

What is CCS?

Huge amounts of CO₂ are produced when fossil fuels are extracted, processed and burnt, and by various industrial processes like steel, cement and fertiliser manufacturing. CCS, or 'carbon capture & storage' aims to stop this CO₂ entering the atmosphere.

Carbon	CO ₂ within a fossil fuel feedstock, a mixed gas waste stream, or ambient air
Capture	separation of the CO ₂ from the source, using various technologies such as passing a waste gas stream over a membrane or through a chemical solvent that singles out CO ₂
(Transport)	compression and transport of the CO ₂ via pipelines, ships or trucks
Storage	injection of the CO ₂ underground for long-term storage, often in former oil or gas reservoirs

CO₂ can be obtained from fossil fuel power stations, natural gas processing facilities, bioenergy power plants, some industrial plants like steel, cement and fertiliser factories and, technically, from ambient air. If CCS reduces the net amount of CO₂ released to the atmosphere, it can be viewed as a climate mitigation tool. However, it is very difficult, resource-intensive and expensive to successfully capture and store CO₂ on an industrial scale. In particular, the high energy requirements of CCS, use of CCS in new coal and gas power plants, and the risk of fugitive emissions over the transport and storage process mean that achieving a net reduction in emissions through this process is extremely challenging.

CCS projects in Australia and around the world

There were 27 CCS facilities in operation around the world in September 2021, offering a total potential (not always achieved) annual capture capacity of 36.6Mt CO₂.¹ For context, this is equivalent to about half the emissions produced just by Queensland's energy sector (64.3Mt in 2019).

The oil industry has deployed carbon capture technologies for several decades in a process known as 'Enhanced Oil Recovery'. In EOR, CO₂ is pumped into depleted oil reservoirs to extract residual oil and extend the life of the reservoir. Historically, the CO₂ was specifically mined for this purpose, but now some EOR projects use CO₂ produced as a by-product in natural gas processing. As a portion of the carbon remains underground each EOR cycle, these projects can be claimed as CCS. The revenue from the additional oil offsets the considerable costs of capturing the carbon, unlike in other contexts, such as power plants, where the application of CCS provides no intrinsic value to the company. As a result, these projects account for the majority of operational CCS projects included in global CCS inventories.

Only one power plant equipped with CCS is currently operating. Boundary Dam is a coal-fired power plant in Saskatchewan, Canada, with a retrofitted CCS system originally seeking to capture 90% of the plant's CO₂ emissions. The CO₂ is used predominantly for EOR. The project has consistently failed to meet capture targets, and has now downgraded its goal to 65% of produced CO₂.²

The only operating commercial-scale CCS project in Australia is at the Gorgon LNG plant in Western Australia. Operated by Chevron, Gorgon consists of a 3-train LNG plant, a domestic gas plant and two LNG tanks. The WA Government approved the plant on the condition that Chevron remove 100% and store 80% of the reservoir emissions from the gas fields - equating to an annual storage target of around 4Mt CO₂, or just under half of the plant's scope 1 emissions.

The largest (by capture capacity) CCS projects in development are attached to coal-fired power stations, natural gas processing facilities, and chemical manufacturing plants.

¹ Global CCS Institute, *Global Status of CCS* (2021), figure 6.

² Institute for Energy Economics and Financial Analysis, '[Boundary Dam 3 Coal Plant Achieves Goal of Capturing 4 Million Metric Tons of CO2 But Reaches the Goal Two Years Late](#)' (20 April 2021).

Australian CCS policy

Australian Federal Governments have supported CCS since at least 2003, when PM John Howard founded the 'CO2CRC' research/lobby group for CCS. The current Morrison Government strongly supports investment in CCS, notably naming CCS a 'priority technology' and committing \$300m to CCS research and projects; releasing 'greenhouse gas acreage' off the coast of the NT and WA for potential CCS projects; and introducing legislative amendments to allow CCS projects to earn Australian carbon credits.

Several proposed CCS projects have received significant Federal support in recent years. Santos and Beach Energy's Moomba natural gas processing plant + CCS reached a final investment decision in November 2021, enjoyed prominent advertisement at Australia's COP26 display, and has received \$15m in Commonwealth support. Glencore received \$5m for its CTSCo project, which would retrofit CCS to the Millmerran coal-fired power station in the Western Downs to capture and store CO₂ in the Surat Basin.

Lock the Gate does not support public money for CCS

Despite decades of investment, CCS has not proven itself up to the task of reducing emissions in any meaningful way - and we don't have any more time to waste. Since 2003, Australian governments have committed over \$4 billion to CCS research, development and projects.³ Yet there is still only one industrial-scale CCS project operating in Australia, the Gorgon CCS, and it doesn't work. The Gorgon project, federally funded to the tune of \$60m, has only injected 5.5Mt CO₂ since 2016, less than a third of its agreed target. It failed to store any carbon at all for its first 3.5 years of operation, and the Gorgon plant pumped enough CO₂ into the atmosphere just in 2017-18 to wipe out the emissions savings from all rooftop solar in Australia combined. Australia needs to urgently cut emissions *right now*, not waste any more time waiting for this fossil fuel industry pipedream.

Even if proposed CCS projects actually met their targets, the greenhouse gases emitted by the coal and gas plants would far, far outweigh the CO₂ captured and stored. Glencore's CTSCo project is aiming to capture 110kt CO₂ per year - just 2% of the 5.2Mt scope 1 emissions released by the Millmerran station each year. Chevron only committed to store CO₂ contained in its natural gas reservoirs - not any of the emissions from burning gas to power the Gorgon plant, which make up 60% of its annual emissions. Crucially, CCS does nothing about fugitive emissions, which are a massive source of greenhouse gas pollution from the fossil fuel industry, accounting for over 10% of Australia's total emissions in 2019.

Huge amounts of money and public support given to CCS divert both funds and attention from far more effective, feasible and readily available climate solutions. Australia has the money, R&D capabilities, resources and renewable energy sources to transition now to a clean, sustainable economy. Bulk emissions reductions in the energy sector can and will come from improved energy efficiency, electrification/gas substitution and renewable energy - not from bespoke, unproven and incredibly poor value-for-money CCS projects on polluting fossil fuel power plants.

In Australia, CCS is being used to greenwash the fossil fuel industry by those with vested interests in prolonging the life of coal and gas. There may be a role for CCS in industries like steel, chemicals and cement production, where CO₂ is, for the moment, an unavoidable by-product of the manufacturing process. But the Morrison Government and companies like Chevron, Santos and Glencore aren't using CCS to decarbonise hard-to-abate industries, they're using it to justify more mining and more burning of polluting fossil fuels when Australia can and must transition to green energy as a national priority.

³ Nathan Morris, 'As carbon, capture, storage commitments near \$4b, what are the options for heavy industry?' (23 August 2021) ABC News
<<https://www.abc.net.au/news/2021-08-21/taxpayer-bill-for-carbon-capture-and-storage-hits-4-billion/100375854>>.