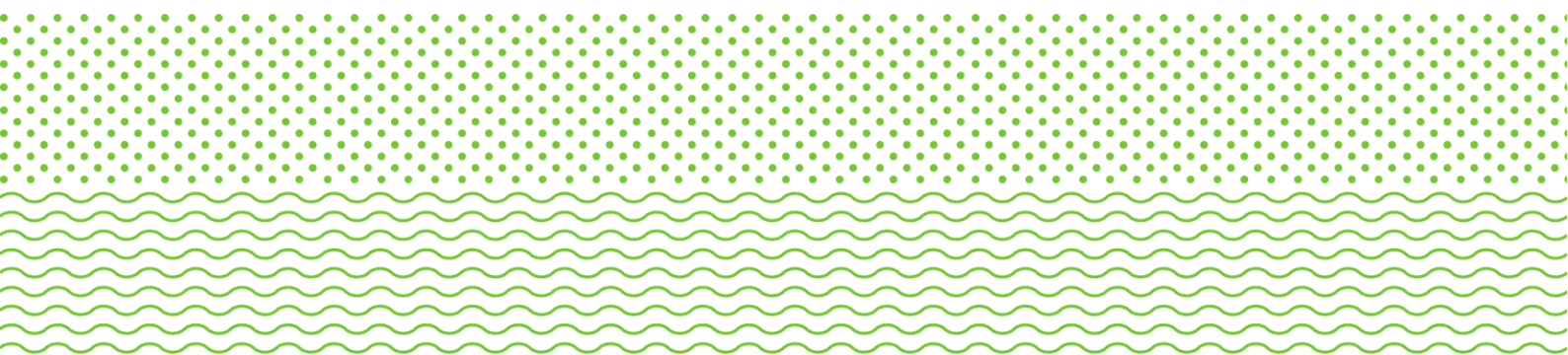




Clean Energy Finance Corporation Amendment (Carbon Capture and Storage) Bill 2017

Submission from the Global Carbon Capture &
Storage Institute

13 MARCH 2018



Committee Secretary
Senate Standing Committees on Environment and Communications
PO Box 6100
Parliament House
Canberra ACT 2600

via email: ec.sen@aph.gov.au

13 March 2018

Re: Clean Energy Finance Corporation Amendment (Carbon Capture and Storage) Bill 2017

Please find enclosed the Global Carbon Capture and Storage Institute's submission to The Clean Energy Finance Corporation Amendment (Carbon Capture and Storage) Bill 2017 (the "Bill") to remove the prohibition on the Clean Energy Finance Corporation (CEFC) investing in CCS technologies.

The Global Carbon Capture and Storage Institute (the Institute) is the world authority on carbon capture and storage (CCS) and appreciates the opportunity to provide a submission regarding this critical Bill.

The Institute's mission is to accelerate the deployment of CCS globally to achieve the required permanent reductions in carbon dioxide (CO₂) emissions necessary to meet climate targets.

The Institute supports the Bill and Schedule 1 to remove paragraph 62(a) from the CEFC Act, with the effect of removing the prohibition on the CEFC investing in CCS technologies.

As a raft of pre-eminent climate change experts and analysis asserts, Paris climate change targets cannot be achieved, and energy security cannot be maintained, without the inclusion of CCS as a fundamental clean technology.

I would appreciate the opportunity to present to the Environment and Communications Legislation Committee, and expand on the detail contained within this submission.

Yours sincerely

Brad Page
Chief Executive Officer
Global CCS Institute

W: globalccsinstitute.com

Key points

- To reach Paris climate change targets and avoid the deeply adverse socio-economic and environmental effects of climate change, we need all available solutions to be deployed, including CCS;
- CCS has been identified by pre-eminent research and analysis, including the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change (IPCC), as pivotal in meeting Paris climate change targets;
- CCS is a proven climate mitigation technology which has been in successful operation for more than 45 years;
- CCS is currently in commercial deployment across 17 large-scale sites, with five more facilities in development;
- CCS effectively complements intermittent renewables in the power sector;
- CCS is the conduit to a new energy economy of hydrogen production, bioenergy and CO₂ re-use applications;
- CCS is the only clean technology capable of decarbonising major industrial sectors (steel, cement, fertiliser, pulp and paper, petrochemicals);
- CCS can play a significant and complementary role in a fully decarbonised Australian electricity market.

Background

The Global Carbon Capture and Storage Institute (the Institute) is the world authority on carbon capture and storage (CCS) and appreciates the opportunity to provide a submission regarding the Clean Energy Finance Corporation Amendment (Carbon Capture and Storage) Bill 2017 (the Bill).

The Institute's mission is to accelerate the deployment of CCS globally to achieve the required permanent reductions in carbon dioxide (CO₂) emissions necessary to meet climate targets.

CCS represents a range of technologies that directly reduce emissions from a variety of industries involving the combustion of fossil fuel (e.g. power generation and steel manufacture) and others where CO₂ is a by-product (e.g. steel, chemical and cement production).

What is Carbon Capture and Storage?

Carbon capture and storage (CCS) captures CO₂ and permanently stores it in meticulously characterised storage formations deep below the earth. CCS technology has been in safe commercial operation for more than 45 years, and is endorsed by international climate change experts including the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) which maintain that it is pivotal to reach climate change targets.

The IPCC and the IEA have developed exhaustive mitigation scenarios which address how Paris targets can be reached and how the disastrous consequences of climate change can be avoided. Both organisations maintain that CCS has a critical and unparalleled role to play in building a new, decarbonised energy system. In fact, in the IEA's 2°C scenario, CCS accounts for 14% of cumulative

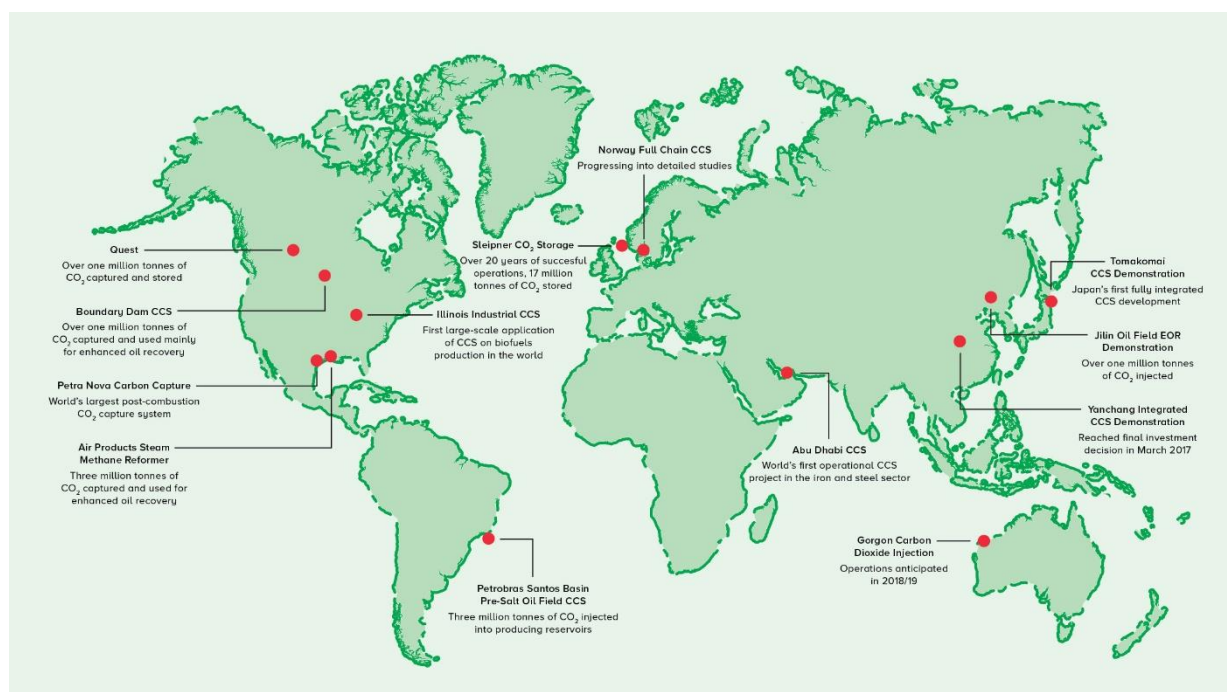
emissions reductions. Under this scenario, a total of 2,732 CCS facilities are needed by 2040 to meet Paris goals – equivalent to present-day annual CO₂ emissions in the United States.

CCS is proven, safe, reliable and operating at commercial scale today.

Operations undertaken over almost half a century demonstrate that CO₂ can be permanently stored deep below ground. Oil, gas and naturally occurring CO₂ reservoirs have proven that fluids can be safely sealed underground for millions of years. CCS facilities access the same geology.

Globally, CCS technology is verifiably well tested. The Institute's projects database currently tracks 38 large-scale CCS facilities either operating, under construction, or in development, around the world. Some of these facilities have been operational for more than 20 years. The Institute also tracks 72 individual smaller pilot and demonstration facilities. Current, large scale facility developments globally are illustrated in Figure 1.

Figure 1: Key CCS facility developments globally



Source: Global CCS Institute

CCS is already curbing greenhouse gas emissions around the globe, with more than 220mn tonnes of anthropogenic carbon dioxide safely and permanently injected deep underground.

There are currently 17 large-scale CCS facilities operating globally, with five more in development. These facilities are capturing and storing 37million tonnes of CO₂ per annum, the equivalent of removing eight million cars from the road each year.

However, this is not enough. To make deep, rapid reductions in greenhouse gas emissions and meet Paris climate change targets at least cost, CCS must be deployed swiftly and at scale.

In December 2015, at COP21 in Paris, 195 countries adopted the Paris Agreement. The Agreement's longer-term climate goals are defined as:

- Limit average global warming to well below 2°C above pre-industrial times, with the aspiration of limiting warming to 1.5°C;
- In the second half of this century, achieve a balance between emissions sources and sinks (often referred to as net-zero emissions). There simply cannot be a cost-effective mitigation response to climate change without CCS.

Modelling of least-cost emission pathways consistently identifies the need to deploy CCS in large volumes if Paris emission targets are to be achieved. The importance of CCS in these results is in direct contrast to claims that CCS is either 'too costly' or 'cannot compete with renewables'.

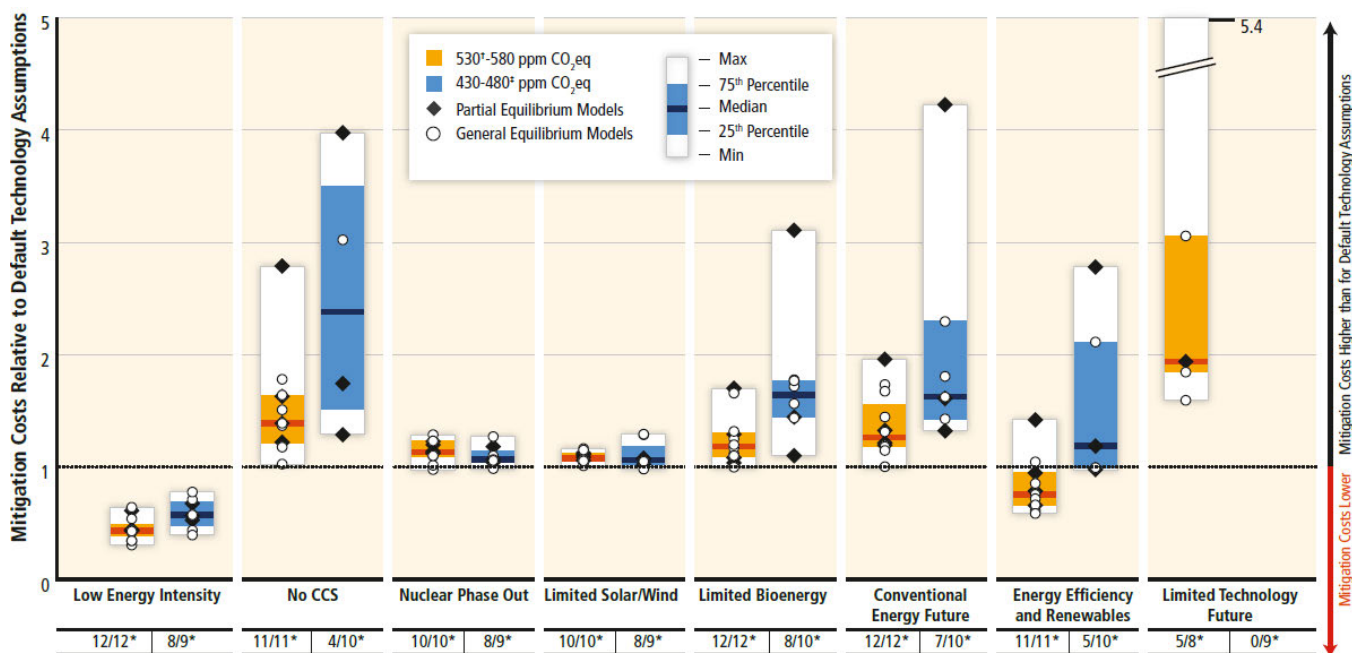
To the contrary, on a like-for-like basis, CCS economically complements renewables. Similarly, it is important to underscore that CCS is not a competitor to renewables, but a supportive adjunct. It is part of a flotilla of clean technologies needed to turn the tide on climate change.

This is well supported across climate change science. The father of the phrase 'global warming', Columbia University Professor, Wallace Smith Broecker, has said:

"Eventually, the dependence on fossil fuels will come to an end and the world will be powered by renewables. But as this energy utopia lies many decades in the future, by the time we arrive there we will be saddled with an atmosphere laden with excess CO₂. CO₂ threatens to change our climate. Hence we must learn how to capture and bury it."

The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report commented on a range of modelling which examined the impact of mitigation technologies on the cost and likelihood of limiting global temperature increases. The results of this are shown in Figure 2, where the median cost of achieving 450 parts per million CO₂ concentration was 138% higher in scenarios that excluded CCS compared to default scenarios where CCS was included.

Figure 2: Mitigation costs 2015 to 2100, with varied technology availability



* Scenarios from one model reach concentration levels in 2100 that are slightly below the 530-580 ppm CO₂eq category

* Scenarios from two models reach concentration levels in 2100 that are slightly above the 430-480 ppm CO₂eq category.

* Number of models successfully vs. number of models attempting running the respective technology variation scenario

Source: IPCC, 5th Assessment Report, Figure 6.24.

CCS complements intermittent renewables in the power sector.

The Renewable Energy Target and state-based renewable energy policies have been effective in supporting deployment of wind and solar PV capacity, but unfortunately not in creating investment in CCS and other technologies to support the low-emission power system required to achieve Australia's global climate targets. Nor have these policies addressed the challenges created by intermittent renewables across system planning, resilience and operation as penetration increases.

Safe, reliable and affordable electricity is reliant on a suite of technologies to meet changing supply and demand patterns. Intermittent renewable energy with energy storage will be an important part of the future global energy mix but renewable energy alone cannot provide reliable electricity at acceptable cost and risk. An electricity system with a high penetration of intermittent renewable generation requires back-up and augmentation systems to ensure reliability and resilience. Dispatchable fossil-based generation with CCS requires no additional grid integration costs or risks, making it affordable and reliable.

Therefore, CCS is a key component in reconciling the so-called “energy trilemma” – the challenges associated with meeting international climate change commitments, keeping the lights on, and ensuring energy affordability, all concurrently.

Inclusion of CCS within an agnostic, “all-of-the-above” portfolio of low-carbon technologies is not just the most cost-effective route to global decarbonisation, it also delivers energy reliability at lower total system costs.

CCS is the conduit to a new energy economy of hydrogen production, bioenergy and carbon dioxide re-use applications.

As the energy matrix continues to evolve, CCS also facilitates the creation of new energy economies, which are yet to reach their apex. A good example is the work Kawasaki Heavy Industries is undertaking with Iwatani, J-Power and Shell Japan to scope a hydrogen energy supply chain in Australia's Latrobe Valley. The opportunity to turn Victoria's brown coal into clean hydrogen is just one example of the new opportunities CCS can create.

It sets the stage for a clean energy hub in Australia which preserves jobs, creates new employment opportunities and creates a new, sustainable, decarbonised economy.

CCS is the only clean technology capable of decarbonising major industrial sectors.

One of the greatest challenges facing the global effort to achieve Paris climate change targets is the decarbonisation of large-scale, emission intense industry which contribute 21% of global CO₂ emissions.

International climate change experts including the IPCC and IEA confirm that CCS is the only mitigation technology capable of reducing large-scale emissions from major industrial sectors such as steel, cement, fertiliser, refining, pulp and paper and petrochemicals.

Successful examples of CCS technology being utilised to reduce industrial emissions can be found in multiple locations around the world such as the AI Reyadah CCUS facility in UAE (the world's first CCUS installation in the steel industry) and the AI Uthmaniyah CCS facility in Saudi Arabia.

If Australia is to meet its commitments under the Paris agreement, the task decarbonising major, unabated industry cannot be ignored. Through stimulating investment in the development and deployment of CCS technologies, we will in turn keep communities alive and create new sustainable economies.

CCS can play a significant and complementary role in a fully decarbonised Australian electricity market.

Australia continues to grapple with its energy mix, and what, exactly, is right for its complex and numerous requirements. However, some things are certain. The pressures on the electricity system are heavy. As we look to the future, it is clear we need a fully decarbonised electricity sector. It is also apparent that gas will continue to be a major energy provider and need to play a significant role in smoothing intermittency. Attaining a zero-carbon electricity system will place a greater burden on hydro and still developing battery technology.

The story that is rapidly emerging is one in which CCS acts as the catalyst for new energy economies including hydrogen, bioenergy and CO₂ re-use applications. Particularly, hydrogen sourced from CCS-fitted gas or coal technologies is more cost-effective than using renewables and hydrolysis. And by applying CCS to gas and coal, renewables can underpin other energy needs where it is best deployed.

In building a reliable, affordable, low emissions power system, and meeting international climate targets, energy policy must abandon ideology and align with reality. The reality is that every low emission technology including CCS is required. All low emissions technologies, including CCS, deserve equal access to policy support and concessional finance necessary to accelerate its deployment.

Presently in Australia, too little attention is being paid to the prospect of CCS-equipped fossil fuel generators playing a role in a fully decarbonised electricity market. This contrasts to other countries such as Canada, the United States and the United Kingdom where large-scale CCS facilities in power generation are operational or have been actively pursued by governments.

Recent developments from across the globe indicate a positive policy shift towards incentivisation, development and deployment of CCS technologies. These include:

- In February, the United Kingdom established a carbon capture and utilisation (CCUS Council) to speed deployment of CCS technologies;
- The European Parliament has voted into law measures to reduce CO₂ emissions across Europe, including the establishment of a multi-billion-euro fund supporting CCS innovation and other low-carbon projects;
- Canada, and, more recently China, have placed a value on avoided carbon as they move towards a low emission future;
- The United States of America (US) recently introduced a tax credit for CO₂ storage, better known as the 45Q legislation.

The recent legislative amendment in the US is prodigious. It represents an historic move by an Administration proven to be reluctant in acknowledging climate change and addressing CO₂ emissions. The tax credit has been lauded as providing the impetus for essential investment in the research, development and deployment of CCS.

Allowing for investment in CCS technologies under the Bill is in-step with international best practice and will enable Australia to establish our position at the forefront of the global fight against climate change.

Concluding comments

This submission forms part of the Institute's broader effort to raise awareness for the essential need for investment in CCS technologies.

We, and our members which includes governments, global corporations, private companies, research bodies, and academic institutions, are neither blind nor emotive advocates of CCS.

The technologies making up CCS processes are varied, as are the industries and locations where CCS is applicable. We are the first to acknowledge that CCS will not be relevant to every situation and every market.

However, like wind and solar PV, CCS requires government incentivisation and support to reach the market. Current policy settings are such that it is still cheaper and easier for consumers of fossil fuels to emit CO₂ into the atmosphere. Against the backdrop of the Paris agreement and the ambitious emission targets, time is short to aggressively reduce emissions everywhere. Attempting this without using all available technologies is likely to lead to failure.

Unless governments can drive change via actual incentives and/or other regulatory measures including carbon pricing, then CCS, and a whole raft of other mitigation technologies, will not be able to play their vital part in meeting international climate change targets, and delivering energy security.

We are fervent in our resolve that there is no single silver bullet in the fight to reduce CO₂ emissions, and meet Paris climate change targets. We need everything and CCS is a pivotal part of that 'everything'. Countries must embrace energy efficiency, cut their emissions, diversify their energy mix and deploy all clean technologies with equal measure.

Amending the Bill and Schedule 1 to remove paragraph 62(a) from the CEFC Act, with the effect of removing the prohibition on the CEFC investing in CCS technologies is therefore crucial.

Any questions on this submission should be directed in the first instance to: