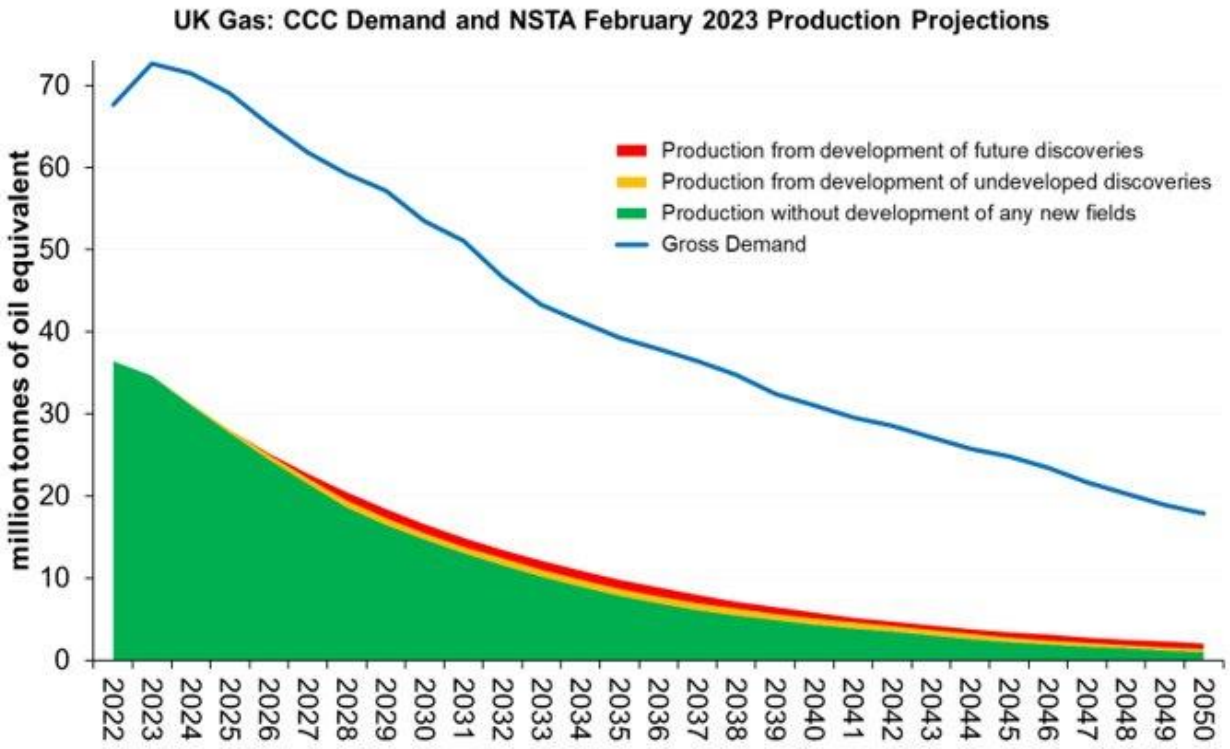
Oil



Gas



Projections include anticipated production from new field developments

NSTA tracking progress of field developments at various stages

Production projected to decline faster than 1.5°C global decline scenarios

Emission reduction

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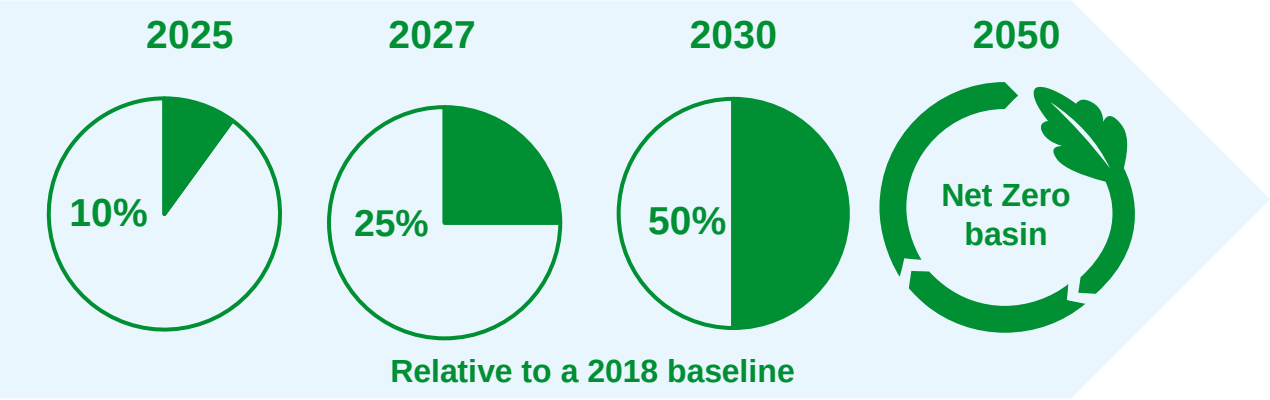
Emission reduction targets (2021)



North Sea Transition Deal (2021)

North Sea Transition Deal - GOV.UK (www.gov.uk)

Progress so far

23% Reduction GHG emissions 2018-22

50% Reduction flaring since 2018

6% Reduction in Carbon intensity in 2022

6% Reduction in hydrocarbon venting in 2022

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Emissions Monitoring Report 2023 (nstauthority.co.uk)

Consultation on draft OGA Plan to reduce UKCS greenhouse gas emissions (nstauthority.co.uk)

Emission reduction pathways

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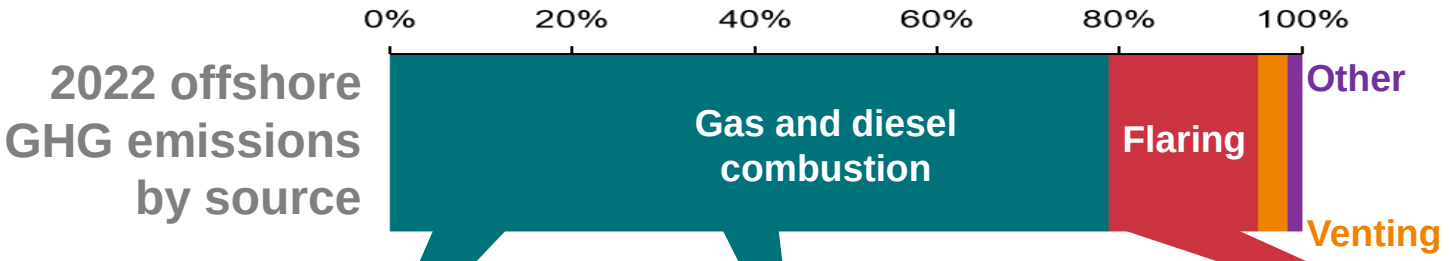


Electrify offshore assets

For facilities with longevity in the basin, replace emission intensive *in situ* power generation for cleaner imported electricity.

Offshore gas turbine

460 gCO_2/kWh

UK electricity grid

2022 **182** gCO_2/kWh

2030 **48** gCO_2/kWh

Energy efficiency

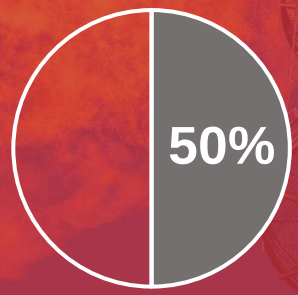
Optimise operations to run compressors, pumps and other equipment more efficiently to reduce power demand.

5% fall = 2 $MtCO_2e$

2023-2030

Eliminate routine F&V

By 2030, all facilities should operate at zero routine flare and vent.



Today roughly half of all F&V is routine.

Source: NSTA, National Grid, DESNZ

Windpower synergies – INTOG

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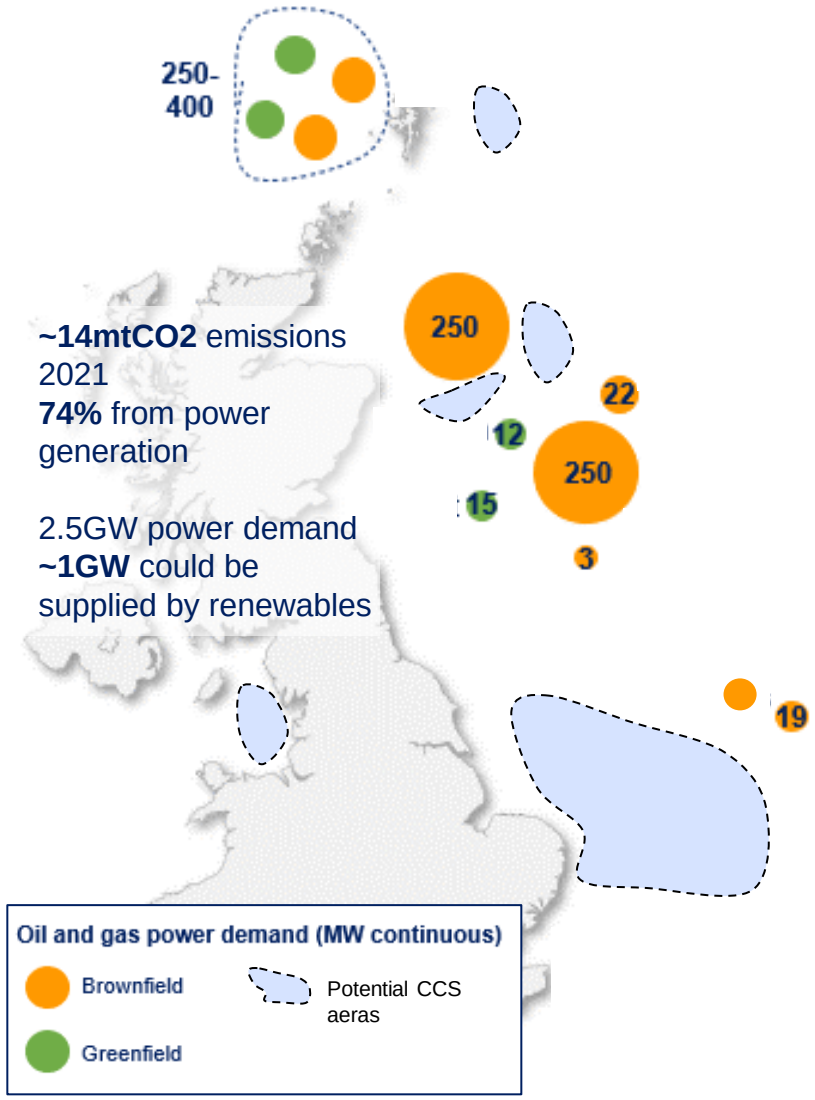
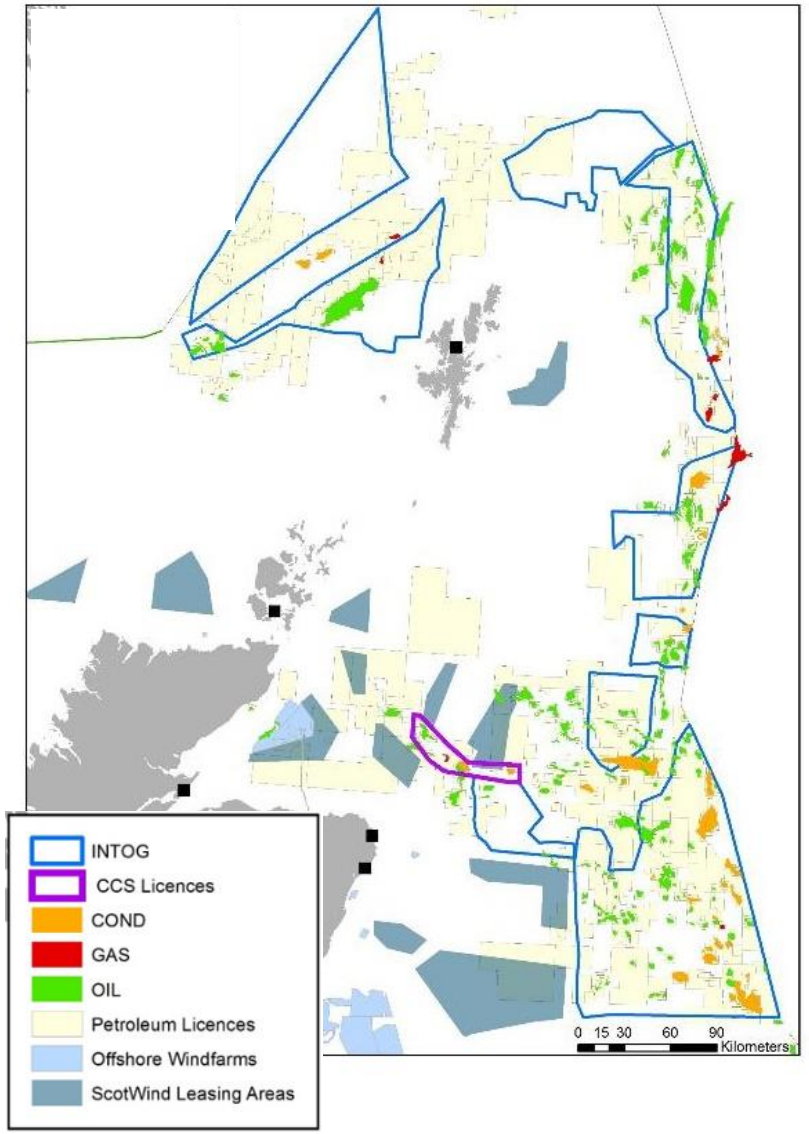
Electrification opportunity (MW)

- **~14mtCO2** emissions 2021
- **74%** from power generation
- 2.5GW power demand
- **~1GW** could be supplied by renewables



INTOG Lease Round



INTOG results (March 2023)

- Innovation and Targeted Oil & Gas decarbonisation (INTOG)
- Scottish Government, Marine Directorate, Crown Estate Scotland
- March 2023: 13 exclusivity awards offered (5 “IN”, and 8 “TOG”)
- 5.4GW capacity
- August-October 2023: Exclusivity Agreements signed and fees committed

Next steps:

- Commence work for “IN” projects
- Developers and O&G operators negotiate “TOG” supply contracts
- Finalise INTOG Sectoral Marine Plan

CCS – UK pathways to net zero

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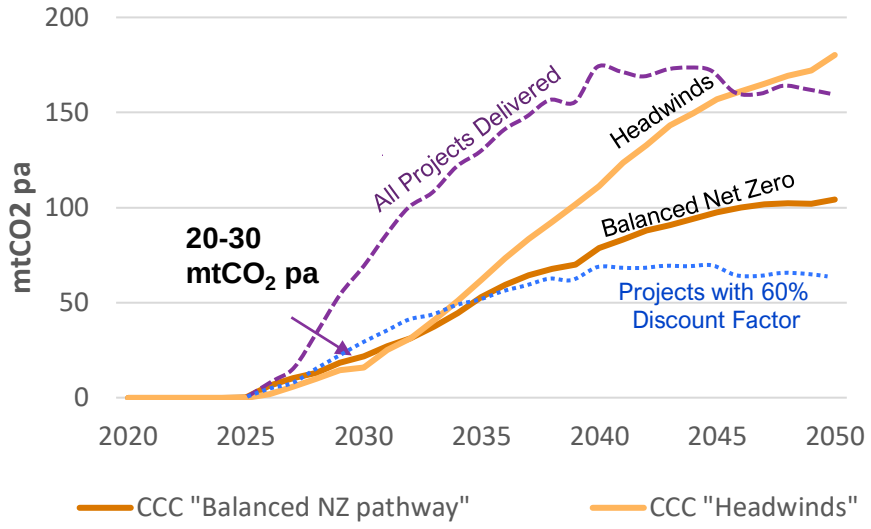
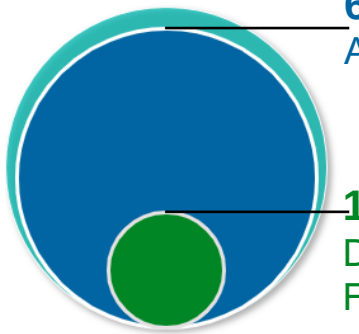
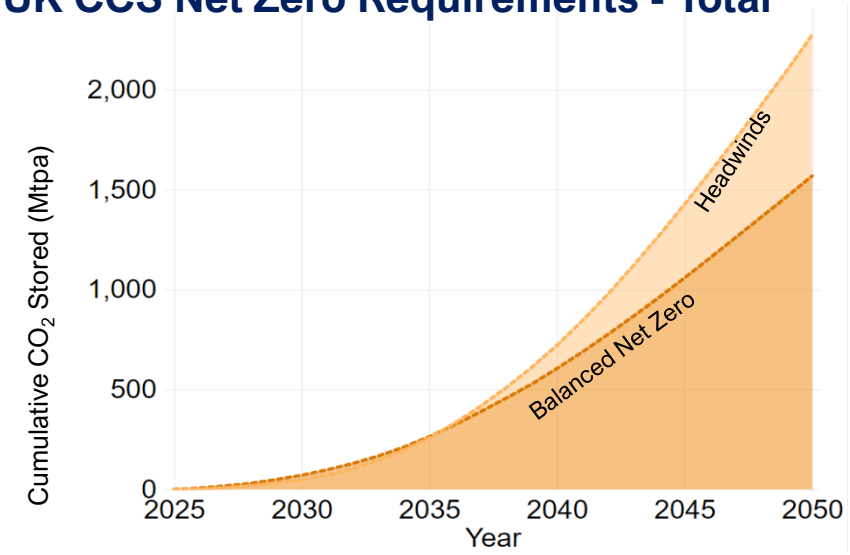
UK CCS Net Zero Requirements – $MTCO_2pa$



78 GT Total UKCS Theoretical Potential Storage Resource



UK CCS Net Zero Requirements - Total



Cumulative volume

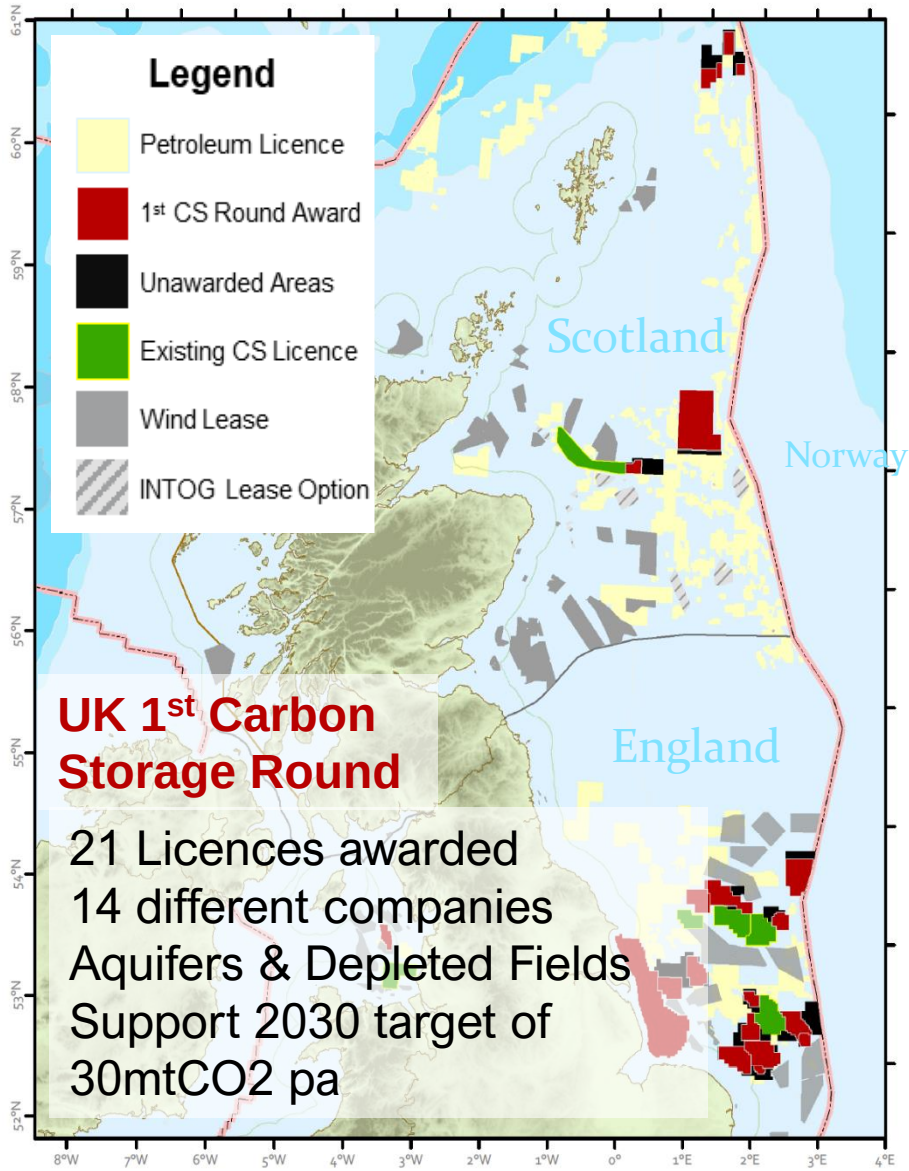
2.3 Gt

1.6 Gt

Appraised stores required

Max 172
Min 47

Max 100
Min 28



Well P&A for CCS

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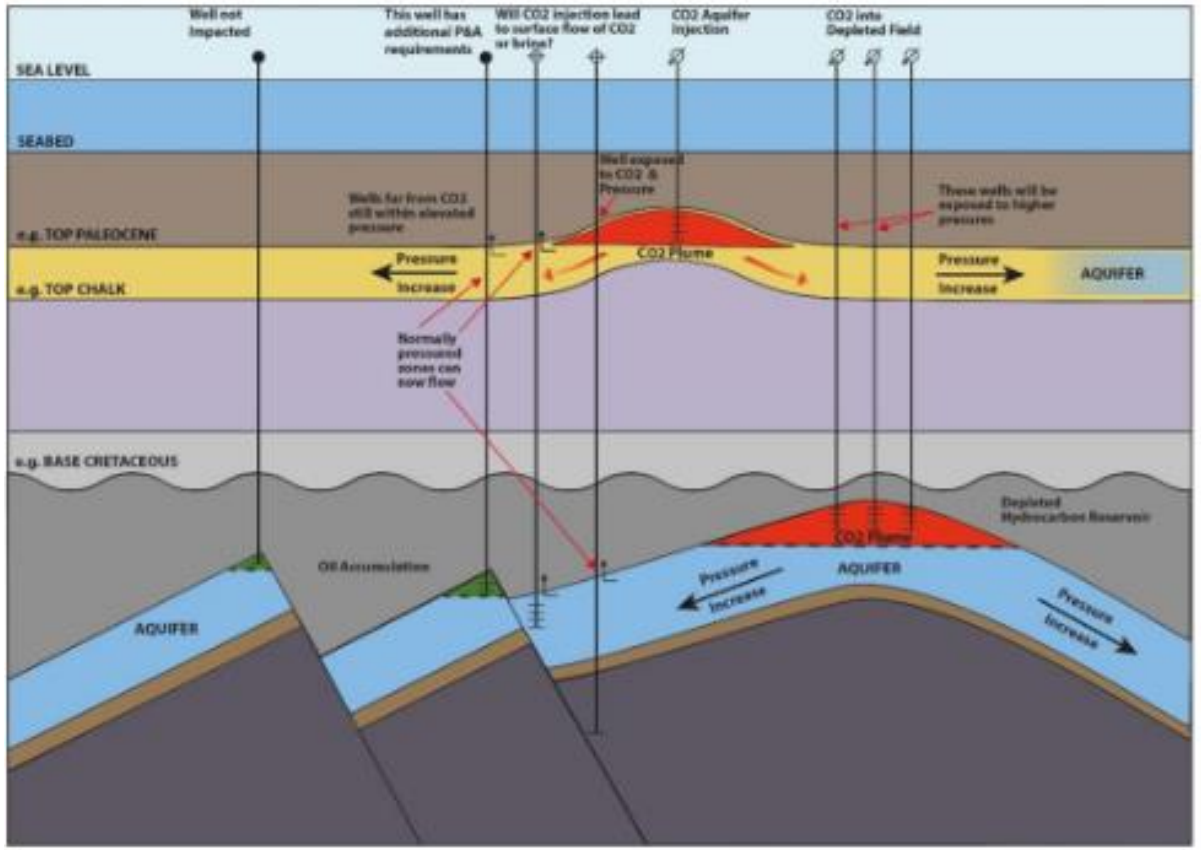
- Over 12,000 wellbores on the UKCS
- **All current storage licences have legacy wells**
- Wellbores need to be evaluated for integrity relating to the formation where the CO_2 will be stored
- Some wells predate digital records -- National Data Repository has become an invaluable resource for well records
- In depleted O&G stores -- original barriers to isolate the reservoir may be adequate
- In aquifers – tend to be in overburden, where barriers often were not installed
- OEUK published "Well Decommissioning for CO2 Storage" in 2022

Wells penetrating potential offshore CO2 Storage sites (Illustration)



Source: OEUK

Hydrogen

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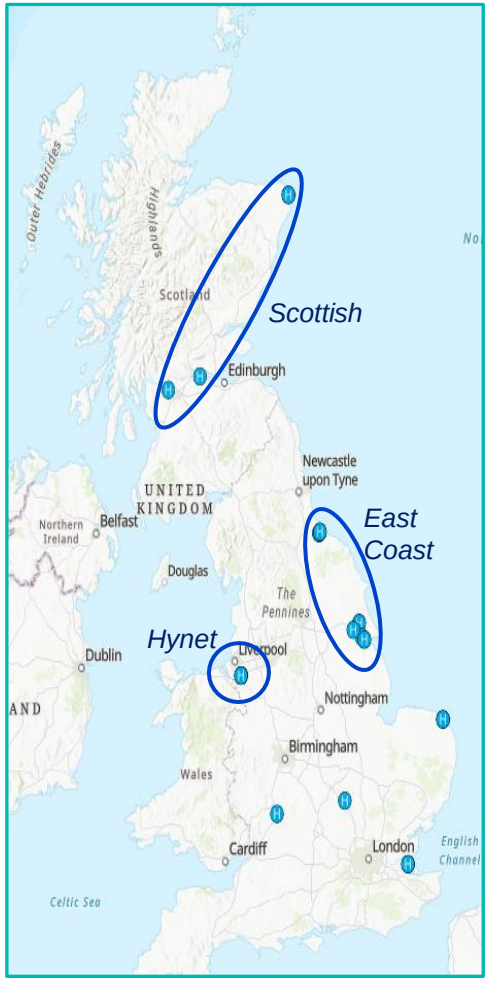
- Nascent low-carbon H_2 industry – outlook still uncertain: demand, supply, infrastructure, *green* v. *blue*, H_2 cost/price
- Government targets 10GW capacity by 2030 (of which 5GW *green-H_2*)
- Opportunity:
  - fuel for hard-to-decarbonise sectors;
  - dispatchable energy from intermittent renewables
- Industry plans (~120 supply projects)
  - Larger scale blue-H_2 projects (100MW->1GW) many in *decarbonisation clusters*
  - Larger number, but smaller scale of green-H_2 projects (1MW-100MW)
- Infrastructure – is needed to develop demand connecting the supply
- (Large) storage capacity – underpins H_2 commercial value

Blue-H_2 projects

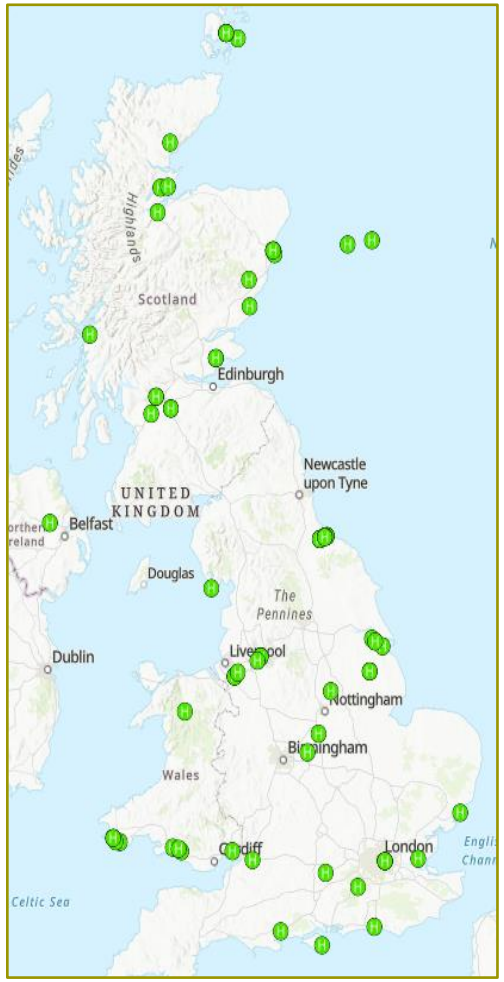
~30 projects, ~12GW



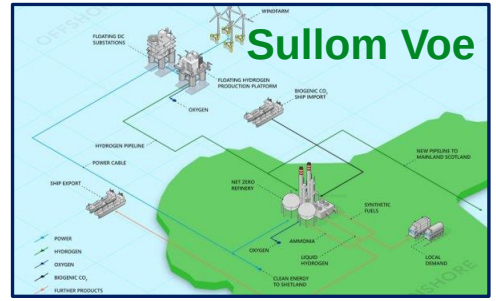
Decarbonisation clusters

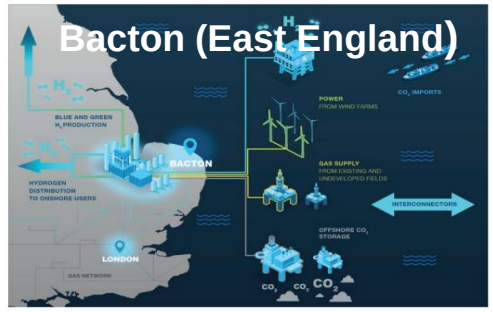
Green-H_2 projects

~90 projects, ~5GW



H_2 Hub concepts





Infrastructure repurposing & re-use

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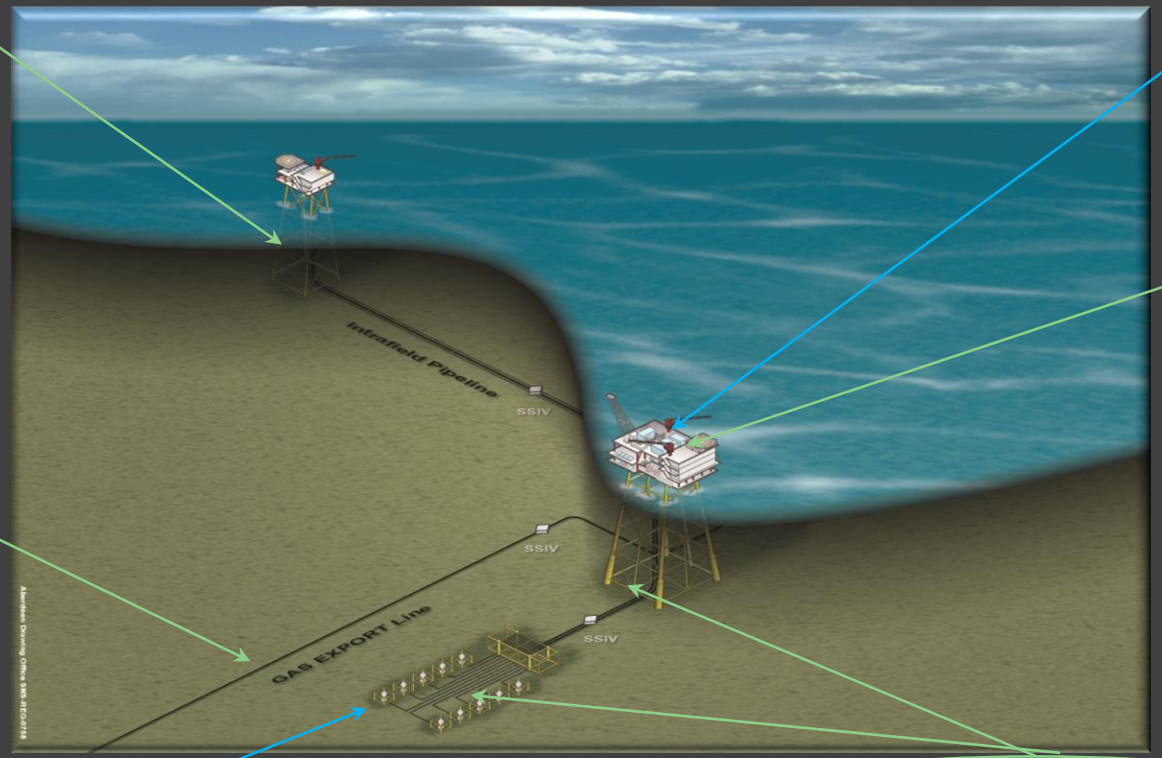
Platform substructure

- To support new renewables / Net Zero topsides

Platform superstructure

Equipment & spares can be re-used on other oil/gas developments



Platform superstructure

Equipment & spares can be re-purposed for non-oil/gas uses

Trunklines

- CO_2 transmission to offshore
- H_2 to shore

Subsea infrastructure

Equipment & spares can be re-used on other oil/gas developments

Development Wells

- To preserve CCUS potential
- To inject CO_2 for underground sequestration
- Tubulars used in onshore construction

Repurposing / Reuse screening

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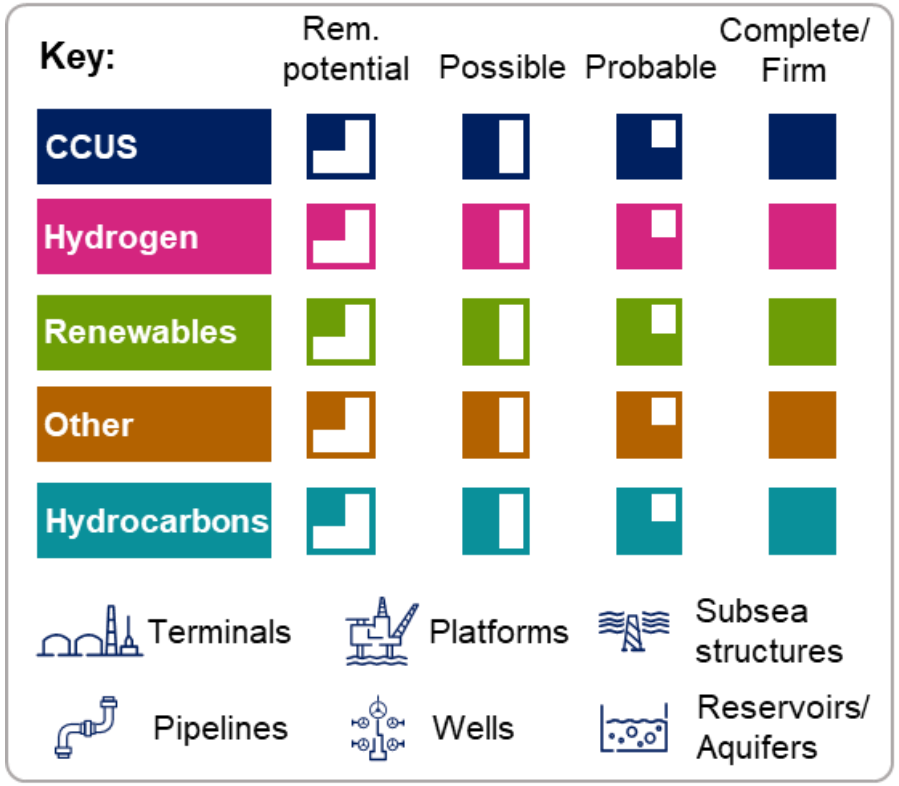
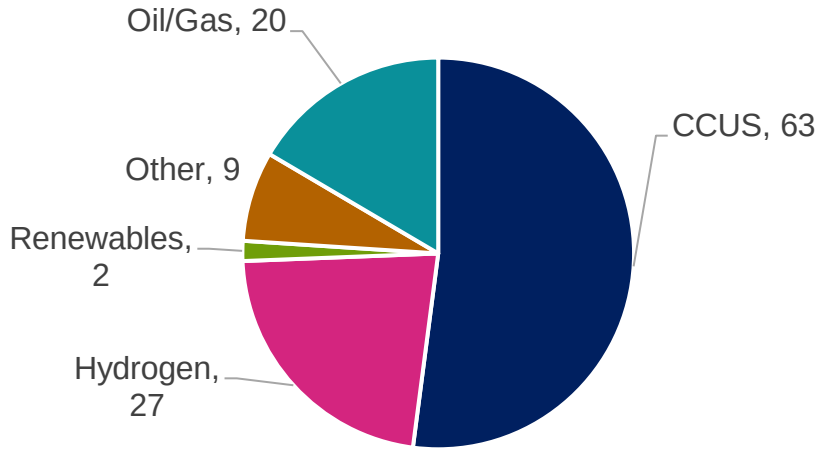
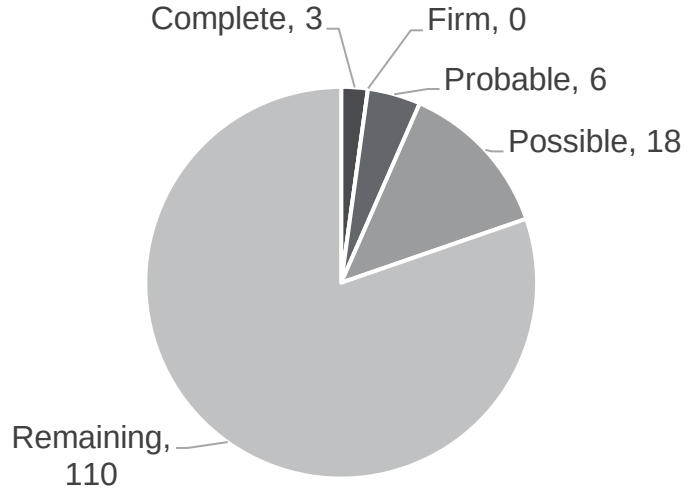


Pipelines by potential use



Pipelines by screening stage



- Screening existing infrastructure for reuse/repurposing (or eventual decommissioning)
- Engaging stakeholders in maturing/progressing these opportunities
- Clarity when repurposing not appropriate and decommissioning should be pursued instead