

2018

ANNUAL REVIEW

COAL21
Low Emissions Coal Australia

2018

**ANNUAL
REVIEW**

CHAIRMAN'S MESSAGE



This year saw the continued execution of the COAL21 strategy as outlined in the 2027 extension plans. Steady progress has been achieved across all carbon capture and storage (CCS) demonstration projects. The completion of the front-end engineering design for the CTSCo project in the Surat Basin and the release of the final report on the highly successful Callide Oxyfuel Project were important milestones.

COAL21, together with MCA, also conducted several ground-breaking energy-related case studies and provided technical submissions to numerous government agencies including:

- ➔ submission to AEMO's National Electricity Market Integrated System Plan Consultation Paper
- ➔ appearance at the Senate Standing Committee on Environment and Communications regarding the submission made on the Clean Energy Finance Corporation Amendment (Carbon Capture and Storage) Bill 2017
- ➔ submissions to the Energy Security Board in response to the National Energy Guarantee Consultation Papers
- ➔ submission to the Minister's Resources 2030 Taskforce outlining the industry's record and achievements in low-emission investments and its continued commitment to funding CCS.

The development of a Surat Basin CCUS Hub concept was another important achievement this year. This exciting piece of work could potentially lay the groundwork for the commercialisation of carbon capture in Australia.

COAL21 also developed a digital awareness plan to provide credible, fact-based information supporting the role for coal in a low-emissions future which included the launch of a new COAL21 website.

On the international front, COAL21 visited commercial CCS plants in Canada (Boundary Dam) and Texas (Petra Nova) to exchange information, and observed global technological developments offering the potential to reduce the cost of CCS.

We also met with our elected representatives, including regular discussions with the Federal Minister for Resources.

Looking ahead for the next 12 months, COAL21's focus will be on achieving a number of significant milestones, including commencing the construction phase for the CTSCo project in Queensland's Surat Basin.

I'm very encouraged by COAL21's achievements in 2018 and would like to thank all our contributors for their continued support of COAL21.

George J Schuller Jr



THE CONTEXT

World energy demand forecasts indicate that coal will continue to play a significant role in energy supply. To limit global temperature rise from human-induced climate change, deep cuts in global CO₂ emissions are required. Achieving these cuts at the lowest possible cost requires use of fossil fuels, including coal with carbon capture and storage.

Established in 2006 and now comprising twenty-six Australian coal producer investors, COAL21 committed \$300m to demonstrating low-emission technologies in the coal-fired power generation sector, and safe fugitive emissions abatement from coal-mining operations.

COAL21 is now preparing to commit a further \$255m for the period to June 2027, to meet its objectives to:

- ➔ build community confidence in CCS technology for safe, long-term CO₂ storage
- ➔ demonstrate safe abatement of fugitive emissions from coal mines
- ➔ assist in making the case for coal to remain a key part of Australia's future energy supply.

Funded by a voluntary levy on coal production, COAL21 has seen \$374m committed to 30 June 2018.

More recently, the Australian Government has prioritised the reduction of electricity prices and reliability of supply and remains open to including high efficiency, low emission (HELE) coal generation and CCS in its energy policy mix.

In response, COAL21 is conducting studies to provide an evidence-based case for coal to remain a key part of Australia's future energy supply while developing the capability to reduce emissions in the future.

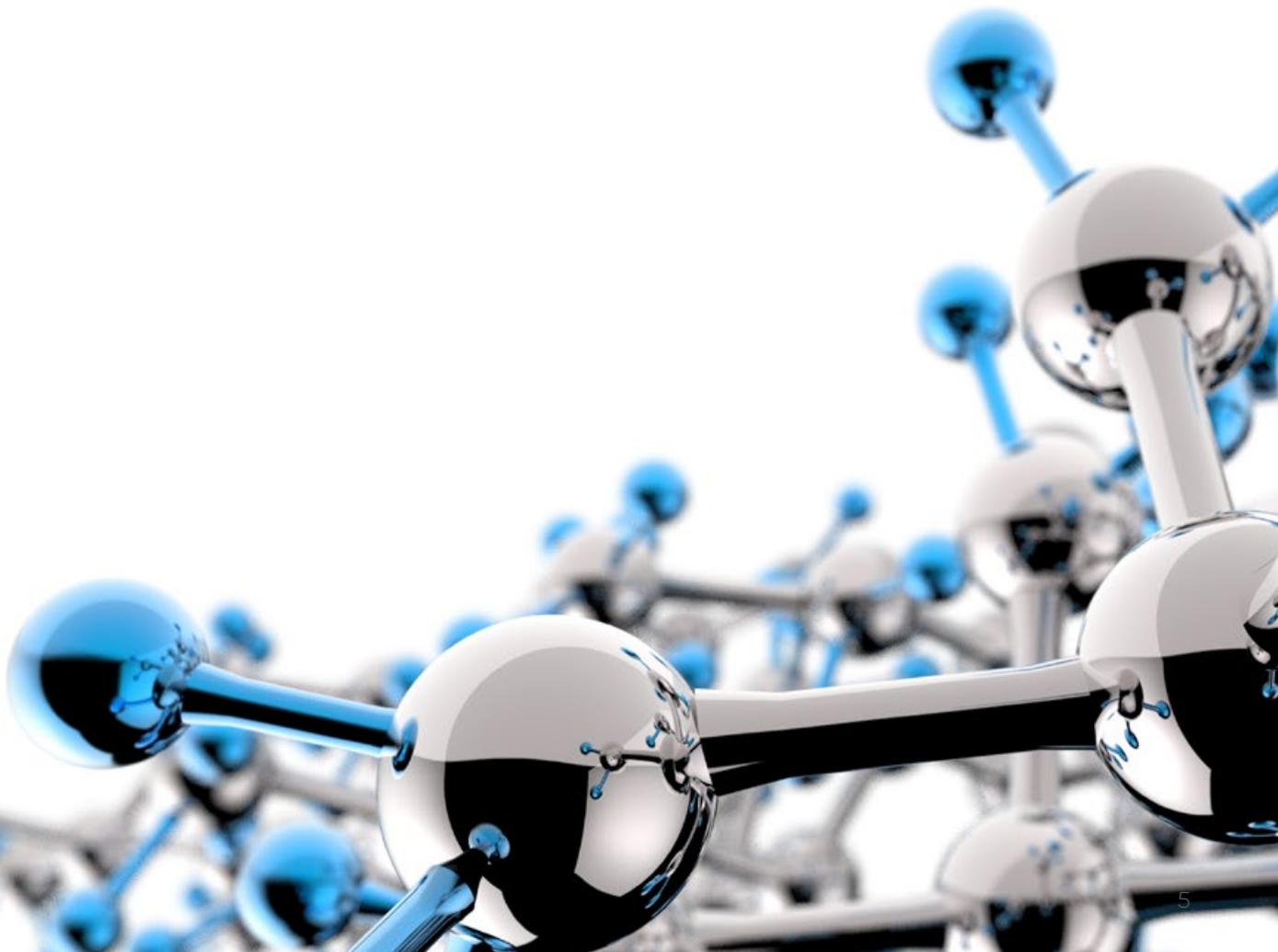
2018: A YEAR OF ACHIEVEMENT

The past year has seen significant progress from COAL21-funded projects in identifying potential sites in Queensland and NSW for an industrial-scale CCS demonstration between 2020 and 2025. Other projects have substantiated COAL21's focus on post-combustion capture (PCC) and oxyfuel carbon capture technologies, while further projects have advanced our understanding of how to safely deploy ventilation air methane (VAM) abatement technology at underground coal mines.

In 2018, COAL21 also commenced a study examining potential pathways to commercial-scale deployment of CCS. Focused on the Surat Basin in Queensland, potential combinations of CO₂ sources and storage options are being considered.

Finally, COAL21 has helped build the case for coal to remain a key part of Australia's energy supply and introduced CCS into the narrative. COAL21, together with MCA, has contributed to the debate on the future of coal and the potential of advanced technology to reduce emissions while delivering affordable, reliable power. COAL21 has commissioned studies to examine opportunities to deploy HELE technology and continues to observe emerging CCS technologies.

To support all these efforts, a new COAL21 website was launched in June 2018.



OUR PROJECTS



CARBON CAPTURE AND STORAGE



CTSCO CCS DEMONSTRATION: QUEENSLAND

This project will demonstrate the technical viability of geological storage of CO₂ in Queensland's Surat Basin. The feasibility stage is complete and has informed the design and operating plans for CO₂ injection at the preferred geological storage site. A preliminary design has been completed for a fit-for-purpose CO₂ capture plant using PCC technology at a nearby coal-fired power station. An extensive and ongoing community engagement program has resulted in broad local support for the project.



UNIVERSITY OF QUEENSLAND: CARBON STORAGE ASSESSMENT: QUEENSLAND

This project is developing a regional model in the Surat Basin to show where to focus future CO₂ storage activities. The model will be based on geological data from various coal seam gas, conventional oil and gas and groundwater-related operations in the region and from other mining activities. It will also enable further Great Artesian Basin studies to understand the interactions of different water tables and the potential to use CO₂ to re-pressurise the water tables, making more water available for farmers to use.



COAL INNOVATION NSW: CARBON STORAGE ASSESSMENT: NSW

The Darling Basin has shown potential for geological storage of CO₂ in NSW. However, further drilling is necessary to confirm how far the favourable reservoir conditions extend horizontally. The Darling Basin location is an attractive carbon storage option providing its storage potential can be confirmed.



SURAT BASIN CCUS HUB

COAL21 has launched a study to consider options for a commercial-scale Surat Basin CCUS Hub in which multiple CO₂ sources would be linked to multiple CO₂ storage locations. CO₂ sources could include coal-fired power stations, ethanol production, and coal-to-liquid fuels or synthetic natural gas. CO₂ storage options may include salt-water aquifers or enhanced oil recovery.

METHANE REDUCTION



UNIVERSITY OF NEWCASTLE: METHANE REDUCTION: SAFETY PRINCIPLES

This project conducted detailed investigations into the safety issues associated with directly connecting a commercially-available VAM abatement unit to an operating underground coal mine. The test program was completed in March 2018. The findings from this project are being used by the Centennial Coal Methane Reduction Demonstration Project.



Centennial Coal

CENTENNIAL COAL: METHANE REDUCTION DEMONSTRATION

This project originally aimed to conduct a full-scale demonstration of VAM abatement at an operating underground coal mine. However, from the work completed by both this project and the related project at the University of Newcastle, it has become clear that proceeding directly to a full-scale demonstration is too big a step to take without further intermediary studies at smaller scale. The project is being re-scoped to include such studies.



UNIVERSITY OF NEWCASTLE: METHANE REDUCTION: CHEMICAL LOOPING

The concept of chemical looping VAM abatement has been proven at small scale to be a potential alternative to commercially-available VAM abatement technology. It is now being tested at higher flow rates and over a larger range of methane concentrations. This will provide valuable information on operational flexibility and equipment size requirements.

RESEARCH & DEVELOPMENT SUPPORT



OTWAY

Otway operates as a large-scale geological storage and capture research facility, involving collaboration between Australian and overseas researchers. CO2CRC is planning a larger scale experiment at the Otway site, involving up to 40,000 tonnes of CO₂ injected into a saline formation. This experiment will also test novel subsurface monitoring techniques, potentially offering lower cost alternatives to today's technologies.



ANLEC R&D

ANLEC R&D supports COAL21-funded CCS demonstration projects by researching CO₂ capture and storage technologies with an emphasis on the underlying science of CO₂ storage, plume migration, monitoring and verification and reactions with host rock.

2018 ACHIEVEMENTS AND 2019 GOALS



PROJECT	2018 ACHIEVEMENTS	2019 GOALS
CARBON CAPTURE AND STORAGE		
Callide: Oxyfuel Demonstration	Delivered final reports and finalised project	NA
Qld Storage Assessment	Finalised data collection for a full geological model of the Surat Basin	Complete data analysis and deliver a project report
CTSCo: CCS Demonstration Queensland	Finished front-end engineering design and preparing a proposal to seek funding from COAL21 and the Federal Government	Attain new Commonwealth funding and start construction of the proposed CO ₂ capture plant and the surface infrastructure for geological storage
NSW Storage Assessment	Secured \$5m of COAL21 funding for next stage of drilling	Re-confirm NSW Government commitment of \$20m. Commence next stage of drilling
METHANE REDUCTION		
University of Newcastle: Safety Principles	Completed project and issued findings report	Deliver report summarising key achievements and provide input to Centennial Coal project
Centennial Coal: Demonstration	Confirmed Federal Government funding remains available for a revised work program	Implement revised work program
University of Newcastle: Chemical Looping	Completed experimental work with final report due March 2019	Complete final report and, based on results, consider an extension project to demonstrate the technology at larger scale
RESEARCH & DEVELOPMENT SUPPORT		
Otway	Secured funding for larger scale (up to 40,000 tonne) injection and advanced planning for construction phase	Advance larger scale experiment, involving up to 40,000 tonnes of CO ₂ injected into a saline formation
ANLEC R&D	Received COAL21 approval to continue to June 2027 with Federal Government agreeing to extend ANLEC to June 2022 with existing funds	Secure Federal Government funding to allow ANLEC to continue to June 2027
Surat Basin CCUS Hub	Completed concept study and secured funding for pre-feasibility work	Complete first phase of the pre-feasibility testing and provide initial scope for preferred path to a commercial-scale hub

OUR FUTURE FOCUS

Through funding targeted projects, COAL21 will continue to build community confidence in CCS technology for safe, long-term CO₂ storage, demonstrate safe abatement of fugitive emissions from coal mines, and assist in making the case for coal to remain a key part of Australia's future energy supply.

Specifically, COAL21 plans to:

- ➔ advance geological storage of CO₂, with PCC as the preferred capture option in the short term and oxyfuel a valuable option in the longer term
- ➔ deliver an industrial-scale CCS demonstration by 2025 through extension of the current CTSCo project. The demonstration would use the geological storage site identified in Queensland's Surat Basin and a commercial PCC module to capture CO₂ at a nearby power station.
- ➔ conduct high-level estimates of storage capacity in NSW and Queensland basins to complement the demonstration in the Surat Basin
- ➔ demonstrate the safe abatement of fugitive methane from coal mines.





OUR VALUED CONTRIBUTORS

- Anglo American Metallurgical Coal Pty Ltd
- Bengalla Mining Company Pty Ltd
- BHP Billiton Mitsui Coal Pty Ltd
- Bloomfield Collieries Pty Ltd
- BM Alliance Coal Operations Pty Ltd
- Byerwen Coal Pty Ltd
- Centennial Coal Company Ltd
- Coronado Curragh Pty Ltd
- Donaldson Coal Pty Ltd
- Ensham Resources Pty Ltd
- Glencore Coal Pty Ltd
- Gloucester Coal Ltd
- Hunter Valley Energy Coal Pty Ltd
- HV Operations Pty Ltd
- Idemitsu Australia Resources Pty Ltd
- Illawarra Coal Holdings Pty Ltd
- Jellinbah Group Pty Ltd
- New Hope Corporation Ltd
- Peabody Energy Australia PCI (C&M Management) Pty Ltd
- Peabody Energy Australia Pty Ltd
- Premier Coal Ltd
- Sonoma Mine Management Pty Ltd
- Tahmoor Coal Pty Ltd
- Warkworth Mining Ltd
- Whitehaven Coal Mining Ltd
- Yancoal Australia Ltd



COAL21 invests in minimising emissions from coal-fired power production and developing carbon capture and storage to support cost-effective, reliable and cleaner energy.

