eReport

Issue 22, April 2019

ANLEC R&D Report Summaries

The following reports are available from the ANLEC R&D website:

Techno - economics Modelling

MEGS study highlights important role of CCS in renewable energy targets

This study of Managing Electricity Grid Systems (MEGS) presents modelling of a very high renewables NEM world that minimises fossil fuel consumption whilst aiming for 90 per cent decarbonisation. The study found deep decarbonisation requires a diverse portfolio of energy technologies for power generation. It shows that it will be prohibitively expensive - with renewable energy alone - to go beyond 65 percent decarbonisation. CCS technology allows the electricity generation portfolio to chart a lowest cost path to achieving more than 90 per cent emission reductions. The study also looked at performance metrics for decarbonisation of a grid and concluded that the 'Total System Cost' is a better metric to assess the affordability of emissions reduction pathways.

More information: Renewable and the NEM: What are the limits and what else is needed to go zero?

Modelling shows QRET and VRET combined won't meet emissions targets

Most Australian states and territories have traditionally relied on coal fired power generation for over 80% of their electricity supplies. More recently, Queensland, Victoria, South Australia and ACT have adopted policies to substantively increase sourcing their electricity from renewable energy and targeting net zero emissions aspirations for the future. How this impacts on the physical operation of the National Energy Market (NEM) has been examined in this work.

The first report for this project looks at the renewable energy targets in QLD and Victoria (QRET and VRET) and their modelling using MEGS (Modelling Energy and Grid Service). The study found QRET and VRET combined does not achieve electricity's fair share of the Australian Paris emission reduction commitment.

More information: The Effect of Renewable Energy Targets on the National Energy Market

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Gippsland Basin

An updated geological model of Gippsland Basin seal lithologies

This project aimed to understand the stratigraphy and structure of intraformational seals in the Gippsland Basin. Such information is vital for the assessment of CO_2 storage sites in the Basin's near- and off-shore areas. This study has found considerable evidence for a marine-influenced coal-bearing system, despite many earlier workers suggesting a predominantly deltaic depositional environment for the offshore Eocene Latrobe Group. This has important implications for the continuity of seals and reservoirs in the succession. A lower coastal plain setting is consistent with the 10's of kilometre scale lateral continuity observed for the coals from seismic and well log data, and seals developed in underlying tidal shales and kaolinitic seat earths. An updated stratigraphic nomenclature is recommended for the nearshore Traralgon Formation.

More information: Geometry and character of Latrobe Group seals

Proxies suggest Gippsland coals can contribute towards seal

There is evidence from hydrocarbon accumulations and groundwater salinity and pressure contrasts that the Traralgon Formation could act as a seal. Potential candidates for key sealing lithologies within the Traralgon formation are coal seams, kaolinitic seat earths and intertidal shales. This project used a novel core flooding technique to characterise the CO_2 entry pressure of coals. Due to lack of samples, a range of cores from Victorian brown coal, and Surat Basin black coal were used as a proxy based on rank. The results from these proxies show that the Traralgon coal seams have

some seal potential in low-salinity environments, such as found in the nearshore Gippsland Basin. In this context, they can contribute towards the observed hydrocarbon and fluid trapping in the nearshore Gippsland Basin, but are unlikely to be the primary seal lithology.

More information: Characterisation of CO_2 interactions with Basal Coal Seam Intraformational Seals

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South Perth Basin

Integrated approach for reducing uncertainties in upward migration barriers

The Yalgorup Member has been interpreted as successions of fluvial clastic sections (sandstones) and palaeosol horizons (mudstones). Based on the current knowledge, the ability of the low permeability mudstone to effectively stop CO_2 movement remains unclear, mainly due to the lack of data about the dimension of the palaeosol bodies. This research project studied its nature by testing for the reactivity and transmissivity to CO_2-rich fluids, via a comprehensive evaluation of the petrographic, petrophysical and mechanical properties of the palaeosols and interbedded sand sequence. The results showed there was more than one uniform claystone facies in the Yalgorup Member, and that their occurrences are controlled by Paleoclimate. Analysis of the formation water salinity suggests that the low permeability facies in the Yalgorup Member may act as local migration barriers, but not as a static seal.

More information: Assessment of multi-barrier systems for CO_2 containment in the Yalgorup Member

South Perth Basin study shows potential to image subsurface with recorded seismic noise

This project deployed a sparse network of sensors over a year. The data was analysed for the seasonal variation of ambient seismic noise from natural processes. Advanced detection and location algorithms were used to search for any local and regional seismic activity. Regional earthquakes and mining explosions are clearly recorded across the network, however, local seismic activity was not detected. Seismic ambient noise tomography results show the variation of 2D seismic velocities across Perth Basin and adjacent Yilgarn Craton.

More information: Passive seismic investigations at the South West Hub

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ANLEC R&D is a member of the following IEA implementing agreements. For access to their reports, please contact admin@anlecrd.com.au

IEA Clean Coal Centre Reports

1. Lockwood, T (2018). “Reducing China’s coal power emissions with CCUS retrofits”.
2. Reid, I (2018). “Non-energy uses of coal”.
3. Sloss, L (2019). “Technology readiness of advanced coal-based power generation system”.

IEAGHG R&D Program Reports

4. IEAGHG (2018). “The Carbon Capture Project at Air Products’ Port Arthur Hydrogen Production Facility”.
5. IEAGHG (2018). “Re-Use of Oil & Gas Facilities for CO_2 Transport and Storage”.