Attachment A

SUBMISSION TO THE ENVIRONMENT AND COMMUNICATIONS COMMITTEE - *CLEAN ENERGY FINANCE CORPORATION AMENDMENT (CARBON CAPTURE AND STORAGE) BILL 2017*

CO2CRC Supports the Clean Energy Finance Corporation Amendment (Carbon Capture and Storage) Bill 2017

It is demonstrated through the International Energy Agency that all technologies, including carbon capture and storage (CCS), are vital to meeting global emissions reductions. No technologies are currently available to reduce the emissions on industrial processes including cement, steel, fertiliser, plastics and chemical manufacture.

The barrier to finance in Australia poses a risk, not only to our emissions reduction, but also to our capacity to maintain our competitive position in minerals exports and jobs. Australia is one of the largest energy exporters in the world and to enable CCS in this country through appropriate funding mechanisms allows the further development, cost reduction and adoption of the technology for export to our major minerals trading partners.

While Australia continues to rely significantly on fossil fuels for electricity production the development of CCS is vital to the continued delivery of cost-effective, and reliable energy for Australian households and manufacturing. The manufacturing sector alone employs more than one million Australians and would decline in a carbon constrained environment unless CCS is allowed to do the heavy lifting with all low and zero emissions technologies.

Removing the prohibition against investment in CCS technologies will allow the CEFC to support a wider range of low-emission technologies and thereby assist in the decarbonisation of the economy more efficiently.

The CEFC's ability to invest in CCS technologies will complement other low-emissions investments by the federal government, including more than $3 billion worth of wind, solar and storage projects since 2013.

CO2CRC is aware that there are “commercial” CCS projects at concept stage that could benefit from access to low cost finance within the CEFC. These projects can take advantage of the costs reductions of “learning by doing” of at least 20-30 percent reduction on existing programs. This submission provides information on the importance of the amendment to the *Clean Energy Finance Corporation Act 2012* to allow for CCS to be included as an eligible low emissions technology option for funding.

Background to Bill

In May 2017, the Government introduced *the Clean Energy Finance Corporation Amendment (Carbon Capture and Storage) Bill 2017* which amends the Clean Energy Finance Corporation Act 2012 to remove the prohibition on the Clean Energy Finance Corporation (CEFC) investing in carbon capture and storage technologies. The of this bill is to permit the CEFC to invest in carbon capture and storage purpose technologies.

Under Section 62 of the *Clean Energy Finance Corporation Act 2012*, the CEFC is prohibited from funding CCS technologies. CO2CRC is pleased that this bill seeks to remove the prohibition and provides the CEFC with the option to invest in CCS technologies.

The Act sets out the purpose and functions of the CEFC. Specifically, the Act sets an investment function for the CEFC to invest, directly and indirectly, in clean energy technologies.

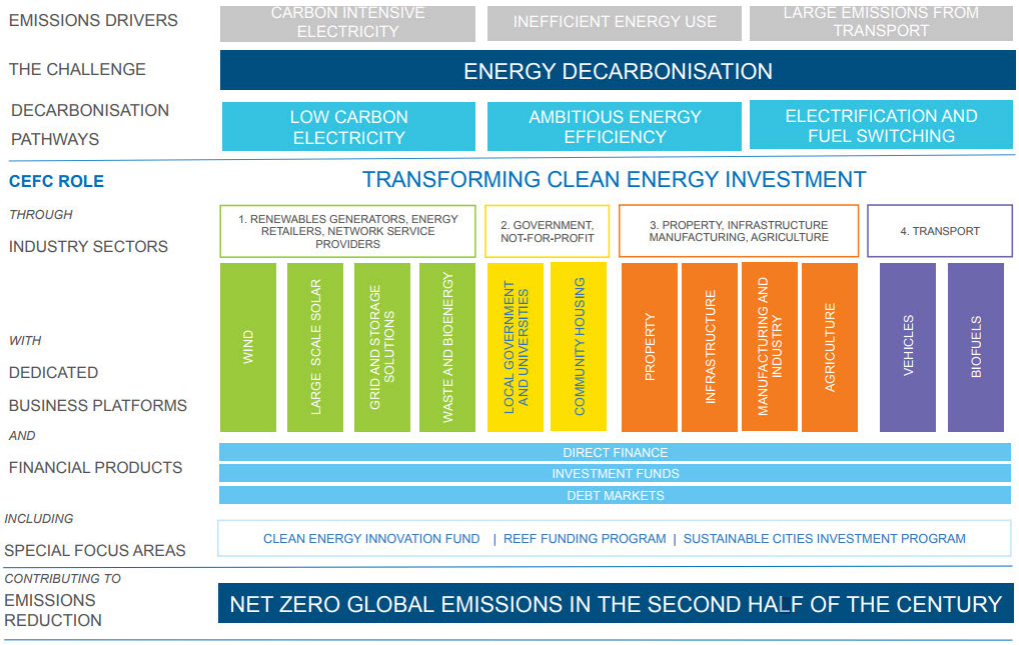
The CEFC mission is to:

"Accelerate Australia's transformation towards a more competitive economy in a carbon constrained world, by acting as a catalyst to increase investment in the clean energy sector"

Clean energy technologies under the Act are any one or more of the following: energy efficiency technologies, renewable energy technologies and low emission technologies. These terms are themselves broadly defined in the legislation.

Clean Energy Finance Corporation Strategy

The CEFC has a strategy as to where it's portfolio of low emissions loans may be heading, it is vital that CCS be recognised as serving a purpose to mitigate existing (carbon/emission) risks for an existing portfolio of projects and therefore important to the current outcomes of the economy.



Clean Energy Finance Corporation – Why it is important to CCS?

CCS is a clean energy technology that has the potential to significantly decarbonise energy in Australia. There are inherent features in the CEFC Act which assist in removing the barriers to CCS investment. Specifically the CEFC would assist CCS projects to:

- co-finance projects with one or more lenders;
- seek to crowd-in global private sector finance into clean energy projects to lower the cost of finance;

- provide commitments to CCS projects that require a longer tenure than commercial banks are typically prepared to finance;
- provide innovative finance mechanisms to match individual projects to overcome barriers to finance;
- be more willing to finance projects with an element of merchant risk;
- finance the first application of a technology deployed overseas but not in Australia, or a technology used in a unique way;
- encourage the private sector to bee more willing co-finance a CCS project, alongside the CEFC.

Role of CEFC to facilitate CCS

To support CCS investment and attract funding, a stable economic framework is essential. The CEFC amendment to include CCS as an eligible low emissions technology is a vital step to encourage investment and associated debt finance.

A capital reduction mechanism such as the CEFC involves the Government providing a form of repayable concessional finance, such as a subordinated loan, at lower than commercial rates. This structure would lower the overall cost of the CCS project by reducing the blended cost of finance. "The government loan is assumed to be subordinated to any senior debt secured from private sector investors i.e. commercial banks or the bond market, meaning the credit risk profile of other debt investors is not significantly altered. The loan would be secured against the asset upfront (prior to construction) and drawn on an "as needed" basis in line with the plant's capital expenditure schedule during construction. The government would provide the debt at its risk-free rate and repayment would commence in the first year of the plant's operation."[1]

Broadening the scope of emissions reduction technologies, the CEFC can invest in, will also assist in achieving our emissions reduction targets more cost-effectively while delivering on our commitment to maintaining energy reliability and security as we transition to a lower-emissions future.

The CEFC could play an important role, consistent with its existing role, to facilitate flows of finance to ensure that a broad range of projects are able to receive an offer of finance. CO2CRC is cognisant that the CCS industry needs to consider its "risk appetite" for CCS projects. Understanding and 'buy in' to CCS will be required at senior levels of the organisation before any consideration is given to financing through loans. CO2CRC is ready and willing to assist the CEFC to understand how far CCS has progressed over the last 10 years.

What is different about CCS is that larger amounts of CO_2 will be stored. For over a decade, governments various industries (oil, gas, coal, cement, fertilisers, power generation, hydrogen) and the science community have worked together to prove that CCS is low risk and to reduce the costs.

[1] Greig, C., Baird, J. and Zervos, T. (2016) Financial Incentives for the Acceleration of CCS Projects, The University of Queensland, Brisbane.

Access to Finance

Access to finance was one of the key barriers to investment in CCS technologies highlighted within the roadmap and discussed in detail within Working Paper No 2, Financial Incentives for the Acceleration of CCS Projects.[2]

Amendment to the Clean Energy Finance Corporation Act 2012 will provide the opportunity for direct financial support through a low-cost loan option for CCS technologies, encourage greater private sector investment and reduce risk for potential investors.

The forward price on emissions in most markets has not been high enough to mobilise private sector investment in CCS. In fact, there have been many projects planned globally which have not proceeded given the current low emissions price, longer term uncertainty around that price and limited government financial support. Where greenhouse gas storage projects have proceeded, these appear motivated by a value being placed on greenhouse gas emissions or by a corporate objective to demonstrate CCS for long-term, business strategy or licence-to-operate purposes.

Financing Barriers

The finance sector has indicated that projects have yet to establish a risk allocation that is considered bankable. The risk profile for each part of the CCS value chain: 'capture, transport and storage' are quite different and integrated projects are difficult to sell into the debt market. Mechanisms to deal with liability are essential as shown in the Offshore Petroleum Greenhouse Gas Act 2009, education and awareness are key to demonstrate a risk allocation that enables commercial debt to be raised on acceptable terms.

There is currently no established commercial contract structure for CCS. The CCS value chain from engineering, through to construction and offtake needs to support the project economics on which debt availability and debt size is based. More international CCS projects in the development phase will lead to an expansion of debt liquidity and deal flows for similar projects with a common financing approach. While not uncommon, the large-scale nature of the industry has meant that high gearing requirements will lead to large amounts of equity being required by lenders.

CCS projects are usually very large and considered complex by the finance sector. Where debt is available, gearing can be limited due to the immature nature of the industry. While this is not uncommon for new industries, CCS is very capital intensive, gearing can lead to

[2] *ibid*

significant amounts in equity provision. When added to other guarantees, such as on construction total liabilities stretch both available debt market liquidity and equity funding. As demonstrated in the Boundary Dam, Saskatchewan and the Petranova project in the United States, government grants can help bridge funding gaps on early projects. The IEA point out in their 20 years of Carbon Capture and Storage publication in 2017, some of the complex issues which have led to finance barriers for CCS in banks and other financial institutions:

> **"Different capabilities involving different market actors and risk cultures.** Different capabilities are involved along the CCS chain often involving distinct types of market actors with different strengths and risk cultures. Emitters range from power to certain heavy industry such as steel and cement to gas extraction and processing companies. Transport and storage operators will need different competencies and tend to come from the oil and gas market. Storage is often, once again, dominated by the petroleum sector. So aside for a situation where the emitter is in the petroleum sector, few companies are well-equipped to deal with the three distinct activities inherent in CO_2 emission/capture, transport and storage.
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> **Development times.** The three components of the CCS project chain present different timing. Long lead times are often needed for storage sites and transportation systems. The risk of available storage is a significant hurdle for the development and timing of the capture facility. The initial screening, the characterisation of selected sites and ultimately the permitting is expensive and time-consuming.
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> **Inter-dependence and cross-default** is a particular issue. Combining the various aspects of CCS together implies an interdependency which will be difficult to manage. For example, construction problems at any level of the chain could lead to delays, additional costs and in the worst case cross-default. Significant construction guarantees at both levels could be required, increasing costs. As noted in a recent report by the CCSA: "the likelihood and consequence of cross-chain default by either the capture operator or the transport or storage operator proved to be a major challenge to both debt and equity investors in all parts of the CCS chain" (CCSA 2016).
>
> **Performance and volume risk.** Investors will be wary of how performance and volume risk is treated. Each actor along the chain will be subject to their partner's performance and in the worst case cross default. For example, the capture of CO_2 may

not be the core competency of the emitter and there will likely be a learning curve for performance. This could reflect on the production volume of CO_2 and the risk of its delivery to the actor managing storage. Conversely, the emitter is also subject to availability of the storage site.

Remuneration. A complicated remuneration system will need to be agreed between the different actors under the contractual framework, which will need to incentivise performance and take into account delays and underperformance. The emitter will need to derive a funding mechanism for the capture investment and operating costs (including any parasitic load). In addition, it can be expected that the underlying payment obligation will fall to the emitter (e.g., under a carbon tax or emissions trading scheme) who will need to pay for the transport and storage of the CO_2. These payments will need to remunerate investment in the transportation and storage stages of the project.

Counterparty credit risk. As a corollary, the transport and storage functions will be subject to the emitter's credit risk."[3]

Addressing CEFC Risk

CEFC Reputational Risk

CO2CRC understands that the CEFC has a heightened awareness and focus on reputational risk and that every project, action and behaviour is scrutinised by Government, APRA through to the community. CO2CRC is well aware that CCS projects need to positively impact the reputation and branding of CEFC. Soundings taken from within industry sectors that may have CEFC eligible commercial projects will already be operating at the highest regulatory standards expected of industry.

Social and Environmental Risk

According to the CEFC Charter, all staff are responsible for managing risks to their reputation, this includes social and environmental risks that may be associated with projects. It is important to ensure that staff understand the social or environmental risks associated with CEFC's financing decisions, to avoid exposure to both reputational and economic loss associated with projects that may not be managing these risks appropriately or are engaged in activities that are not sustainable in the long-term. CO2CRC is cognisant of this need and has worked across industry and primarily with the oil and gas and coal sectors to prove CCS is low risk and environmentally benign. CO2CRC enjoys the confidence and respect of 34 member organisations and partners working together to provide lower risk, lower cost opportunities for CCS.[4]

[3] IEA (2016), *20 Years of Carbon Capture and Storage: Accelerating Future Deployment*, IEA, Paris. http://dx.doi.org/10.1787/9789264267800-en

[4] Clean Energy Finance Corporation website, last accessed 12 March@ https://www.cefc.com.au/

The CCS Industry in Australia and internationally seek to ensure that all staff contribute to identification, management, and mitigation of social, environmental, economic and business outcomes for projects.

CO2CRC and our valued partners have been conducting field test level pilots at its National Field Test Facility, near Nirranda South West Victoria for over a decade. Our approach has been one that reflects an exemplary attitude to maintaining "social license to operate". Demonstrating on a daily basis strict adherence to Commonwealth, State and local legal and regulatory obligations.

Laws, regulations and standards to manage CCS are continuing to evolve, however, they have already been tested in Australian conditions by CO2CRC at our Otway National Field Test Facility, CS Energy and their Japanese Partners at the Callide Oxfuel project during 2012, planning and assessment and approval phases of the Gorgon Project, Australian Flagships CarbonNet and South West Hub, the Coal industry's CTSCO project in Queensland and in various capture pilot projects located in Victoria and NSW. CEFC can be well informed by these experts to provide credible information and data to guide them on early CCS projects.

Analogue- Oil & Gas Sector Investment

Financing risks associated with CCS are directly comparable with Oil & Gas projects. For over 50 years, the oil and gas sector has injected CO_2 as a way to increase their oil production levels and depleted reservoirs have been used for decades for underground gas storage.

There are examples in every State in Australia where oil and gas have invested in underground gas storage. Legislative requirements for CCS projects onshore mirror those required of oil and gas projects as evidenced by CO2CRC's work programs at our National Field Test Facility.

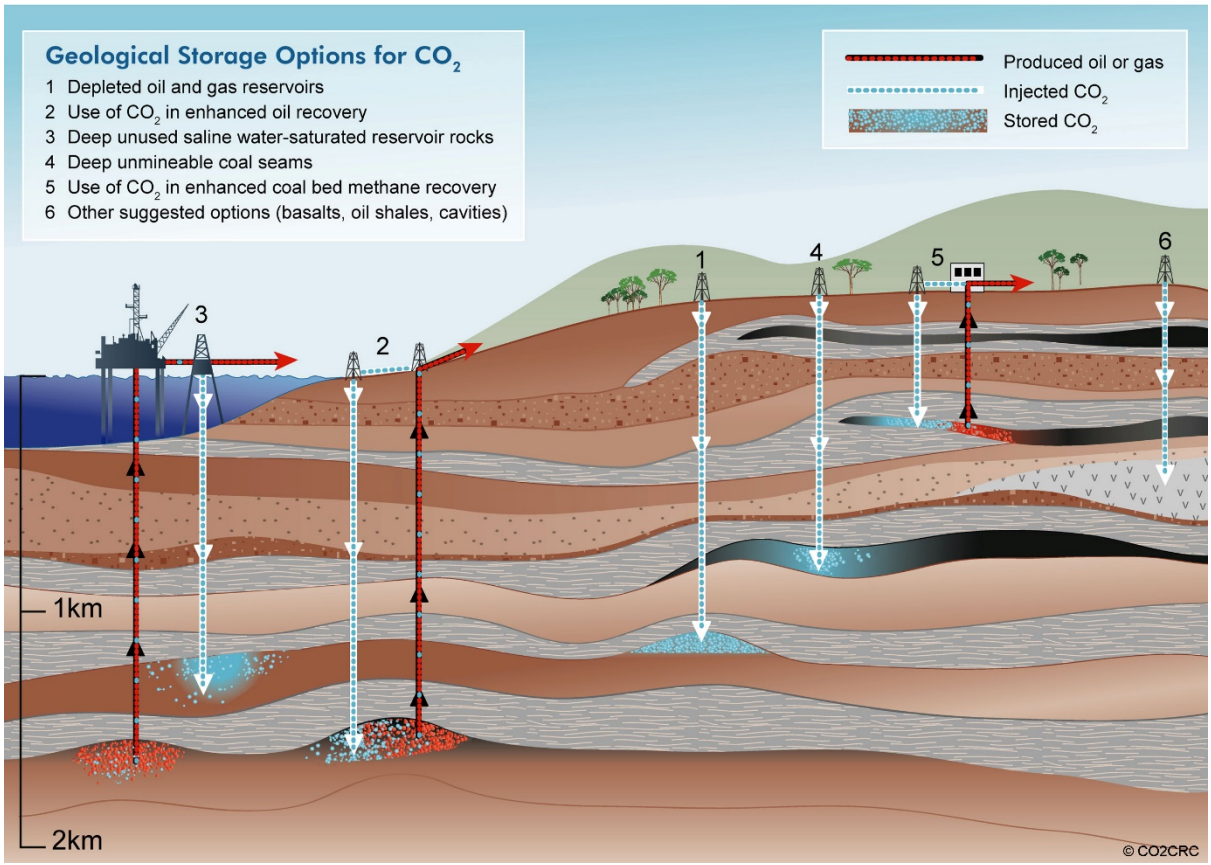
There is evidence at State Government level that could require new Australian Oil & Gas developments to separate and reinject produced CO2 that, in addition to carbon capture, may optimise oil & gas recovery as illustrated by the Gorgon LNG project. Although oil and gas are capable of attracting debt funding, these two alternatives rely on suitable reservoir availability and the assets themselves being able to economically support the CCS and/or co-development capital investment. Support at a Government level has in the past proven important in taking final investment decisions. The CEFC could act as one of a suite of important finance options to help secure financial investment.

What is Carbon Capture and Storage

Carbon capture and storage is the capture of carbon dioxide from major emission sources such as industrial facilities, power stations, and the transport, injection and long term storage of the gas in deep, underground rock formations, that have a permanent seal. Essential manufacturing industries such as steel, cement, plastics, chemicals, and fertiliser production have no option but to adopt CCS to significantly reduce their emissions footprint.

CCS with oil and gas production or coal and gas fired power generation can produce low emission, uninterrupted and abundant energy. Figure 1 below demonstrates the geological storage options for CO_2.

Figure 1



Australian Climate Change Commitments

As a signatory to the Paris Agreement, Australia has agreed to hold the increase in global average temperature to below 2° degrees. This can only be achieved through the inclusion of carbon capture and storage (CCS) as an acceptable decarbonisation option along with other low emissions technologies.

This is not a choice of using a single category of technology, all low emissions technologies will be needed as they are applicable to relevant sectors, including energy and manufacturing. Industries that do not have alternatives such as gas, coal, industrial (cement, steel, fertilisers) will need to adopt CCS as a medium-long term decarbonisation option to be sustainable in the long term.

International Energy Agency Forecast

The International Energy Agency (IEA) has determined that achieving emissions reductions consistent with below 2°C, at least cost, will require CCS to contribute nine per cent of total global abatement. The Intergovernmental Panel on Climate Change (IPCC) has determined that without CCUS, the cost of achieving a below 2°C world more than doubles (138%) by 2100. CCS technology has been acclaimed by the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) as critical to enabling the world to meet its emission reduction targets.

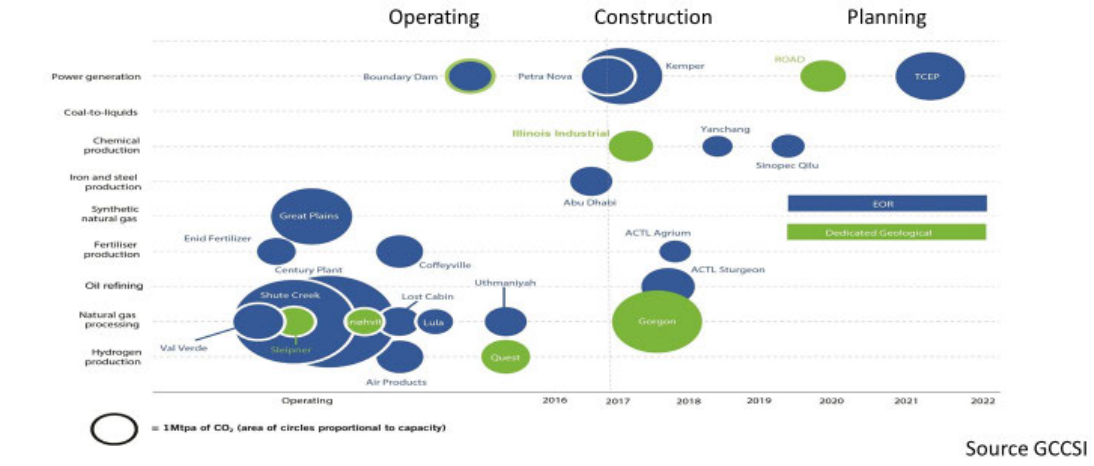
In the IEA Sustainable Development Scenario low-carbon sources double their share in the energy mix to 40% in 2040. The scenario relies on the deployment of carbon capture and storage by 2040. CCS has an important role to play in the meeting the IEAs sustainable development scenario. In 2040, globally, the IEA suggests that the power sector is all but decarbonised with carbon capture and storage playing its part (6%) and an equally significant contribution from the industry sector.[5]

It is widely recognised by energy leaders and climate scientists that a broad mix of technologies will provide the least cost option for decarbonisation. The delay in CCS development highlights the need for governments worldwide to increase their effort to establish the technology as a legitimate option alongside other low emissions technologies to decarbonise economies.

Global CCS Projects including Industrial Processes

CCS is now a proven low-emissions technology. The image below provided by the Global CCS Institute, illustrates that there are 17 large-scale CCS facilities in operation around the world and five currently under construction including the Gorgon Project in Western Australia. Once operational, the Gorgon LNG project in Western Australia will become the world's largest CCS project when it begins injecting between 3-4 four million tonnes per annum of carbon dioxide in the coming years.

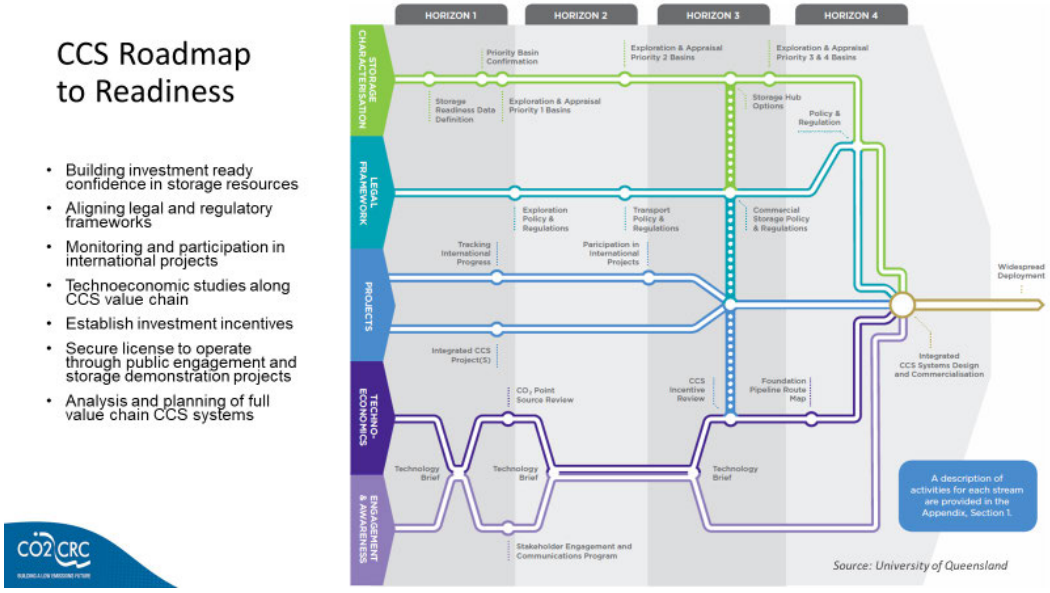
[5] IEA (2017), *Energy Access Outlook 2017: From Poverty to Prosperity*, IEA, Paris. http://dx.doi.org/10.1787/9789264285569-en



Source GCCSI

Carbon Capture and Storage Roadmap

The CCS community in Australia is united in our intention to have CCS deployed in Australia and five organisations including CO2CRC, CSIRO, ACALET, ANLEC, the Department of Industry and the NSW Department of Industry in 2016 released the *Australian Carbon Capture and Storage* Roadmap 2016. This roadmap addresses the barriers currently facing CCS projects in Australia and provides solutions across various time horizons.[6]



[6] Greig, C., Bongers, G., Stott, C. and Byrom, S. (2016) Energy Security and Prosperity in Australia: A Roadmap for CCS, The University of Queensland, Brisbane. ISBN 978-1-74272-175

The roadmap highlights that CCS is ready today to be applied to some existing commercial coal and gas power stations in Australia and the LNG industry and is suitable as an option for other industries.[7] The roadmap can be viewed on www.co2crc.com.au.

Exports and Jobs

The enabling of CCS in Australia is crucial to the national interest through the maintenance of jobs and exports. The lower cost development of CCS will provide the opportunity to export learnings to our major trading partners while maintaining our high value minerals industry.

The Australian Minerals Council cites mining exports at $207 billion in 2017, approximately 53 percent of total goods and services export revenue, representing 10 per cent of GDP and 1.1 million people directly and indirectly employed in the resources sector. These sectors are essential for underpinning economic outcomes and job creation particularly in rural areas of Australia.[8]

[7] *ibid*

[8] Minerals Council of Australia website last accessed 10 March 2017 @ http://www.minerals.org.au/news/mining_boom_delivers_record_resource_export_revenues

About CO2CRC

CO2CRC is Australia's leading CCUS research, development and demonstration organisation having invested A$110 million in research during past decade. We aim to align high-quality R&D with commercial partnerships and insights to assist industries to find innovative, efficient and economic ways to manage their CO2 emissions. Our members recognise the strategic importance of having collaborative R&D centres systematically progressing the science and engineering of CCS/EOR to ensure an efficient and safe deployment of the technology. Leverage 1:10 payback for membership CO2CRC has done multiple pilot CO2 injection projects in the Otway basin and capture tests in the Latrobe Valley and NSW. Our Otway National Field Test facility is one of the largest CO2 injection demonstration sites in the world and is unique with our own source of CO2 insitu.

CO2CRC partners include: ANLEC R&D, Global CCS Institute, Chevron Australia, Coal 21, Woodside Energy Limited, Shell Development (Australia) Pty Ltd, Australian Government Department of Industry and Science, Australian Government: Department of Education, New South Wales Government Department of Planning & Environment, South Australia Government Department for Manufacturing, Innovation, Trade, Resources and Energy, Victoria Government Department of Economic Development, Jobs, Transport and Resources, Western Australia Government Department of Mines and Petroleum, CarbonNet Project, CSIRO, Geoscience Australia, GNS Science, University of Adelaide, Charles Darwin University, Curtin University, University of Melbourne, University of NSW Australia, University of Queensland, University of Western Australia, Korea Institute of Geoscience & Mineral Resources, J-Power, Lawrence Berkeley National Laboratory, University of Edinburgh, Federation University Australia, Australian National University, GFZ Germany, King Abdullah University, University of Cambridge and Stanford University.

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