UP HERE TOO MUCH
CO_2 IS A PROBLEM

THE PETERHEAD CARBON CAPTURE AND STORAGE PROJECT

sse

DEEP DOWN UNDER
THE NORTH SEA
THERE IS A SOLUTION

PART I
WHY ARE WE DOING IT

Dr Owain Tucker

Sequestration manager,
Peterhead CCS project

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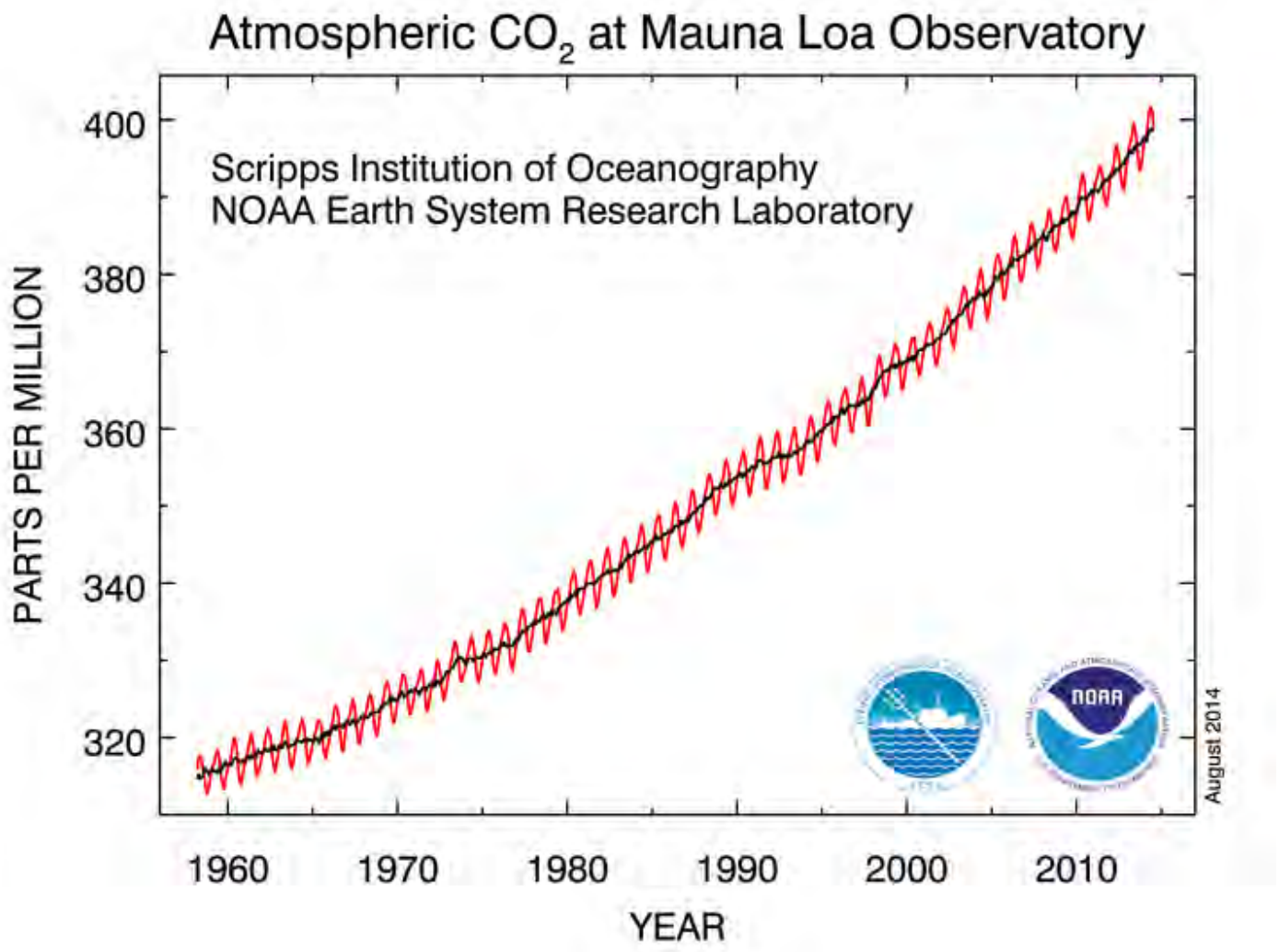
WHY?



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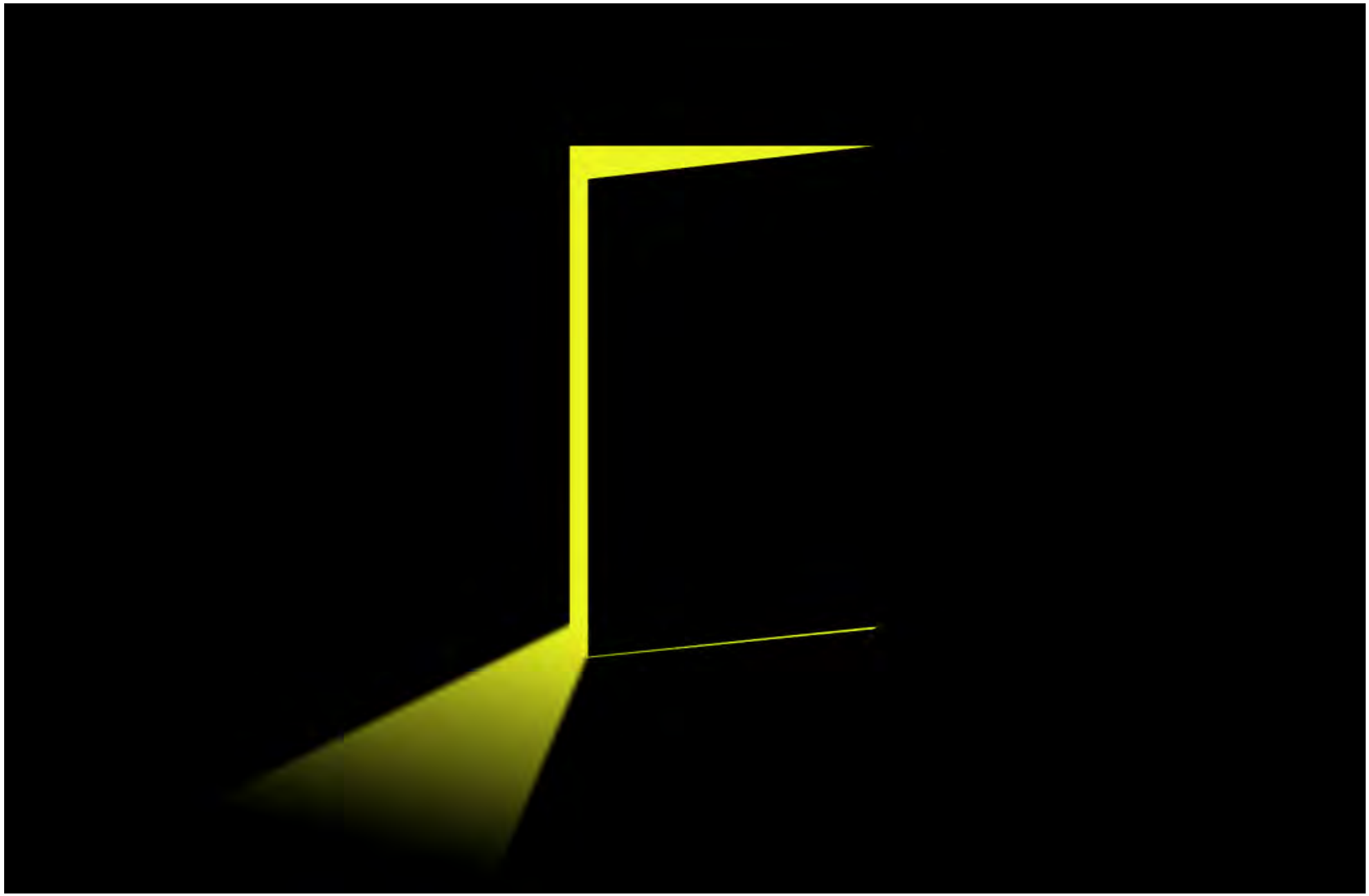
THE DOOR TO A 2° (1 Trillion Tonnes) WORLD IS CLOSING



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IT IS GOOD FOR THE UNITED KINGDOM

Prize for Britain

32 Billion

£/ Annum

Without CCS, the additional costs to run a decarbonised UK economy in 2050 will be £32Billion.

UK Energies Technology Institute

Government Objective

… by the 2020's, private sector electricity companies can take investment decisions to build CCS equipped fossil fuel electricity generation facilities without Government capital subsidy at an agreed contract for difference strike price that is competitive with the strike price for other low carbon generation technologies"

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SHELL IS DEVELOPING SIGNIFICANT EXPERIENCE IN CCS

Quest

1 Mtpa
Aquifer

TCM

Weyburn
Midale

Peterhead

1 Mtpa
Depleted field

Aberthaw

Boundary Dam

Otway

Gorgon

3-4 Mtpa
Aquifer with
extraction

Shell involvement in CCS Projects;

- Industrial scale projects in operation
- Industrial scale projects in construction
- Industrial scale projects planned
- Involvement through Cansolve
- Demonstration projects, joint industry partnerships

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PART II: THE PROJECT DIMENSIONS

OVERVIEW AND TIMELINE

CAPTURE

TRANSPORT

STORAGE

THE LOCAL COMMUNITY

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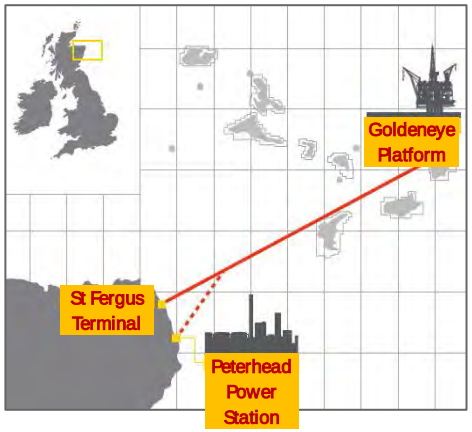
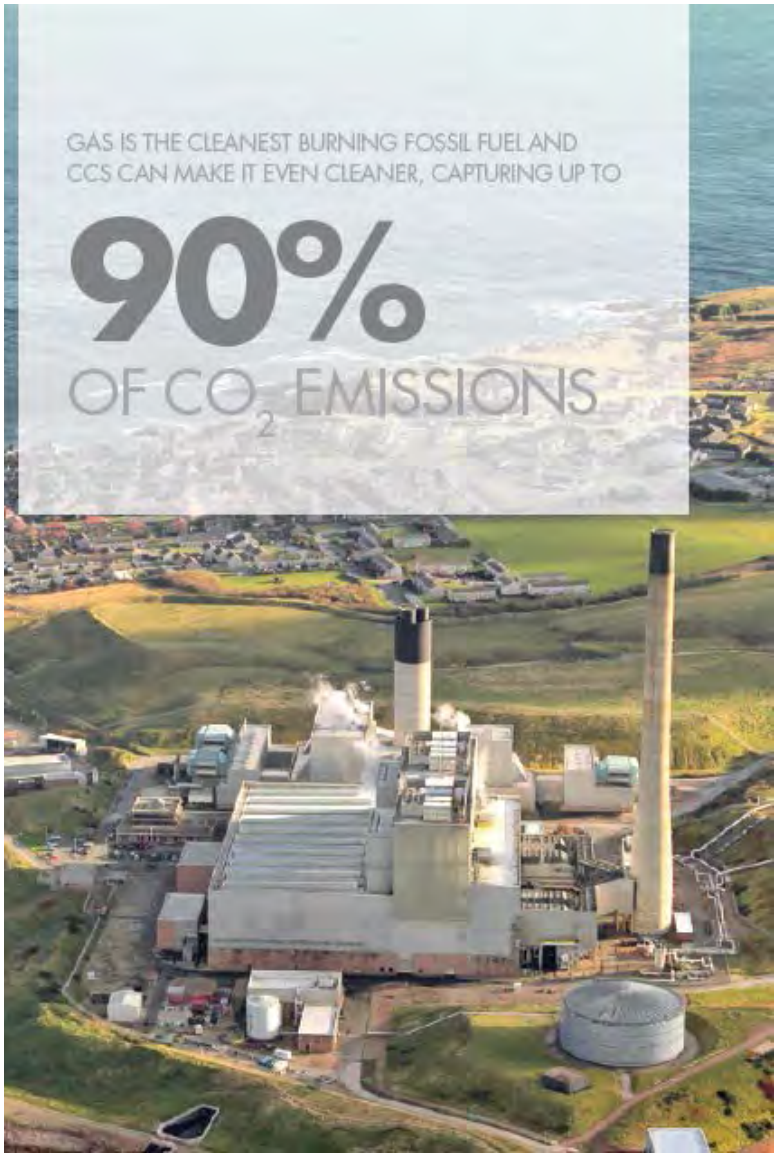
PETERHEAD AT A GLANCE

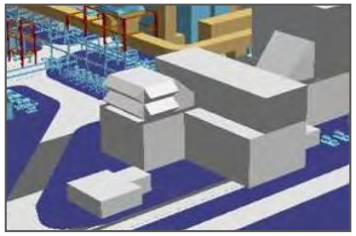
- **WORLD FIRST** – first full-scale CCS project on a gas-based power station
- **WHERE?** – capture at Peterhead Power Station; storage in depleted Goldeneye gas reservoir (100km offshore)
- **IMPACT** – 10 million tonnes of CO_2 captured over a ten-year period (90% CO_2 capture from one turbine)
- **TECHNOLOGY** – post-combustion capture using amines
- **TIMELINE** – could be operational by the end of the decade

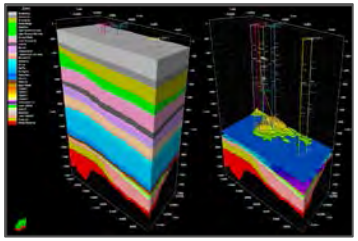




EXISTING INFRASTRUCTURE

- ✓ Power station
- ✓ Flue gas source
- ✓ Substation to national grid
- ✓ Offshore pipeline
- ✓ Appraised storage reservoir





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KEY ELEMENTS OF WORK ON PETERHEAD

Power Station

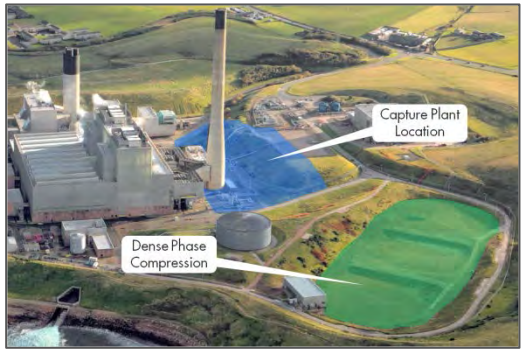
- Carbon capture facilities
- Compression & conditioning facilities
- Modifications to power station, including a new steam turbine

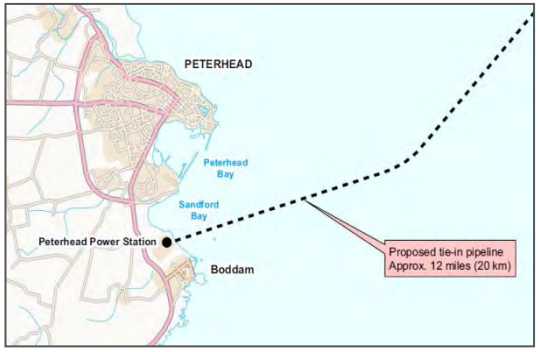
Near Shore

- Circa 20km offshore pipeline (from beach to existing Goldeneye pipeline)

Offshore

- Replacement of existing SSIV
- Modifications to the Topside platform
- Well recompletions





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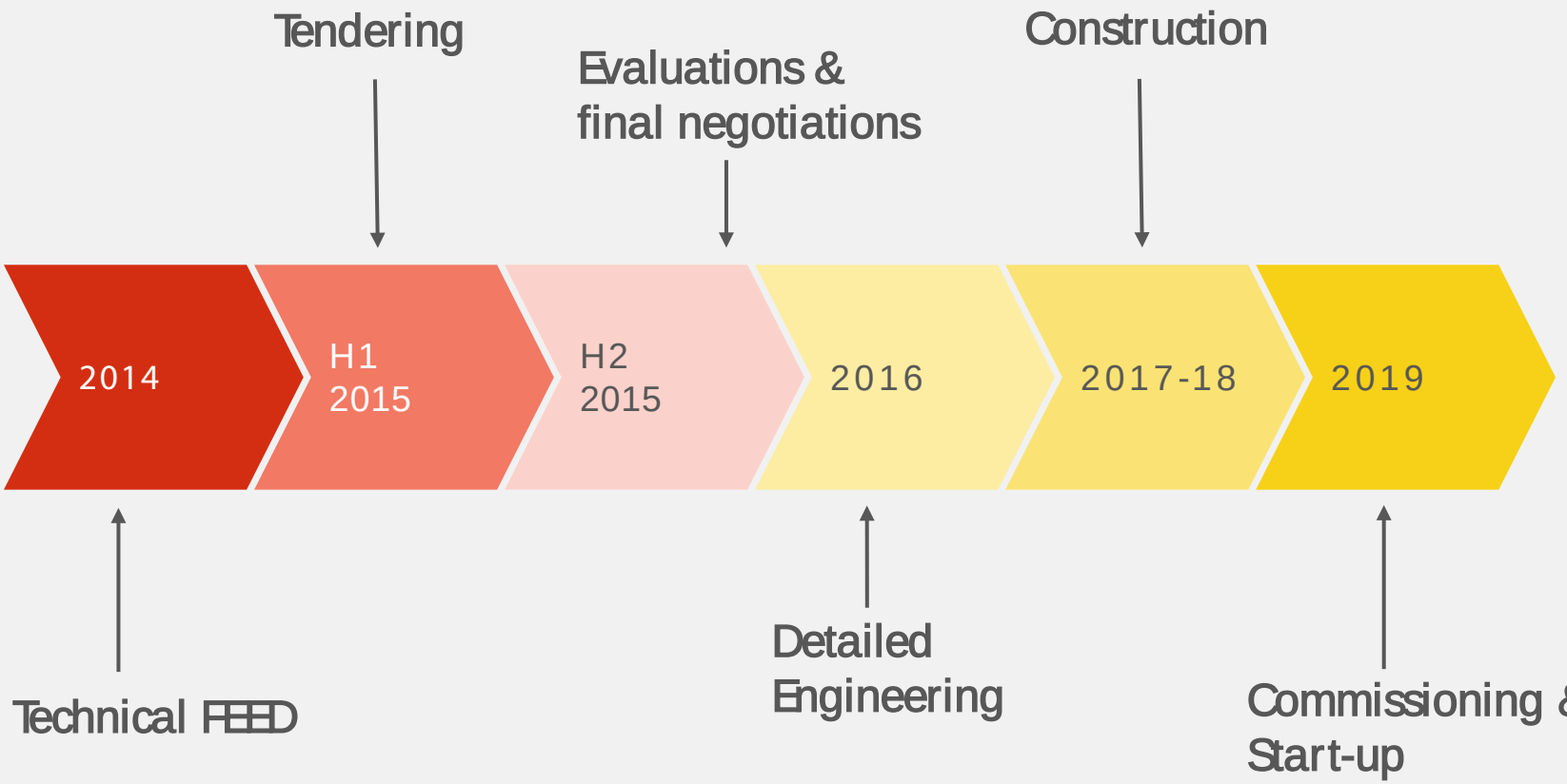
ANTICIPATED PROJECT SCHEDULE



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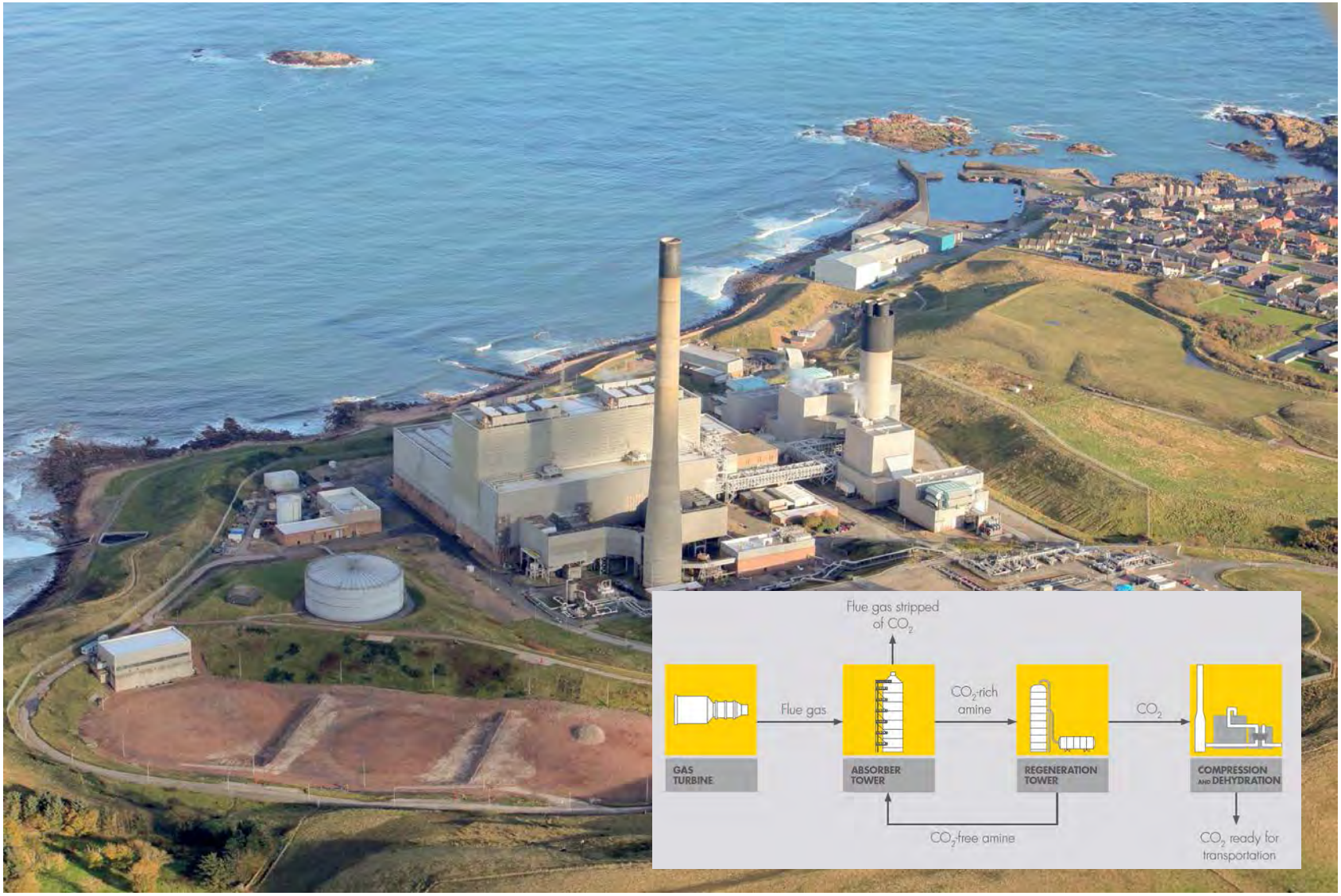
CAPTURING CO_2 AT PETERHEAD POWER STATION



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OVERVIEW OF ONSHORE CONSTRUCTION

KEY POINTS

- Construction anticipated to take approximately 30 months
- Maximum number of 500 people on site at peak; average of 350
- Tallest new structure: absorber tower at approx 80m (existing chimney 180m)
- Modular approach where possible
- Maximise local content

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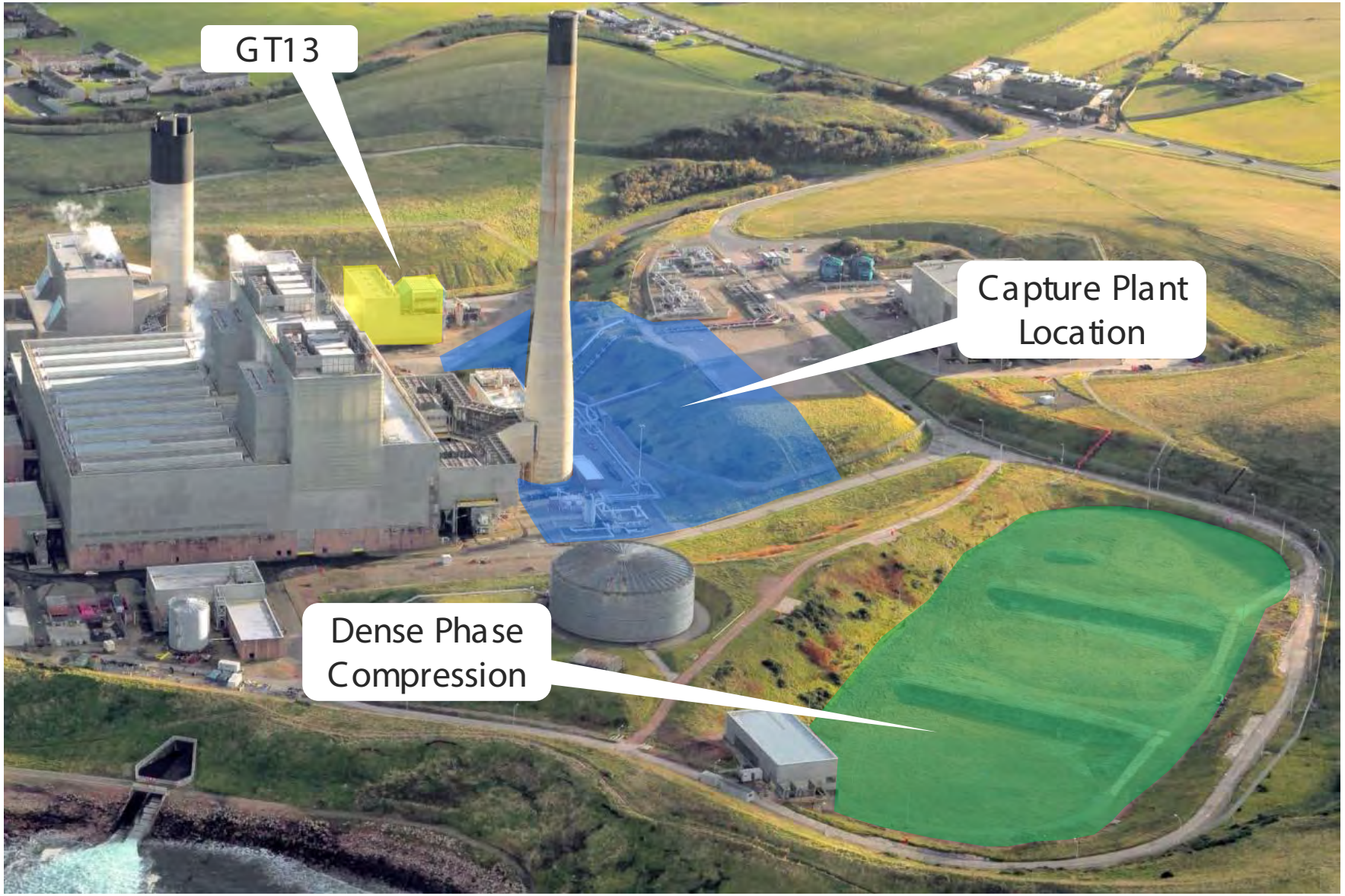
ONSHORE LAYOUT



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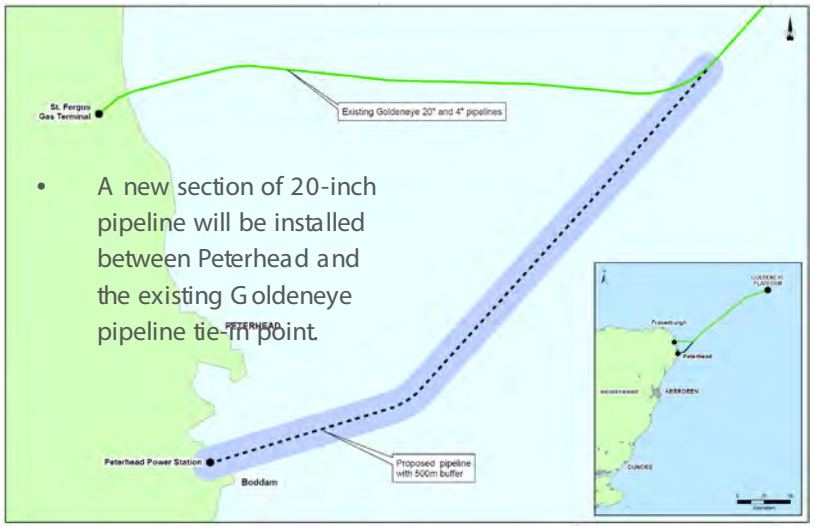
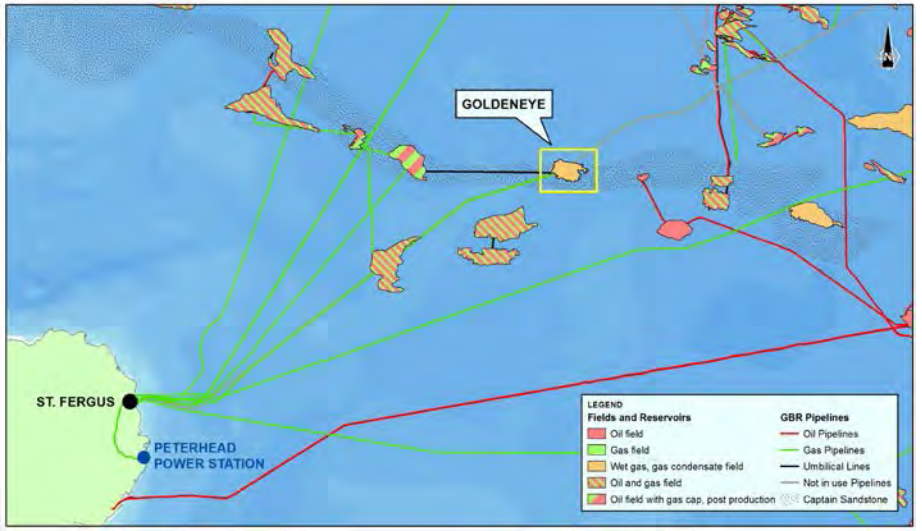
OVERVIEW OF OFFSHORE CONSTRUCTION

SUBSEA & OFFSHORE SCOPE

- New CO_2 export pipeline section and landfall at Peterhead Power Station
- Subsea tie-in of new pipeline with existing pipeline
- Upgrade or replacement of 'Subsea Isolation Valve' near the Goldeneye platform
- Goldeneye platform upgrade to CO_2 service
- Wells workover to enable CO_2 injection





GOLDENEYE PLATFORM & WELLS ACTIVITIES

PLATFORM

- Platform needs to be upgraded to allow it to receive CO_2 - replacing piping, installing filters and advanced monitoring and control systems
- A 'walk-to-work' system will be utilised during construction. Workers will be accommodated on a vessel and walk to the platform using a hydraulic, heave compensated draw-bridge

WELLS

- Four of the existing wells will be 'recompleted': internal tubing and systems will be replaced to make them suitable for CO_2 injection
- Advanced 'down hole' monitoring equipment will be installed to allow real-time reporting.

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PART II: THE PROJECT DIMENSIONS

OVERVIEW AND TIMELINE

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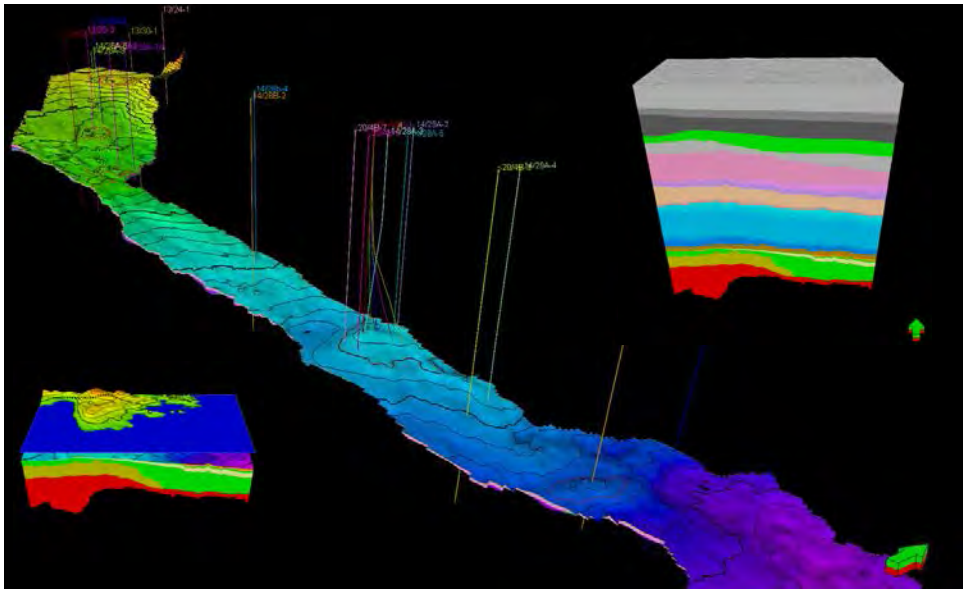
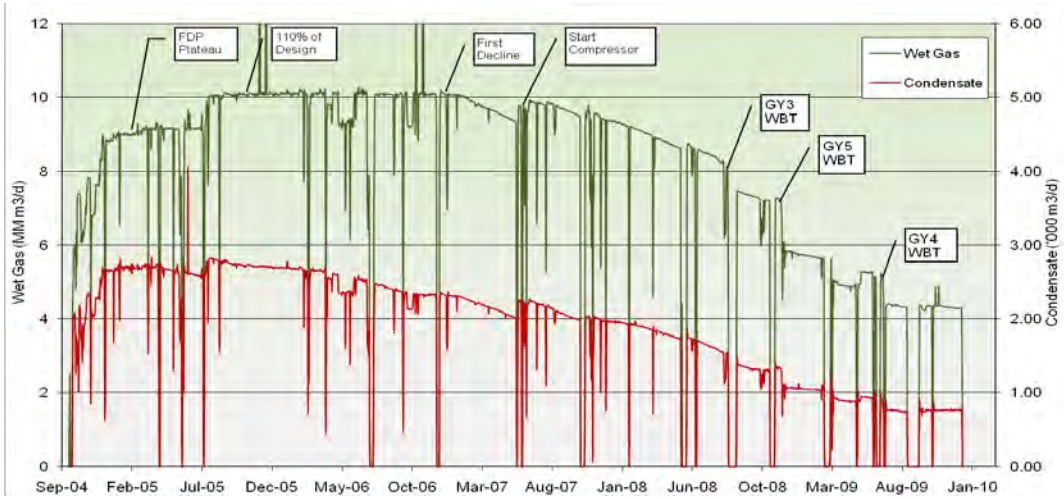
SUBSURFACE

- Geoscience work coming to a close
- Finalising well design components
- Finalising selection of monitoring components





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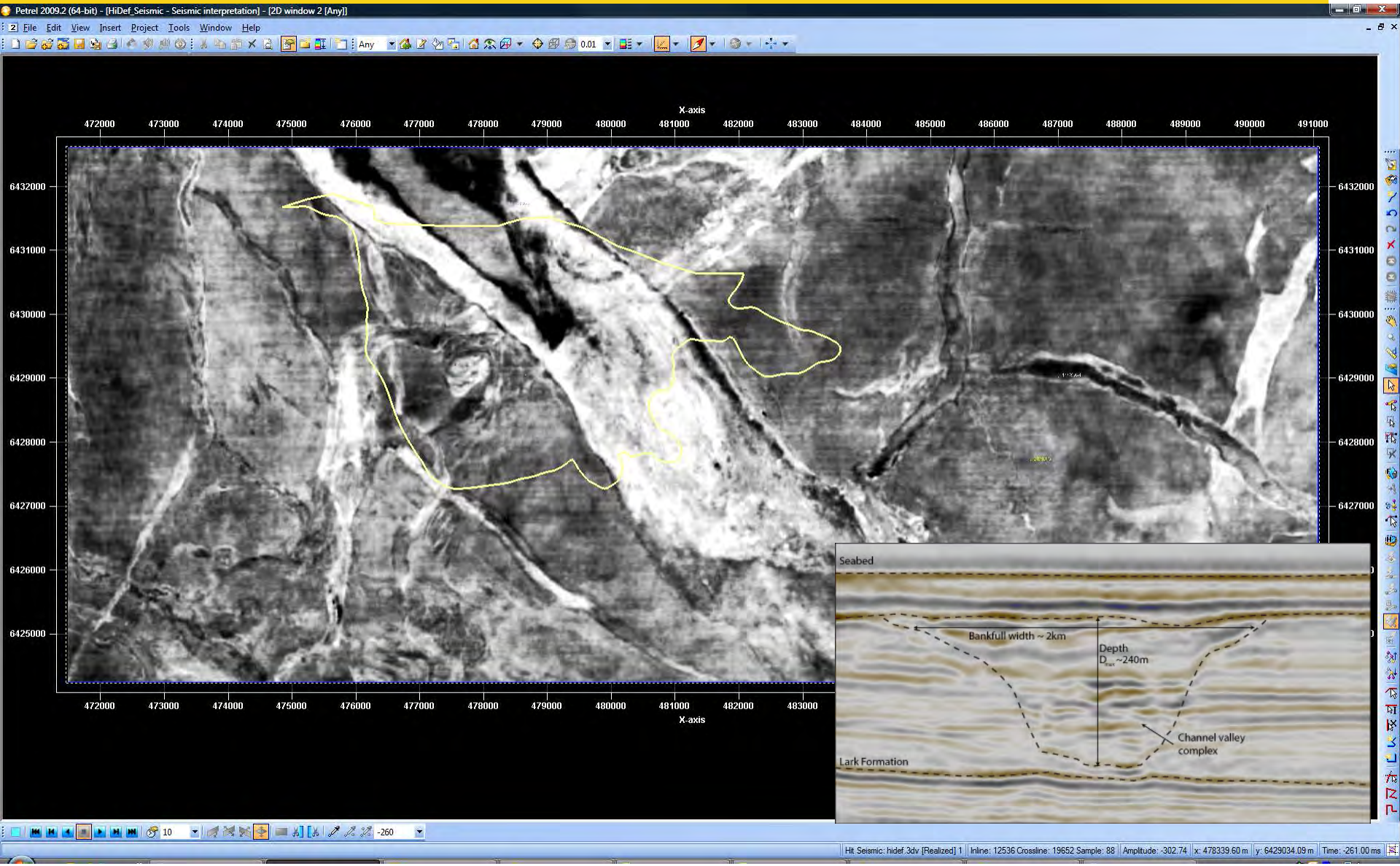
LARGE SCALE CHARACTERISATION OF SUBSURFACE

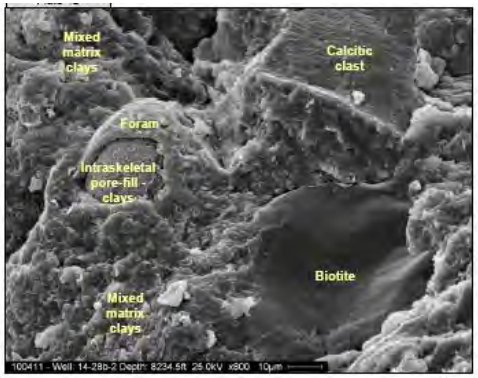
E.G. GLACIAL CHANNELS IN THE PLEISTOCENE [1.8 MLN YEARS]

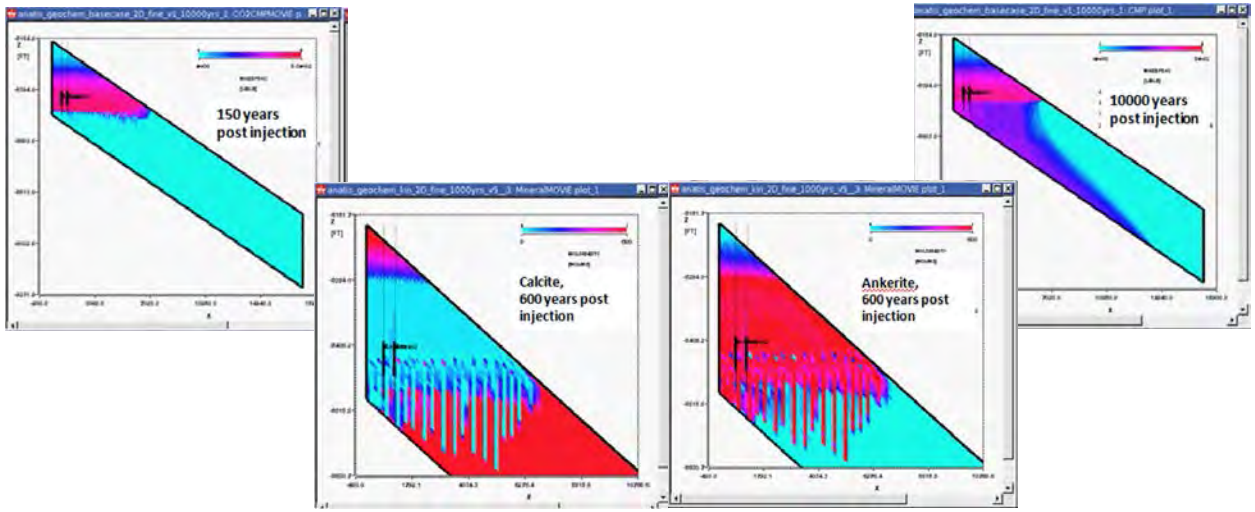


MICROSCALE SCRUTINY

Rock constituents have been measured, and geochemical effects have been assessed

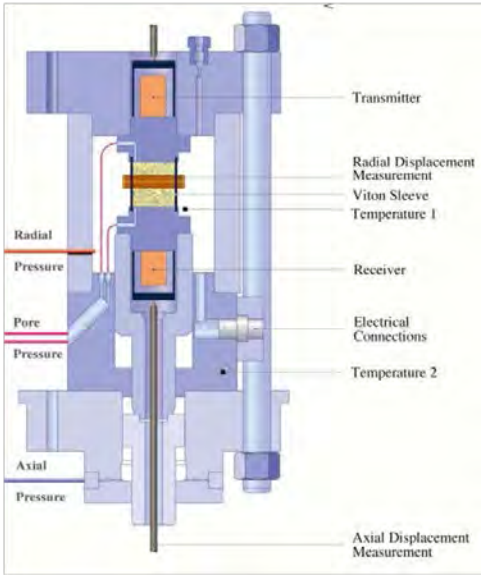
- In the lab with rock samples: showing that the core is not weakened by the injection of CO_2
- In a coupled simulation examining the potential effects over the next 10,000 years
- The caprock is found to become more sealing (porosity decreases)





Calcite dissolution

Ankerite precipitation



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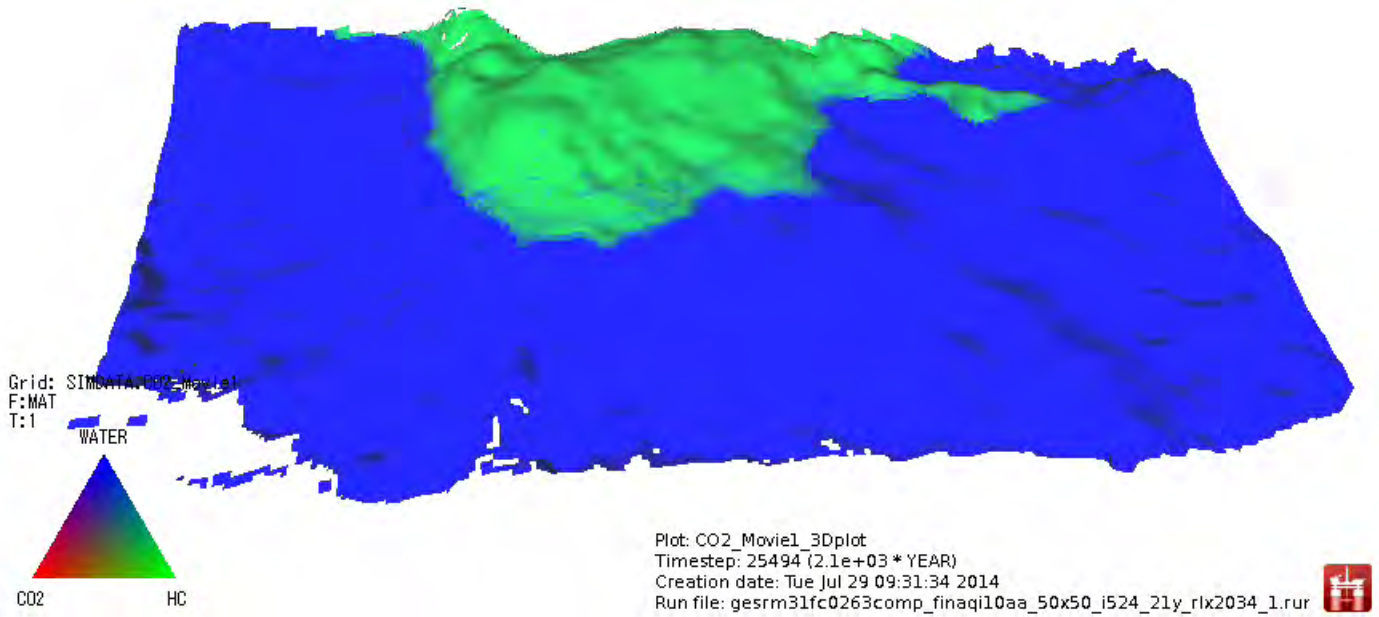
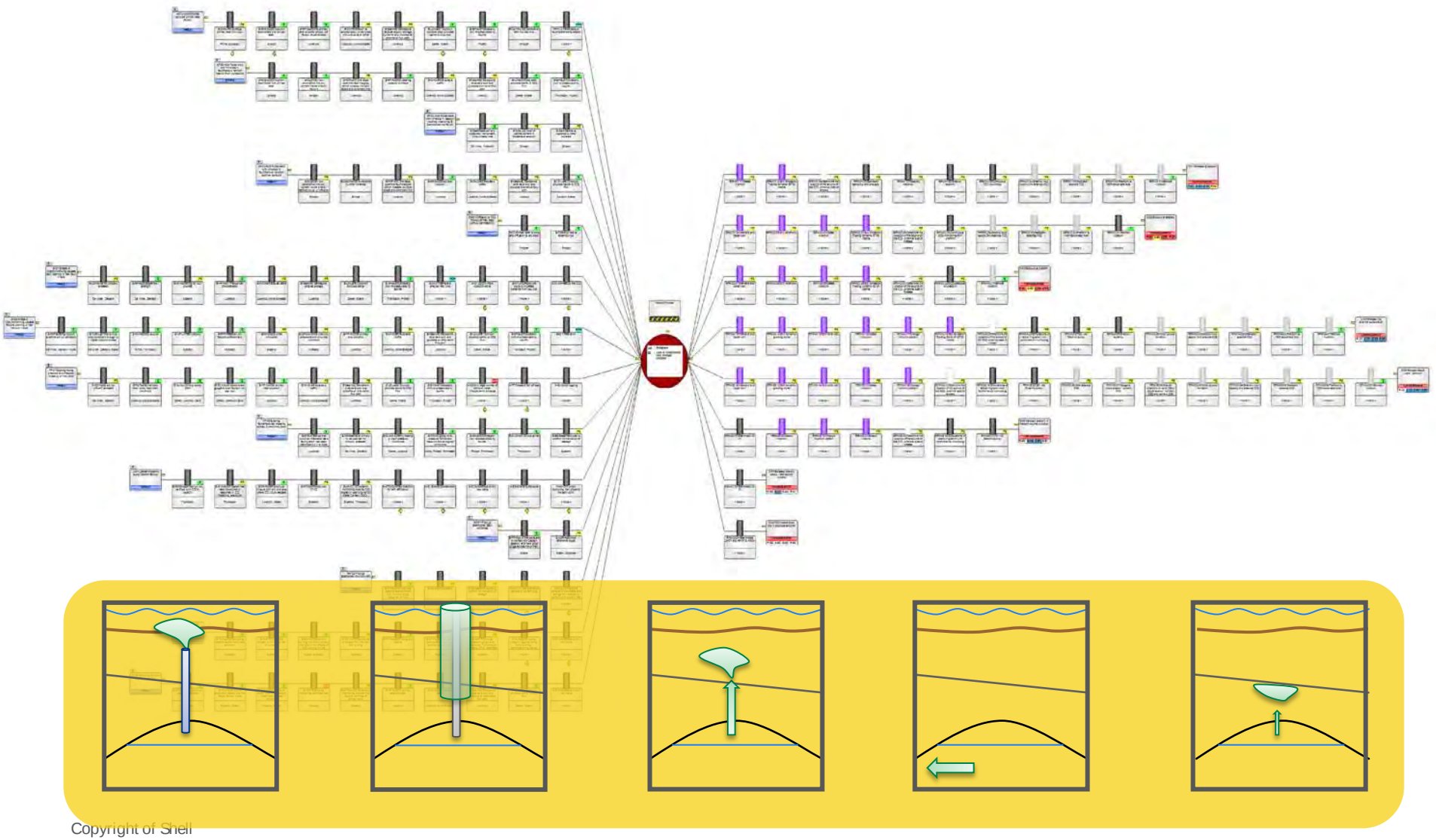
PRODUCTION BEHAVIOUR HISTORY MATCHED AND FORWARD MODELLED



COMPREHENSIVE RISK ASSESSMENT



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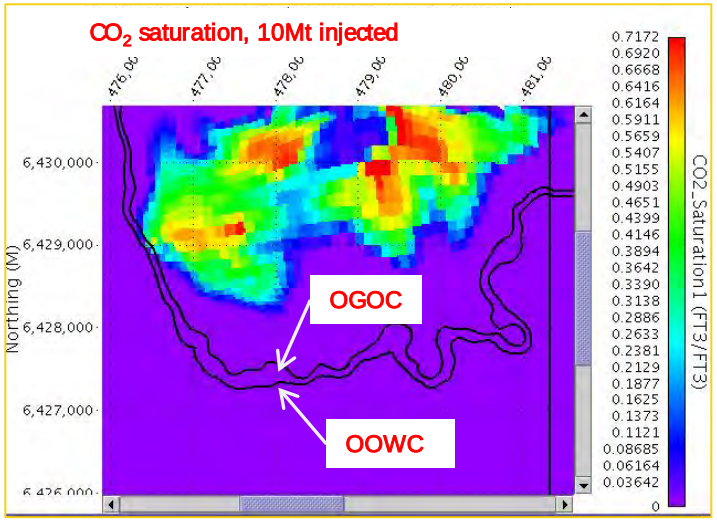
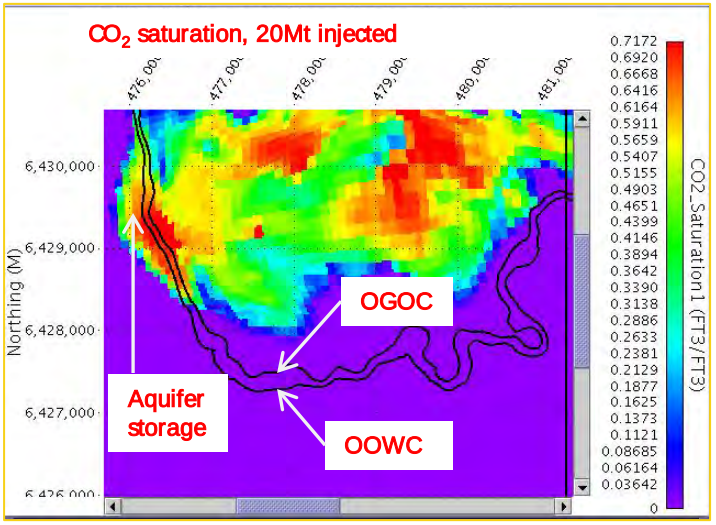
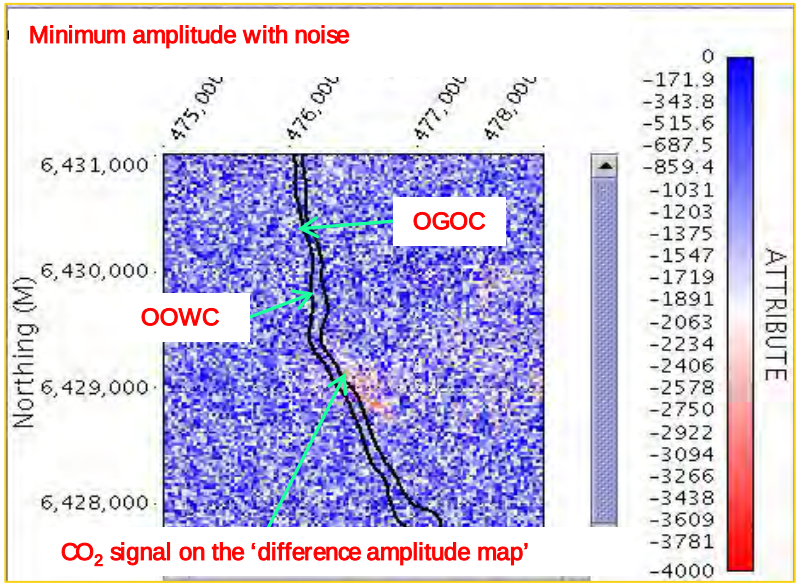
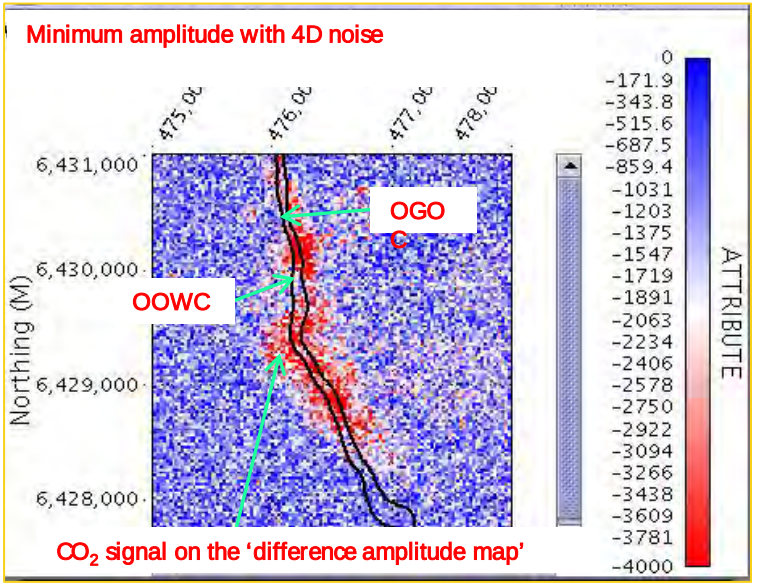
MONITORING RESPONSES MODELLED AS INPUT TO MMV PLAN









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PETERHEAD POWER STATION

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COMMUNITY BENEFITS

Power Station Life

Construction Jobs

Operations Jobs

Future Industry Hub

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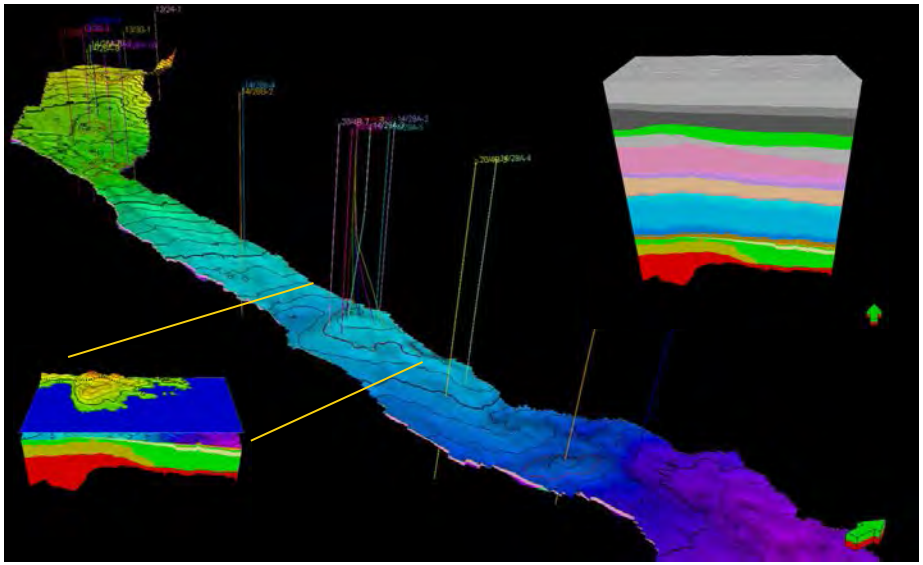
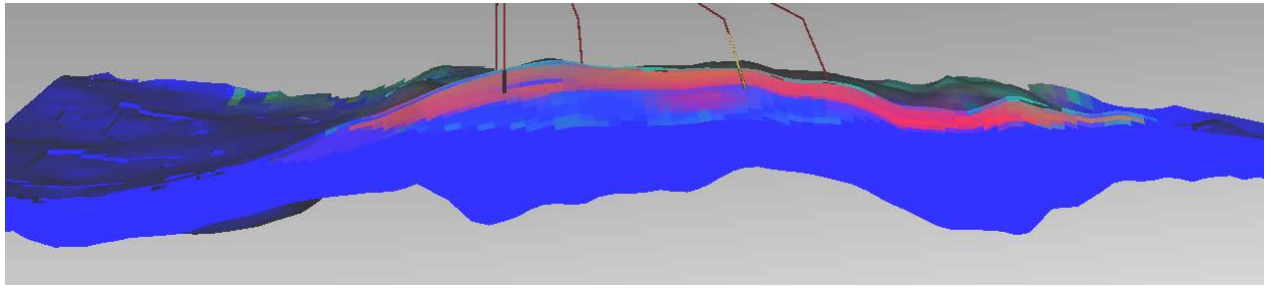
STORAGE POTENTIAL FOR A FUTURE INDUSTRY HUB

- The Goldeneye field has an active aquifer.
- Once injection starts at Goldeneye the location becomes a "proved and operating" CO_2 store.



- Injection can then be expanded, at the same location, storing CO_2 in the connected Captain aquifer which has a range of capacity estimates that reach up to 1.6Gt (SCCS study)



Goldeneye forecast 100 years after end of 20Mt injection

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