Environmental Defenders Office

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Committee Secretary
Senate Standing Committees on Environment and Communications

Submitted via: Submissions Portal

Dear Committee,

Submission to the Inquiry into Glencore's proposed carbon capture and storage project

Environmental Defenders Office (**EDO**) welcomes the opportunity to make a submission to the Senate Standing Committee on Environment and Communications in relation to proposed carbon capture and storage (**CCS**) in the Great Artesian Basin. Our submission focusses on term of reference **(g): *the role of CCS technology in Australia's broader climate change mitigation strategy, including an evaluation of its efficacy, risks and alternatives.*** This submission has been prepared with input from our expert science and technical advisory team.

EDO's longstanding evidence-based position is that CCS is not an effective or environmentally sound solution for the urgent reductions in greenhouse gas (**GHG**) emissions needed in Australia, or globally. As it stands and for the foreseeable future, CCS does not offer a solution to the enormous contributions of the fossil fuel industry to climate change. CCS is not currently effective in reducing greenhouse gas emissions and it is unclear whether it will ever be effective, at least in the timescales in which it would be needed, as it is unscalable at the rate and extent needed to see a rapid reduction in emissions.[1] In addition, CCS also presents new challenges in environmental regulation and harm, particularly in relation to water impacts.

Given the lack of successful large-scale projects over the past decade, it is important that investment in CCS is not used to justify and prolong a carbon-intensive economy. Recent global investment in CCS projects appear to be last-ditch efforts to comply with emission reduction targets, without having to say no to proposals from large emitters. It has become increasingly clear that CCS is not a miracle solution to greenhouse gas emissions, but simply delays the inevitable transition away from fossil fuels. It is important therefore that investment in CCS is not used to justify and prolong a carbon-intensive economy. Instead, Australia's regulatory regime should be designed to effectively bring down emissions by preventing further fossil fuel expansion, production and use, rather than allow approval loopholes such as reliance on unproven CCS technology that may undermine the actual emissions reduction required to meet legislated targets. The regulatory framework for decision-making on proposed projects should be clear and rigorous on this issue.

In response to the above concerns, EDO has developed a set of **seven essential questions that must be answered in relation to any proposed CCS project**, in any jurisdiction, as a guide to understanding the efficacy, risks, and alternatives.

[1] N. Mac Dowell et al., 'The role of CO2 capture and utilization in mitigating climate change' (2017), 7 *Nature Climate Change* 243 <https://www.nature.com/articles/nclimate3231>; see also The Royal Society, *Locked Away: Geological Carbon Storage Policy Briefing* (2022) 4.

1. Will the CCS project enable continued or additional fossil fuel production and use that could result in an increase in GHG emissions?

A key concern is that CCS projects are touted as solutions to the climate crisis, but without providing long-term, secure, and effective storage of carbon. The Gorgon Gas Project in Western Australia is a clear example of a CCS project failing to meet projections of CO2 sequestration, while providing a social license for continued fossil fuel production. Gorgon received an initial $60 million grant from the Australian government for the CCS plant, which promised to store 80% of the CO2 naturally occurring in the gas of the reservoir (4 million tonnes per annum; over 100 million tonnes over the life of the system), or 40% of the scope 1 GHGs produced from gas refining.[2]

To date, the project has been plagued by technical problems and engineering challenges, and by July of 2022, Chevron was buying 5.23m tonnes of CO2 offsets to compensate for the lack of capture at its CCS plant. Only 200,000 tonnes could be offset using credits from the Australian market,[3] meaning significant emissions were exported. Meanwhile, Chevron increased LNG production to 1.1 million tonnes more than design capacity, and the Gorgon LNG plant produced more greenhouse gases than any other industrial facility in the country.[4]

This is a clear example of the promised reductions failing to result, yet GHG emissions continuing to increase. New CCS projects risk enabling additional fossil fuel production and use, and subsequent climate-harming GHG emissions. Any new CCS project must be considered in light of the emissions that it would allow, facilitate, or lend social licence to.

2. Are there appropriate regulatory frameworks in place to adequately regulate CCS activities?

Appropriate regulatory regimes must be in place to ensure capture rates are complied with, avoid contamination of water, and penalise companies which fail to appropriately monitor CCS projects. For example, injection and storage in reservoirs create risks of reservoir failure and potential for contamination, including of drinking water.[5] GHG leaks can lead to contamination of important aquifers as CO_2 migrates through fractured or ineffective caprock, along fault lines, or through porous geological strata.[6] Moreover, as noted above, chronic leakage of CO_2 has significant climate impacts and can result in vast shortfalls in storage rates, such as the experience of the Gorgon LNG project.

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[2] Chevron, *Gorgon Gas Development and Jansz Feed Gas Pipeline Five-year Environmental Performance Report 2015–2020* (October 2020) at 4, https://australia.chevron.com/-/media/australia/our-businesses/documents/gorgon-and-jansz-feed-gas-pipeline-5-year-environmental-performance-report-2015-2020.pdf

[3] "*Gas giant Chevron falls further behind on carbon capture targets for Gorgon gasfield*". The Guardian, 16 Jul, 2022. https://www.theguardian.com/environment/2022/jul/16/gas-giant-chevron-falls-further-behind-on-carbon-capture-targets-for-gorgon-gasfield

[4] "*Chevron's Gorgon hits record gas exports at the expense of emissions*." WAtoday, 12 April, 2023. https://www.watoday.com.au/national/western-australia/chevron-s-gorgon-hits-record-gas-exports-at-the-expense-of-emissions-20230410-p5czaz.html

[5] See., e.g. The Royal Society, above n 1, 12; see also 'Carbon storage: The economic efficiency of storing CO2 in leaky reservoirs' (2003) 5 *Clean Technologies and Environmental Policy* 181.

[6] Jinfeng Ma et al., 'Carbon Capture and Storage: History and the Road Ahead' (2022) *Engineering* 14, 33-43, 39; see also IPCC, *Carbon Dioxide Capture and Storage* (2005), <https://www.ipcc.ch/site/assets/uploads/2018/03/srccs_wholereport-1.pdf>.

Queensland was one of the first jurisdictions in the world to establish a comprehensive legislative framework for CO2 storage.[7] However, this legislation has not been well-integrated into the wider environmental regulatory framework. This has led to significant uncertainty, both for proponents and members of the wider community, and risk with respect to how the unique impacts of these activities on the environment and agriculture will be avoided and managed. EDO draws the Committee's attention to our publication, Improving Regulation of CCS in Queensland, which sets out five recommendations to improve the regulatory scheme in Queensland.

3. Will other gases be released to the atmosphere during the carbon capture process?

Although CO2 is the primary GHG emitted during combustion of fossil fuels, they are not the only GHGs emitted during the fossil fuel production life cycle. GHGs and other noxious gasses are emitted to the atmosphere both because of the energy penalty of CCS (explained below) and due to fugitive gas emissions.

The CCS "energy" penalty refers to the fuel required in each step of the CCS process requires work. Most CCS projects address emissions only for one step of the energy production life cycle. For example, the CCS facility at Gorgon was designed to abate the reservoir CO2, while an almost equal amount of CO2 was associated with the production facility. Additionally, GHGs emitted during production of gas are referred to as "fugitive" emissions. Fugitive emissions from the gas industry arise from leaks from equipment, from deliberate or accidental venting or from flaring of gas at every stage of the gas supply system. These emissions are rarely directly measured but are instead estimated using IPCC default methods. No country directly monitors all fugitive emissions from the gas industry.

It is imperative that GHG emissions be considered across all stages of the fossil fuel and/or energy production project, and that any benefits of a CCS project adequately consider the energy penalty and fugitive emissions.

4. Is monitoring of emissions occurring at all stages from capture and over the long-term?

CO2 emissions are possible through all steps of CCS. Leaks can occur throughout the lifecycle of a CCS project, during capture, transport, and sequestration, and even a minor leak can nullify the effects of CCS. Therefore, it is crucial that monitoring occur not just at the sequestration site, but throughout the process. The injection of CO2 into subterranean storage (i.e., geosequestration) involves a risk that the gas is not contained adequately and escapes into the atmosphere, defeating the goal of CCS at the final step. To retain the climate benefit of carbon capture, CCS projects should maintain a leakage rate below 0.01% or less per year for 10,000 years.[8]

Successful long-term CO_2 storage therefore requires regular and reliable monitoring to confirm there is no subsurface movement of injected CO_2 and that the CO_2 stays in the reservoir as intended, enabling any leakages to be promptly detected and corrective actions initiated.[9]

[7] *Greenhouse Gas Storage Act 2009* (Qld), and later the *Greenhouse Gas Storage Regulation 2021* (Qld).
[8] Johannes Miocic et al, '420,000 Year Assessment of Fault Leakage Rates Shows Geological Carbon Storage Is Secure' (2019) 9(1) *Scientific Reports* 769 <https://www.nature.com/articles/s41598-018-36974-0>.
[9] Ivar-Kristian Waarum et al, 'CCS Leakage Detection Technology - Industry Needs, Government Regulations, and Sensor Performance' (2017) 114 *Energy Procedia* 3613, <https://www.sciencedirect.com/science/article/pii/S1876610217316879>.

5. What is the process for fixing leakages, and who has liability in the short- and long-term?

Assessment of whether a CCS project proceeds must require not only the detailed monitoring requirements for both the operational and post-closure phases of the project, but also emergency and remedial response requirements.[10] Inadequate liability provisions risk negating benefits of CCS through CO2 leakage and place governments and taxpayers at risk of bearing financial burdens. Strong financial assurances are imperative to cover the costs of closure, decommissioning, monitoring, maintenance, and remediation. To ensure adequacy, estimates of security should be reviewed regularly by regulators or an independent third-party.

Prior to being permitted to inject CO_2, the proponent should be able to demonstrate the long-term integrity of the process and the sequestration site. Accordingly, to avoid the state or taxpayer being burdened by liability for carbon sequestration, liability should remain with the proponent in perpetuity, or for a minimum of 100 years after site closure. EDO also supports a trailing liability regime that allows the government to "call back" former titleholders or related parties to cover closure *and* post-closure costs (such as decommissioning, remediation, etc) if the current owner/operator is unable to.[11] However, trailing liability provisions should be a "backstop" only.

6. Have community concerns been adequately addressed?

CCS projects raise significant concerns for communities who may be negatively affected by health or environmental impacts arising from the project (including the associated fossil fuel project). For example, impacts from the upstream extraction as well as the burning of (and export of) oil, gas, and coal include toxic chemical releases to air, water, and from oil and gas drilling operations; and particulate matter, sulfur dioxide, volatile organic compounds, and nitrogen oxides emissions from burning coal and gas.[12] Moreover, the impacts on water may be significant, with the water footprint of CCS ranging from 0.74 to 575 cubic metrics of water per ton of CO2.[13]

As with any project, communities must be able to participate effectively in decision-making about the proposal, ventilate their concerns about these impacts, and have their input incorporated into project design and decision-making. The community should have access to comprehensive information within reasonable timeframes, and to justice mechanisms in cases where decisions are not taken in line with the law. For CCS specifically, this means full assessment and provisions of information about the risks, including pollution and water impacts.

7. Have the operational costs have been adequately evaluated, and how the costs compare with lower-carbon alternatives?

CCS is frequently uneconomic, without a lucrative end use for the captured CO_2 (e.g., enhanced oil

[10] See e.g., California Air Resources Board, 'Carbon Capture and Sequestration Protocol Under the Low Carbon Fuel Standard', (13 August 2018) 66 <https://ww2.arb.ca.gov/sites/default/files/2020-03/CCS_Protocol_Under_LCFS_8-13-18_ada.pdf>.

[11] For example, in 2021, the federal government introduced trailing liability provisions for amended the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth) to empower it to direct former titleholders to take necessary remedial actions. ss 594A-595.

[12] Cradle to grave: the health harms of fossil fuel dependence and the case for a just phase-out, (2022), https://climateandhealthalliance.org/wp-content/uploads/2022/07/Cradle-To-Grave-Fossil-Fuels-Brief.pdf (last visited Mar 30, 2023).

[13] Lorenzo Rosa et al., The water footprint of carbon capture and storage, Elsevier (2020).

recovery) or significant ongoing subsidies.[14] It can be difficult to interrogate the full costs estimates of CCS projects, partly because the industry itself often fails to present sufficient information to accurately evaluate such estimates, and many industry estimates are based on insufficient or irrelevant data. Many factors influence the price of CCS including, including distance required to transport the CO_2, field and/or well capacity, and facility maintenance.[15] Significant cost overruns are also common.[16] Overall, it is the most expensive mitigation option with the least total potential contribution to climate mitigation for the energy sector.

Given the inefficiencies in, and lack of efficacy of current CCS projects,[17] the large amount of investment needed to set up and run a CCS project may be better directed to initiatives which are proven to reduce GHGs or mitigate climate change – particularly where that funding is provided by the taxpayer through government subsidies or direct investment.

Conclusion

EDO does not support CCS as a solution to the climate crisis, and has consistently advocated for more effective mitigation measures to be implemented urgently, including the cessation of fossil fuel exploration, extraction and use, as a means to addressing climate change and reaching real net zero emissions.

In this context, the above questions relate to term of reference (g), and consider the risks, efficacy and alternatives to CSS projects in the context of Australia's response to climate change. They should also be used by the Committee when developing a response to the broader terms of reference regarding Glencore's proposed project in the Great Artesian Basin.

For further information, please contact or
Yours sincerely,

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[14] Bruce Robertson & Milad Mousavian, 'The carbon capture crux: Lessons learned', (2022) *IEEFA,* <https://ieefa.org/resources/carbon-capture-crux-lessons-learned>; CIEL, 'Confronting the Myth of Carbon-Free Fossil Fuels: Why Carbon Capture is Not a Climate Solution', (2021) 11, <https://www.ciel.org/wp-content/uploads/2021/07/Confronting-the-Myth-of-Carbon-Free-Fossil-Fuels.pdf>.
[15] A 2011 report by the pro-CCS group found that there is a wide cost range within each CCS project, with the "high" cost scenario between 3 to 10 times more expensive than the "low" cost scenario. *See* 'The Costs of CCS Storage,' (2011) *European Technology Platform for Zero Emission Fossil Fuel Power Plants* 6.
[16] Robertson and Mousavian, above n 14.
[17] See also Minh Hà Dương and David W Keith, above n 5, 182.