



SCCS PhD Consortium, Edinburgh
4th December 2023

MAXINE AKHURST

UK geological storage resources for the energy transition

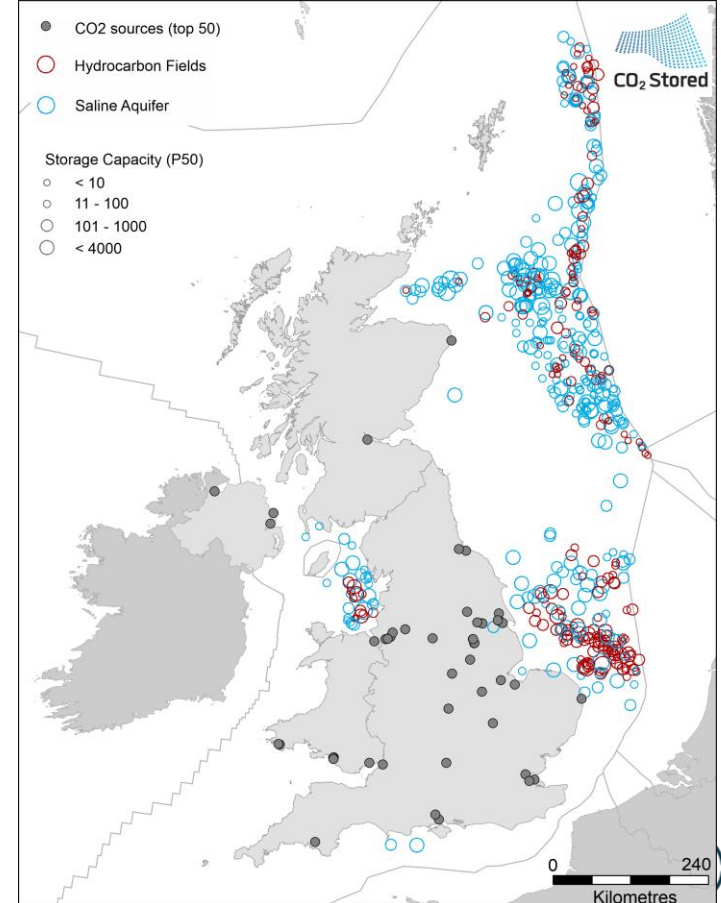


British
Geological
Survey

CO₂Stored – UK national CO₂ storage database

- Database populated by Energy Technologies Institute £4m UK Storage Appraisal Project in 2011
- Eleven party academia & industry consortium, including BGS, Heriot-Watt and Edinburgh Universities
- BGS & The Crown Estate developed an online database of mapped capacity
- Ownership transferred from ETI to BGS in 2018
- CO₂Stored provides:
 - Data on more than 570 prospective CO₂ storage units offshore around the UK
 - Units are shown by geographical position, store type and capacity
 - Stores assessed are depleted hydrocarbon fields and saline aquifer sandstones
 - First calculations of theoretical capacity
 - Starting point for industry CO₂ projects

www.CO₂Stored.co.uk



CO₂Stored 2.0 – Objective & outputs



British Geological Survey

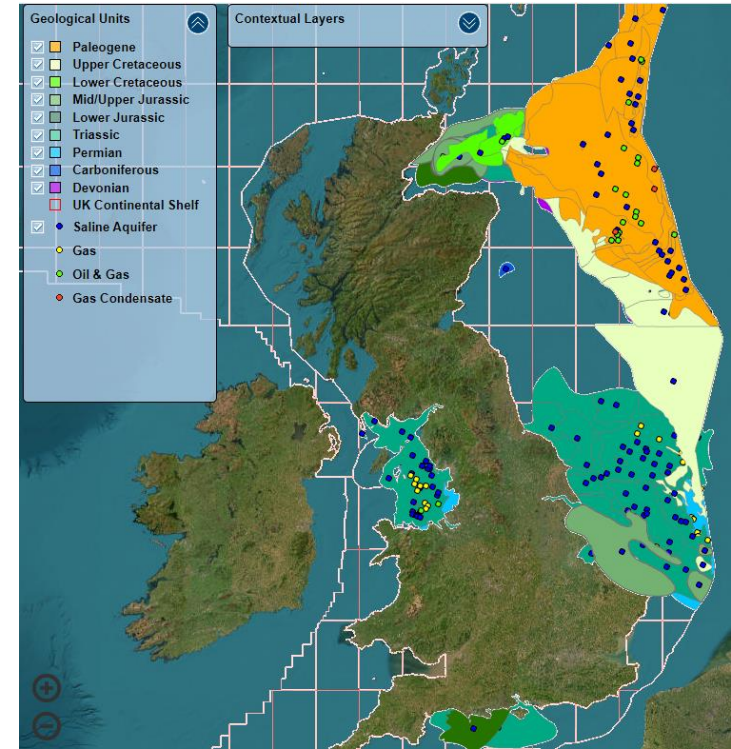


Objective

- Deliver first updates to the underpinning data in CO₂Stored, of UK CO₂ storage resource information since 2011

Outputs

- Robust database & improved web site functionality for CO₂Stored users
- Up-to-date information on storage resource around the UK, particularly hydrocarbon field stores not previously in the database
- Updates of recently completed studies and new research available to all clusters



CO₂ Stored 2.0 – IDRIC research update

September 2023



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Implemented and tested the update procedure

Completed updates:

Industry- and government-funded investigations

- UK CCS demonstration & commercialisation competitions Longannet, Kingsnorth, White Rose and Peterhead CCS project plans
- Strategic Storage Appraisal Project: Viking Gas Fields, Hamilton Gas Fields, Bunter Closure 36, Captain & Forties 5 aquifer sandstones

CO₂ Stored research by BGS and The Crown Estate

- East Irish Sea mapping of additional storage units and recalculation of capacity values: Collyhurst Sandstone, five new closures, three 'parent' storage units revised with one significantly extended



CO₂ Stored 2.0 – IDRIC research updates November & December 2023



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Hydrocarbon field store updates

- Reviewed field data publicly available since 2011 database population
- Calculated hydrocarbon field store capacities based on produced oil and gas, and injected gas and water
- New data now available for 246 oil fields
 - updates for 92 fields already in the database -
 - identified 154 fields new to the database
- New data now available for 201 gas fields
 - updates for 121 fields already in the database
 - Identified 80 fields new to the database,
- New fields require: stratigraphy, depth, thickness, property map data
- Updates for the fields already in the database was completed in November 2023

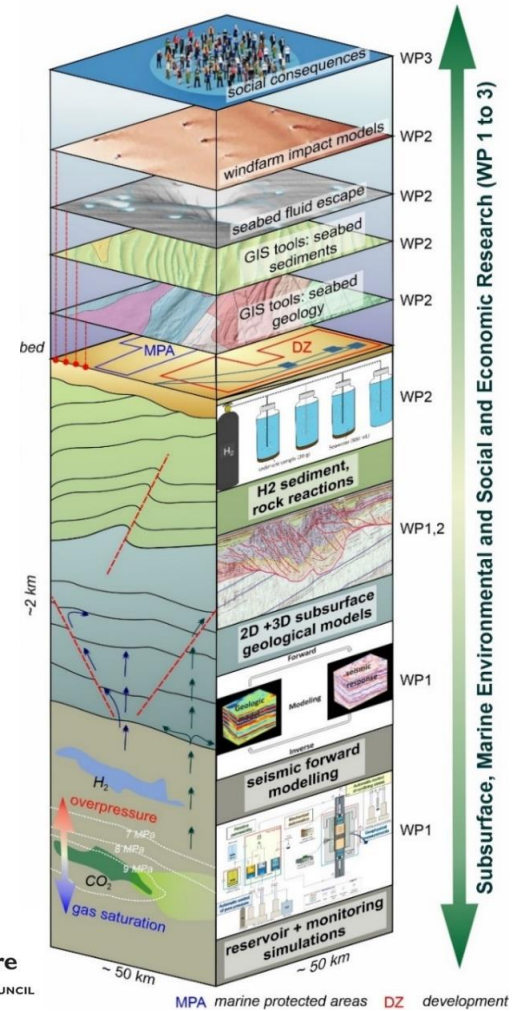
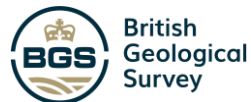


Managing the Environmental Sustainability of the Offshore Energy Transition (MOET)

UK's first holistic study of the environmental and social impacts resulting from the rapid expansion of offshore infrastructure driven by the UK's energy transition to net zero emissions.

Research commenced in 2022 with funding for five years

- Ensuring the effective and optimal use of subsurface geological resources for temporary H₂ and permanent CO₂ storage
- Ensuring the environmental sustainability of offshore energy infrastructure - understanding the shallow subsurface, seeps and the marine environment
- Societal consequences of the energy transition
- Translating scientific research into stakeholder-led outcomes to support decision making



Effective and optimal use of the subsurface and seabed for the energy transition

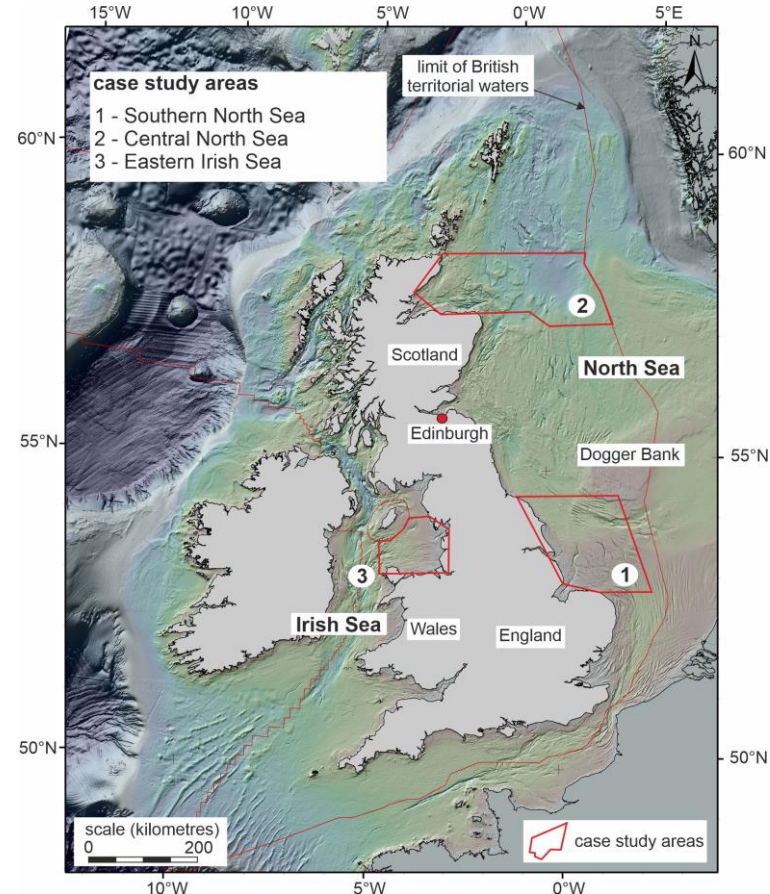
- Offshore UK is already busy, seabed and subsurface
- Transition to low-carbon technologies, existing and new uses
- New low-carbon technologies for Net Zero:
 - Temporary storage of hydrogen in salt caverns
 - Temporary storage of hydrogen in porous strata
 - Permanent storage of CO₂ in porous strata
 - Installation of offshore wind farms
- Existing natural gas production and storage
- Physical interaction of storage facilities, infrastructure and operations
- Assessing synergies and minimising conflicts of subsurface use



Managing the
Offshore
Energy
Transition

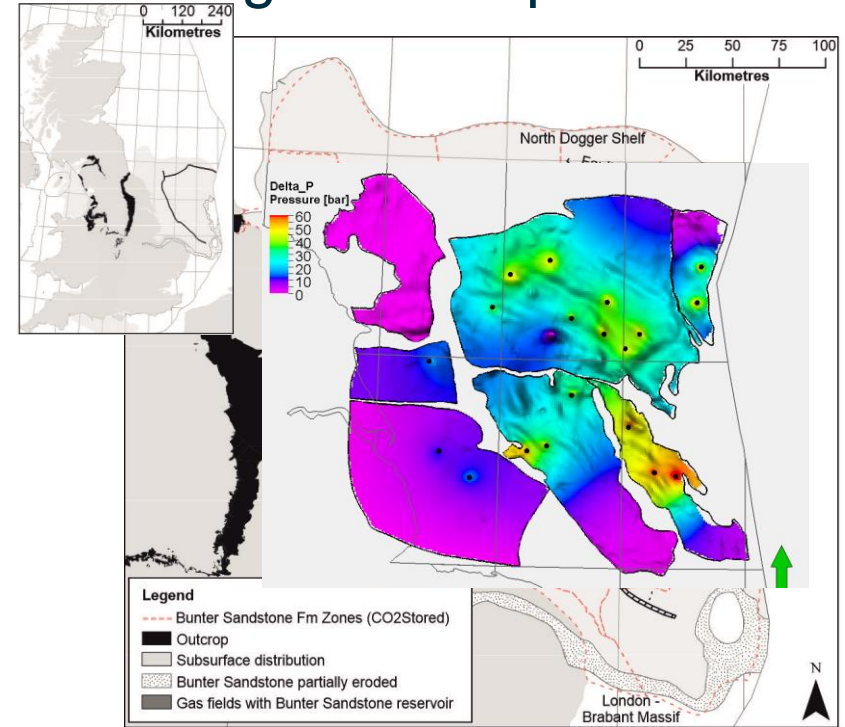
MOET areas of interest & subsurface interactions

- UK industrial decarbonisation clusters are the focus for MOET research, three areas of interest
- industry clusters,
 1. Humberside & Teesside, southern North Sea
 2. Acorn, Scotland, outer Moray Firth
 3. Hynet, Liverpool Bay
- Initial work
 - Detailed investigation for the southern North Sea clusters
- Investigation of subsurface and seabed low-carbon technology uses
- Fully integrated to consider synergies & minimise conflicts of use



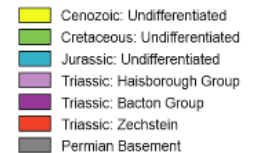
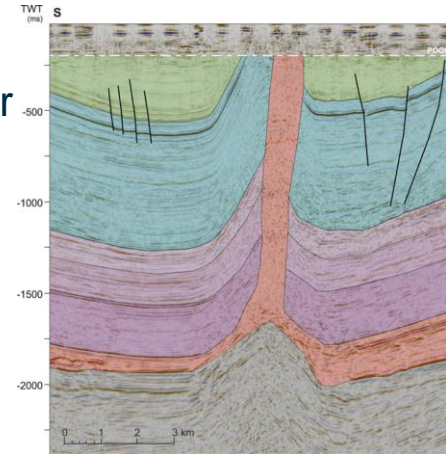
Southern North Sea - mapping, modelling & lab experiments

- First pass mapping rock salt suitable for cavern storage of H₂ has been completed, component formations in progress, to identify communities
- Mapping of structures that bound zones in the Bunter Sandstone, is well progressed.
- Regional modelling of pressure increase by simulated CO₂ injection, e.g., if boundaries are closed to flow, to inform likely interaction
- Rock physics flow-through experiments completed, to measure rock properties of Bunter Sandstone for prediction & monitoring
- A database of likelihood of microbial activity for UK storage strata has been compiled, presentation as a web-enabled screening tool in discussion, to screen potential sites



Ambitions

- Inform of communities for areas where H₂ might be stored, assessment of societal perspective & concerns
- Understand capacity for H₂ cavern storage near to coast, for lower cost & potential interaction of activities
- Potential impact on communities, ecology, ecosystems services from:
 - co-location of H₂ storage sites in salt and CO₂ sandstone storage
 - competition for H₂ and CO₂ sandstone storage & whether a choice of storage use for sites.
- Impact on storage operations from connectivity across boundaries
- Effect of cyclical hydrogen operations on permanent CO₂ storage & vice versa
- Impact of storage operations on the overburden, seabed, offshore windfarm and pipeline infrastructure.



Summary

UK national CO₂ storage database, CO₂Stored, is being updated

- IDRIC-funded research has supported development of update procedure
- industry- and government-funded investigations in September 2023
- hydrocarbon field stores already in the database in November 2023
- hydrocarbon field stores new to the database in December 2023.

MOET Project, Managing the Offshore Energy Transition

- Investigates subsurface and seabed low-carbon technology uses
- Integrated to consider synergies & minimise conflicts of use for H₂, CO₂ & wind
- Three study areas associated with the Track-1 and Track-2 clusters
- Comprises experimental, mapping and modelling activities
- Initial work on the Bunter Sandstone, for H₂ and CO₂ storage, and Zechstein salt for H₂ storage
- Technical output to inform of impact of co-location of storage operations likely areas for H₂ storage to assess societal perspectives and concerns

