Australian Geo-observatories

CO2CRC Otway Project and South West Hub / In Situ Lab Projects

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26th June 2018
Outline

• Where in Australia?
• Otway examples
• South West Hub & CCS RDD In Situ Lab examples
  • Tracers
• The non-technical
• When things go wrong...
• Conclusions
The Australian Scene – CCS Projects
CO2CRC Otway Project

- **Otway Stage 1**
  - 65,000 tonnes gas injected
  - One of the most extensive M&V research portfolios
  - Continued monitoring for ~10 years in reservoir to give real data for predictive modelling and risk reduction

**Details**
- Retrofit of Naylor-1 gas well
Identifying Breakthrough
300m well spacing

transition to gas lift
• Slight delay relative to mol%CO₂ increase

Buttress CO₂

Tracers arrive together

Buttress CO₂

• Identifying Breakthrough

300m well spacing
CO2CRC Otway Project

- **Otway Stage 2**
  - Well drilling / push-pull test / seismic study
  - 2B Single well residual saturation & dissolution test
  - Novel and conventional tools to measure residual CO$_2$
  - Residual saturation ranges highly uncertain, while regarded as an important storage mechanism in saline aquifers
  - Understanding ‘e’!
Tracer Research Stage 2B

- CO₂-sat water injection (8t H₂O & 0.3t CO₂)
- 12kg Triacetin, 10kg Propylene Glycol Diacetate & 8kg Tripropionin added
- Soak time 10 days
- Back production of 23.7t formation fluids over 12 hr
- Approx 600 samples taken every other minute
Data and modelling fit for Stage 2B

- Pulsed neutron logging got: av. 0.20 (0.07-0.32) [Dance & Paterson, 2016]
- Reactive esters got: 0%: [Myers et al., 2015]
- And there were others....

Myers et al, 2015
CO2CRC Otway Stage 3

Objectives of Define phase:

• Finalise well placement and design based on analysis of uncertainties in the subsurface
• Confirm performance of monitoring methods
• Complete initial operational concept for monitoring
• Critical path starts with static model

Stage 3 concept (schematic)
South West Hub CCS Project & CCS RDD In Situ Lab Project
Background - South West Hub Project

- Australian Carbon Capture Storage flagship project
- Greenfield (4 data wells)
- Site characterisation phase
- ~1500 m thick reservoir
- Containment?
- Groundwater aquifer absent
- No CO₂ injected so far
Unique Setting of South West Hub

- Reservoir thickness (> 1500 m) is very large compared to other sites globally
- CO$_2$ dissolution in formation water & residual trapping are dominant mechanisms for CO$_2$ containment; not completely relying on structural trap or confining seal layer
- Proofing up the storage suitability of the SW Hub may increase portfolio of storage sites in Australia and globally
In situ monitoring

**Instrumentation**
- Discrete pressure and temperature measurements in each interval
- Distributed fibre-optics to enable DAS, DTS, and heat-pulse monitoring
- U-tube sampling in the lower two Wonnerup intervals
- Piezo source + Geophone/hydrophone sensors
Site layouts during well workover and test injection
Other factors....
The team is more than the geos...

• Technical
  • Geology, geochemistry, geophysics, structural, diagenesis, petrophysics, reservoir engineers, mechanicals.. Etc etc..

• Support
  • Procurement, finance, HSE, operations, communications, regulation, etc...

• Community engagement...
When things go wrong....

Waroona-Yarloop Bushfire
18 JANUARY 2016
Thank you

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