



CO2CRC is Australia's leading carbon capture, utilisation and storage (CCS) research organisation

CO2CRC INSIGHTS | OCTOBER 2019

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HIGHLIGHT: High-level EU conference calls for expanded CCS

The European Union and the Government of Norway have taken a lead on CCS policy with the convening of the [European High-Level Conference on CCS](#) – held on September 5 in Norway.

The conference involved more than 400 delegates from throughout Europe. There was a general consensus among attendees that CCS represents an essential element of the region's ambition to achieve carbon neutrality by 2050. Highlights included:

- A presentation by Norwegian Minister of Petroleum and Energy Kjell-Borge Freiburgh pointing out all realistic scenarios for keeping global warming within 1.5 degrees

include CCS, echoed in the major European Commission strategy paper *A Clean Planet for All*;

- Operators of the Northern Lights CCS project in Norway signing Memoranda of Understanding with seven CO₂- producing industrial companies in France, Sweden, Ireland and Norway, confirming interest from the private sector helps build the case for Norwegian government support of the project.
- A keynote speech from UNFCCC Executive Secretary Patricia Espinosa, who stated: “carbon capture and storage is a powerful element of an overall strategy that—if we capitalize upon it properly—can help lead to the deep transformation that society must make towards ultimately achieving a carbon-neutral future.”

The strong presence of Norway in the conference underlines the country’s broader commitment to CCS. In 2016 the Norwegian Government released a major policy study indicating that a full-scale CCS chain in Norway is possible by 2022. Norway is the largest oil producer in Western Europe.

CO2CRC: CO2CRC completes drilling as part of the Otway Stage 3 project to develop low-cost, low environmental footprint CO₂ monitoring

CO2CRC has completed the drilling and casing of four new monitoring wells at its Otway National Research Facility in south-western Victoria.

The drilling program, part of the Otway Stage 3 project commenced in mid-July and progressed as planned, and on 18 September, the final monitoring well was drilled and cased. All wells are equipped with the newest fibre optics suitable to detect seismic signals as well as pressure and temperature gauges to monitor any changes in downhole pressures.

These new monitoring techniques offer a more cost effective and less invasive means of monitoring CO₂ storage sites compared to conventional seismic surveys and will be able to be used at commercial CO₂ storage sites in Australia and internationally.

PARLIAMENT: CCS Regulatory Framework One Step Closer

Canberra lawmakers appear to be moving towards a clearer consensus on CCS, with the passage through the lower house of amendments to the Offshore Petroleum and Greenhouse Gas Storage Act 2006.

The amendments transfer regulatory oversight of offshore greenhouse storage to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). The amendments give NOPSEMA the ability to recover the cost of its oversight activities in relation to greenhouse storage, meaning that funding for one of the key regulatory components of carbon storage can be streamlined.

The ALP has supported this bill, with WA MP Matt Burt stating:

“These bills will help ensure that Australia has the safest and most environmentally responsible methods for pursuing carbon capture and storage in our offshore oil and gas fields. In practice, this would add to NOPSEMA’s current portfolio of responsibilities the management of the environmental impact of offshore gas wells alongside its current responsibility for the management and good operation of those other gas and petroleum activities.”

CO2CRC: CO2CRC is holding its biennial CCUS Symposium from 19-20 November

Across two days leaders from across the CCUS community will meet in Torquay to discuss CCUS’s vital role in reducing greenhouse gas emissions. The CO2CRC CCUS Symposium is a premier showcase for Australia’s CCUS research community and provides a collaborative setting for presenting latest developments and new scientific knowledge from CCUS projects and research from around the world.

A stimulating program of technical sessions, panel discussions and plenaries will feature research and academic scientists, industry and CCUS project proponents as well as government officials.

COMPANIES: Oil and Gas Climate Initiative launched

The Oil and Gas Climate Initiative (OGCI) – a body representing 13 major oil and gas producers and around 30 per cent of global oil and gas production – made a major announcement in the lead-up to the United Nations Climate Summit in New York at the end of September.

OGCI launched its KickStarter initiatives to use CCUS to assist industrial hubs around the world reduce their carbon emissions. It aims to achieve this by starting five CCUS hubs in the US, UK, Norway, the Netherlands and China, and double the amount of carbon that is currently being stored. The longer-term ambition is to have other CCUS hubs commenced in other locations globally.

OGCI Climate Investments has established a US\$1 billion-plus fund to assist in lowering the carbon footprint of the energy and industrial sectors. One of its key CCUS investments so far is the Wabash Valley Resources CCS project. The project is currently in the process of converting a gasification plant into an ammonia production plant with CCS. Ammonia production currently accounts for around 2 per cent of global carbon emissions.

STEEL: Rio Tinto cooperates with steel sector

Anglo-Australian resources company Rio Tinto announced this week that it had signed a memorandum of understanding (MoU) with China’s biggest steelmaker to tackle carbon emissions. The MoU – signed between Rio and China’s Baowu Steel Group – commits both sides to rolling out initiatives that deliver a less carbon-intensive supply chain.

The MoU that was announced is focused on steel-making, which the Energy Transitions Commission claims is responsible for seven percent of total global emissions. Both companies commit to exploring alternative technology to reduce emissions, including CCS.

The announced action by Rio and Baowu comes alongside a number of other announcements from other companies, including BHP and European Aluminium. Elsewhere, a group of British energy firms- including the owner of the national grid – have joined forces to conduct joint research on a shared CCS facility.

CONSTRUCTION: Global construction body builds CCS support

The World Green Building Council (WGBC) has thrown its weight behind CCS. The Council's new strategy and directions paper – Bringing Embodied Carbon Upfront – is a paper that sets out coordinated action for the construction industry to take on carbon emissions.

The WGBC is the umbrella body for more than 70 national Green Building Councils around the world, and is highly influential in terms of setting out principles, guidelines and policies for sustainable design.

The paper sets a number of policy goals for the building industry over the next 25 years. The organisation is seeking to immediately explore carbon capture for the industry, pilot CCS in the industry by 2035, and deploy technologies that fully address emissions – using CCS – by 2045.

The construction sector's largest emissions are those from production of materials and 'embodied' emissions in materials such as cements and steel. In both cases, there are few alternatives other than CCS for reducing these emissions.

TECHNOLOGY: Cambridge completes lab-scale carbonate mineralisation

UK company Cambridge Carbon Capture have announced the completion of a lab-scale trial of their 'CO2LOC' technology. Cambridge's process involves reacting captured CO₂ with magnesium hydroxide to produce and filter out magnesium carbonate. Magnesium carbonate is very fire resistant, and has a number of industrial uses that include flooring, fireproofing, fire extinguishing compositions and filler material.

One of the keys for Cambridge has been the low-cost production of magnesium hydroxide which is achieved in a two-stage process involving low energy digestion of silicate minerals followed by CO₂ capture.

The company's CEO Michael Evans puts forward the possibility of a cement manufacturer using the technology to produce magnesium carbonate, which could then be used as filler in ready-mix concrete.

The company is now moving towards a larger demonstration project, and is seeking co-investment from partners, particularly in manufacturing industries.

FUNDING: DOE announces projects, 8 Rivers taps private markets

The US Department of Energy (DOE) has selected nine projects for its current Front-End Engineering Design (FEED) study round. The DOE has awarded US\$110 million to the projects, which includes studies on retrofitting existing coal and natural gas power generating plants in Virginia, Illinois, California, New Mexico, Nebraska, North Dakota, Alabama and Texas with CCS.

The DOE has also awarded US\$9 million of additional funding for three R&D projects which aim to improve the efficiency and reduce the complexity of enhanced oil recovery (EOR) in offshore wells.

New Zealand's 8 Rivers CCS project is tapping private markets for funding. The group's Taranaki project is seeking to establish a fertiliser production facility that will use the Allam Cycle in which super-critical carbon dioxide is used to drive turbines to produce electricity.

CCS BASICS: Utilisation

Carbon Capture and Utilisation (CCU) has started to attract considerable attention worldwide because it can turn waste CO₂ emissions into valuable products or to provide services. Although its capacity to sequester CO₂ is often limited compared to geological storage of CO₂, its treatment of CO₂ as a resource rather than an emission creates opportunities for CCU, as a group of technologies to complement other strategies with much larger emissions reduction potentials such as CCS.

CCU covers a variety of industrial processes which use CO₂ emissions as a feedstock for new products or services. There are two main pathways in CO₂ utilisation – direct use of the CO₂ or through transformation (via chemical or biological processes) into a new product.

Direct utilisation of CO₂

For decades CO₂ has been injected into mature oil and gas reservoirs to enhance the recovery of the hydrocarbons. When used in processes such as Enhanced Oil Recovery (EOR), Enhanced Gas Recovery (EGR) and coalbed methane recovery (ECBMR), a proportion of the CO₂ injected into the reservoir remains trapped in the underground formations similar to geological CO₂ storage.

CO₂ is also directly used to carbonate soft drinks and beers, in fire extinguishers, as a refrigerant and in the treatment of alkaline water. More recently, processes such as the Allam Cycle seek to utilise supercritical CO₂ as a working fluid in power cycles.

CO₂ utilisation through transformation

CO₂ can be transformed into a new compound through chemical and biological processes. The current conversion technologies can be clustered into three groups:

- **Chemicals production:** Using CO₂ as a feedstock to produce chemicals such as formic acid, polymers and polycarbonates. The conversion process often requires the use of catalysts, heat or pressure.

- CO₂ to fuels: Using techniques to convert CO₂ – with other carriers or chemicals – into other fuels such as biodiesel (via algae) or methanol.
- Mineralisation: Adding CO₂ to existing mineral compounds (generally calcium or magnesium compounds) to produce another mineral product, which is then used in construction materials or to stabilise other materials such as mine tailings.

While direct uses of CO₂ are widely and commercially available, utilisation pathways that involve the transformation of CO₂ are in various states of research and development and will require greater investment to make them market ready.

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