CASSEM Overview

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CASSEM

CO_2
Aquifer
Storage
Site
Evaluation &
Monitoring

CASSEM Partners

SCOTTISHPOWER
British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL
EPSRC
Engineering and Physical Sciences Research Council
Scottish and Southern Energy
Schlumberger
HERIOT WATT UNIVERSITY
Technology Strategy Board
amec
MARATHON
AEA
Tyndall Centre for Climate Change Research

Project Description

- Collaboration between industry and academia
- £2.25 million
- 2 ½ years
- Develop methodology to select and characterise potential UK storage sites in deep saline aquifers

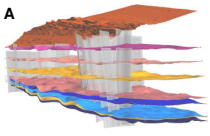
Site Selection (BGS)

- Identified 2 ***analogue*** sites, near power stations
  - one in Scotland, one in England
- Characterised sites
  - seismic and borehole data
  - mineralogical analysis
- Created geological models

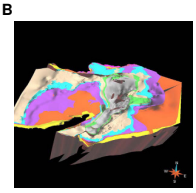
CASSEM Models

- Model A
  - tilted layers
  - some faults
- Model B
  - complex structure
  - faults
  - anticlines and synclines

A

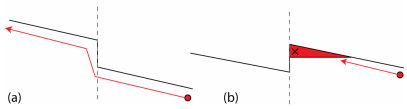


B



Modelling 1 (UoE)

- Basin modelling
  - validate structure (faulting)
  - assess trapped volumes
  - investigate migration paths
    - CO_2 may collect on up-throw side of a fault



Modelling 2 (HWU)

- Dynamic flow simulation
  - pressure build-up
  - migration of CO_2
  - dissolution in brine
  - geomechanical and geochemical effects
- Improved estimates of storage potential

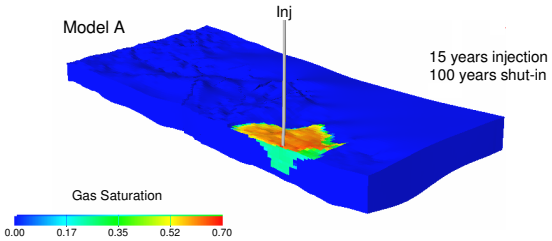
Three Levels of Modelling

1. Basic
   - existing data, simple simulations
2. Intermediate
   - using BGS geological models
   - some geomechs and geochem
3. Advanced
   - using lab results

more data

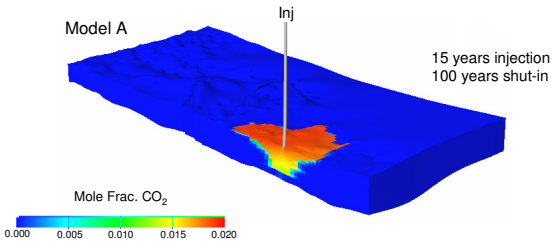
Example Results

- Spread of CO_2 under cap rock



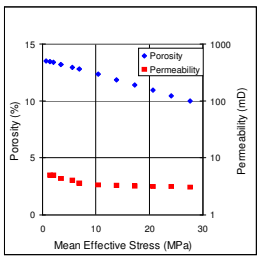
Example Results

- CO_2 dissolved in brine



Laboratory Work (HWU)

- Geomechanical tests
- Geochemical tests
- Results to be used in Level 3 flow simulations



Injectivity (UoE)

- Injection schemes
  - Standard CO_2 injection
  - CO_2-brine surface mixing
  - CO_2-water surface mixing
  - CO_2 alternating brine (CAB)
- CO_2-brine surface mixing reduces risk of leakage of free CO_2
  - but large volumes of fluid must be injected

Geophysical Monitoring (UoE)

- Assess applicability of
  - seismic
  - gravity
  - resistivity
- Results depend on what you're trying to measure
  - presence, leakage, migration, etc.

Risk Analysis (UoE)

- Risk register kept throughout the project
  - Assess likelihood and severity of FEPs
    - Feature, Events and Processes
- Simpler site perceived to be more secure

		Likelihood				
		1	2	3	4	5
Severity	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

CCTS (AMEC)

- Carbon Capture Transport and Storage
  - bringing everything together
  - processes are linked
  - parameters in each process affect other processes upstream and down stream
  - understanding relationships is important
  - the importance of understanding the down-hole behaviour is critical

Summary of CASSEM Integrated Activities