

eReport

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ANLEC R&D Report Summaries

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

Balancing Flexibility Whilst Decarbonising Electricity on the NEM

ANLEC R&D recently completed an independent study on valuing energy generation technologies in the context of the host national electricity market grid (NEM). It demonstrates an innovative modelling approach that considers the grid system cost by including the importance of firm generation, the cost of balancing the system and the required flexibility, while on the “pathway” to a lower emissions grid.

The results show that:

- The lowest cost energy technology options change as a low emissions NEM asset portfolio develops.
- As emissions reduction proceeds to high levels, dispatchable power like HELE+CCS will be required to deliver the required resilience for grid stability.
- It is a technology that will be necessary to deliver the deepest decarbonisation ambitions for the NEM.

Full Report: [The value of flexible and firm capacity in decarbonising Australian grids](#)

The Lesueur: Vertical connectivity, injectivity and residual trapping

The South West Hub project is proceeding to further reduce its uncertainties regarding the containment potential of the upper and lower confining layers of the Lesueur Formation through a drilling, coring and logging program. Constraints on injectivity, compartmentalisation and vertical connectivity across the Lesueur and Eneabba formations are currently highly uncertain. In anticipation of the drilling of Harvey-5, an improved understanding of the injectivity and residual trapping properties of the Wonnerup is required. This project examined containment processes at SW Hub project by:

- Simulating residual trapping, vertical sweep efficiency and the influence of internal barriers to CO₂ migration within the Lesueur Formation, and
- Configuring well-tests that enable the measurement of appropriate parameters to validate models of injected CO₂ movement.

The investigation of vertical migration patterns of CO₂ has previously been limited largely to core or sandbox scale experiments. The current project took a first step at exploring the impact of heterogeneity on the vertical CO₂ migration in the absence of continuous seals. Within the project scope, it was only possible to run a limited number of comparative cases between Darcy-flow and invasion percolation simulations. Also, there is still a large uncertainty with respect to important input parameters, i.e. permeability, anisotropy, range and degree of heterogeneity of capillary entry pressures.

Project Summary: [The Lesueur: Vertical connectivity, injectivity and residual trapping](#)

Hyperspectral imaging can determine the mineralogy of clays and their propensity to be reactive

This project describes the successful application of hyperspectral sensors for investigating the mineralogical composition; in particular, the occurrence of potentially low permeability or baffling layers containing clay and other reactive minerals, of the Precipice Sandstone at the outcrop scale.

A detail analysis of the mineral alteration of the outcrop surface also gave an indication about the behaviour of the minerals present in the Precipice Sandstone. The analysis shows that the Precipice Sandstone presents a mineralogy suitable for CO₂ injection – it is geochemically poorly reactive. CO₂ injected within the reservoir unit could therefore migrate both laterally and upward without substantial impediment, although the finer grained nature of the Upper Precipice could begin to slow vertical migration.

Full report: [Hyperspectral scanning of Precipice Outcrop](#)

ANLEC R&D Technical Presentations

1. D. Pistellato, et al. 2017, *Virtual Outcrop Mapping for CO₂ Reservoir Analogue Modelling*, proceedings presented to The Photogrammetric Record Journal
 2. A. D'Angelo, et al. 2017, *Large Scale Cost Reduction through Adsorption Based Oxygen Generation Technology*, proceedings presented to Journal of Physical Chemistry
 3. G. Ji et al. 2017, *H₂/CO₂ separation by NaMg double salts in a Temperature Pressure Swing Adsorption Process*, proceedings presented to International Journal of Hydrogen Energy
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ANLEC R&D Recorded GCCSI Webinars

1. June 2016:
[Convective mixing in geological storage of CO₂](#)
Authors: Christopher Green and Jonathan Ennis-King, CSIRO Energy
 2. July 2016:
[Callide oxyfuel research project, Part 1: Removal of SO_x, NO_x and Mercury gases during CO₂ compression](#)
Authors: Professor Terry Wall and Dr Rohan Stanger, The University of Newcastle, Australia
 3. August 2016:
[Callide oxyfuel research project, Part 2: CO₂ quality control prior to compression](#)
Authors: Professor Terry Wall and Dr Rohan Stanger, The University of Newcastle, Australia
 4. September 2016:
[Dispersion modelling for CO₂ pipelines: Fit for purpose and best practice techniques](#)
Author: Phil Johnson, Sherpa Consulting
 5. October 2016:
[Development of an aqueous ammonia-based post-combustion capture technology for Australian conditions](#)
Authors: Dr Hai Yu and Dr Kangkang, CSIRO Energy
 6. January 2017:
[Laboratory-scale geochemical and geomechanical testing of near wellbore CO₂ injectivity improvement](#)
Authors: Professor Sue Golding and Dr Grant Dawson, The University of Queensland
 7. February 2017:
[Mercury and other trace metals in the gas from an oxy-combustion demonstration plant](#)
Authors: Professor Peter Nelson and Anthony Morrison, Macquarie University
 8. March 2017:
[Managing carbon geological storage and natural resources in sedimentary basins](#)
Author: Karsten Michael, CSIRO Energy
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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

- Baruya, P. 2017, [International finance for coal fired power plants, CCC/277](#)
- Lockwood, T. 2017, [Public outreach approaches for carbon capture and storage projects, CCC/276](#)
- Carpenter, A. 2017, [Water conservation in coal-fired power plants, CCC/275](#)
- Sloss, L. 2017, [Emerging markets for pollution control retrofits, CCC/274](#)
- Wiatros-Motyka, M. 2016, [An overview of HELE technology deployment in the coal power plant fleets of China, EU, Japan and USA, CCC/273](#)
- Nalbandian-Sugden, H. 2016, [Operating ratio and cost of coal power generation, CCC/272](#)
- Barnes, I. 2016, [The prospects for HELE power plant uptake in India, CCC/271](#)
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IEAGHG R&D Program Reports

Report: 2017-05, *Combined Meeting of the IEAGHG Monitoring and Modelling Networks*

Report: 2017-04, *CO₂ Capture in Natural Gas Production*

Report: 2017-03, *Techno-Economic Evaluation of Deploying CCS in Standalone (Merchant) SMR Based Hydrogen Plant using Natural Gas as Feedstock/Fuel.*

Report: 2017-02, *Techno-Economic Evaluation of Deploying CCS in Standalone (Merchant) SMR Based Hydrogen Plant using Natural Gas as Feedstock/Fuel.*

Report: 2017-01, *Case Studies of CO₂ Storage in Depleted Oil and Gas Fields*

Report: 2017-TR3, *Reference data and supporting literature reviews for SMR based hydrogen production with CCS*

Report: 2017-TR2, *Review of CO₂ Storage in Basalts*

Report: 2017-TR1, *Feasibility Study for Ship Based Transport of Ethane to Europe and Back Hauling of CO₂ to the USA*

Report: 2016-10, *Techno-Economic Evaluation of Retrofitting CCS in a Market Pulp Mill and an Integrated Pulp and Board Mill.*

Report: 2016-TR6, *National CO₂ Storage Assessment Guide*
