ENVIRONMENTAL JUSTICE AUSTRALIA

Submission in response to

2023 offshore greenhouse gas storage acreage release: nominated areas

prepared by

Environmental Justice Australia

30 June 2023

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About Environmental Justice Australia

Environmental Justice Australia ('EJA') is a national public interest legal centre. We use the law to empower communities, to protect and regenerate nature, to safeguard our climate and to achieve social and environmental justice.

We are proudly non-profit, non-government, and funded by donations from the community. Our legal team combines technical expertise and a practical understanding of the legal system to protect communities and our environment.

EJA has a long history in advocating for a just energy transition, and has worked closely with people, communities and environmental organisations to encourage and compel governments to act, to transform industries, and to ensure justice for the people most affected is at the foundation of all climate solutions, today and tomorrow.

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Executive Summary

Capturing greenhouse gas emissions for permanent underground storage is a nascent technology that remains at an early stage of development worldwide. It carries known and potentially serious direct environmental risks, as well as the fundamental risk of technical failure resulting in the release of captured emissions to the atmosphere, contributing to harmful climate change.

The release of acreage for bidding represents the moment at which the selected geological formations first become available for preliminary carbon capture and storage ('CCS') exploration and appraisal activities, and the *Offshore Petroleum Greenhouse Gas Storage Act 2006* ('OPGGSA') permitting and environmental assessment framework comes into play.

This framework is the key protective measure in place to manage the immediate and longer-term risks of large-scale CCS projects. It must ensure that CCS project risks are identified and minimised, that the public is able to access information about CCS operations, and that project proponents are appropriately accountable for any liabilities arising from their activities.

We submit that the framework falls far short of this standard. It does not reflect the need for CCS projects to result in actual emissions prevention, does not adequately protect against the significant immediate and longer-term risks associated with commercial-scale CCS, and does not provide effective measures to ensure that future costs arising from CCS project failure will be fairly and appropriately apportioned.

In these circumstances, we submit that no further acreage should be released for CCS exploration and development, until a robust, best practice regulatory scheme has been developed that addresses the issues we have identified, and comprehensively confronts and engages with the risks of CCS.

Critically, measures must be introduced – whether within the OPGGSA framework or more broadly across government decision-making – to ensure that, to the extent CCS is contemplated in Australia, any application of this technology avoids inadvertently (or otherwise) perpetuating fossil fuel extraction which would otherwise be phased out as is required to address fossil fuel-driven climate change.

1 Introduction

1. The purpose of this consultation is to assist the Department of Industry, Science and Resources to determine which offshore areas should be released for bidding by proponents of potential CCS developments. The apparent policy rationale for the acreage release is the assertion that 'CCS is a technology with the potential to reduce emissions from hard-to-abate sectors'.

2. Capturing greenhouse gas emissions for permanent underground storage is a nascent technology that remains at an early stage of development worldwide. It carries known and potentially serious direct environmental risks, as well as the fundamental risk of technical failure resulting in the release of captured emissions to the atmosphere, contributing to harmful climate change.

3. Several large offshore CCS projects have been proposed in Australian waters, and the technology has recently attracted renewed, vocal support from within industry. Although the financial, social, and technical barriers to large-scale offshore CCS appear to remain considerable, the rate of exploration and appraisal activities could soon increase.

4. The release of acreage for bidding represents the moment at which the selected geological formations first become available for preliminary CCS exploration and appraisal activities. From this point, the permitting and environmental assessment framework of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth) ('OPGGSA') and its associated regulations comes into play. This legislative framework is the key protective measure in place to manage the immediate and long-term risks associated with large-scale CCS projects.

5. In this context, it is vital that the OPGGSA framework is, from the outset, optimally designed to ensure that the risks associated with offshore CCS activities are publicly identified, avoided or minimised, that residual risks are appropriately managed, and that liability for any future rehabilitation or compensation can be wholly and fairly apportioned.

6. We are concerned that the OPGGSA framework falls short of this standard.

7. We have taken the opportunity presented by this consultation process to raise several key issues for the Department's consideration:

    a. The framework provides no assurance that CCS projects will achieve the policy objective of a net reduction in Australian greenhouse gas emissions.

    b. The calculation and attribution of long-term liability for CCS project failure exposes the Australian public to significant risk.

    c. There is inadequate public reporting and transparency around CCS project impacts and risk management.

8. This is not an exhaustive analysis of the gaps in the OPGGSA framework. Rather, we wish to highlight several key problems which, given that major CCS deployment appears to be a real possibility, and that such deployment would carry significant environmental and health risks, should prompt a review of the framework prior to the release of further acreage for CCS activities.

2 Offshore CCS status and environmental risks

2.1 Carbon capture and storage remains a nascent technology

9. Of the 30 CCS projects worldwide operating as of late 2022, 21 entail 'Enhanced Oil Recovery' ('EOR'), where CO_2 is pumped into depleted oil reservoirs to extract more oil.[1] In these projects, the permanent storage of CO_2 is not the objective; no attempt is made to ensure the CO_2 remains underground long-term, nor is any systematic monitoring of storage volumes or duration undertaken. As a result, the pool of experiential knowledge about the effectiveness of CCS as a means of absolute emissions reduction is very small.

10. Further, most of the flagship carbon capture projects - including those for Enhanced Oil Recovery - have experienced chronic technical difficulties:[2]

    a. **Chevron's Gorgon LNG plant, WA** – Approval of this project was conditional on the capture and storage of 80% of the waste CO_2 from gas processing, or about

[1] See Global CCS Institute, *2022 Status Report* (2022), 53-54.
[2] For further detail, see Bruce Robertson, *The Carbon Crux: Lessons Learned* (September 2022) Institute for Energy Economics and Financial Analysis <https://ieefa.org/media/3007/download/>.

12.3Mt over 2016-21. However, technical problems including leaks, corroded valves and issues with the storage pressure management system meant that the CO_2 injection only commenced three years after the site's first LNG shipment. The WA Government subsequently ordered Chevron to reduce CO_2 storage volumes due to safety issues. As a result, only 4.9Mt CO_2 in total was injected over the project's first five-year compliance period, missing the target by approximately 60%.

b. **Boundary Dam, Canada** – This project involved the retrofitting of carbon capture to a coal-fired power plant, with the captured CO_2 waste stream used to extract oil. The project cost US$1.5bn to construct and due to a series of problems with the capture equipment has never met its 90% capture target, averaging closer to 50%.

c. **Petra Nova, US** – This project was another carbon capture retrofit to a power plant, with the CO_2 to be used for EOR. The project operated for 3 years, during which time it experienced frequent outages and missed its target by 17%, before it shut down at an estimated cost to investors of US$150m.

d. **In Salah, Algeria** – This project was set up with an annual target capture and storage capacity of 1 to 1.2Mt CO_2. Injection commenced in 2004 but was suspended in 2011 due to concerns about the integrity of the cap rock seal. The project stored 3.8Mt CO_2 over its lifetime, missing its target by about 55%.

These examples demonstrate that CCS remains a complex and nascent engineering exercise.

2.2 CCS activities carry potentially significant environmental risks.

11. The environmental footprint of CCS activities consists of unavoidable or inherent impacts, most notably adverse effects on marine wildlife from seismic surveying, and a further set of potential impacts that may eventuate as a result of poor design, implementation failures, accidents, or other unintended events.

Unavoidable impacts

12. Seismic surveying is a necessary first step in assessing the suitability of a geological formation as a prospective CO_2 storage site. Used frequently in offshore petroleum exploration, the noise resulting from seismic surveying has well-documented adverse impacts on marine wildlife. Impacts can be direct, like interfering with marine animals' ability to use auditory senses and causing aural damage, or indirect impacts, like loss of habitat

and resources due to displacement.[3] For example, seismic surveys conducted with air guns have been shown to slow the physical development of juvenile Southern Rock Lobsters, and to impair their ability to right themselves (after being flipped), which increases exposure to predators.[4] Whales and dolphins are considered to be particularly vulnerable to the adverse effects of seismic surveying, due to their dependence on acoustic communication for critical life functions like communication and hunting, and multiple studies have observed changes in the distribution and behaviour of cetaceans in the vicinity of seismic survey activity.[5]

Potential impacts

13. A complete CCS project consists of several interrelated yet discrete engineering processes: capture, compression, transport, injection, storage, and monitoring. While the compression and injection components of this system have been used by the petroleum industry in Enhanced Oil Recovery for decades with varying degrees of success, the other technologies are even less well-developed.

14. Industry's relative lack of experience in deploying offshore CCS at commercial scale heightens the probability of accidental impacts occurring. Such impacts include the unplanned release of CO_2 (or another greenhouse gas substance) from a compression facility, pipeline, injection well or storage formation, whether chronic or acute, and whether in the short-term or long-term, after injection has ceased.

15. Some research has been undertaken in Europe to explore the potential effects of an underwater CO_2 leak on marine ecosystems, but this remains a very new field of study. There is evidence that changes to marine water chemistry from a CO_2 leak are likely to impact enzyme activity on the seafloor, affecting organic matter cycling and ecosystem

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[3] See, e.g., A.G. Carroll, 'A critical review of the potential impacts of marine seismic surveys on fish & invertebrates' (2017) 114(1) *Marine Pollution Bulletin* 9.
[4] See Ryan D. Day et al, 'The impact of seismic survey exposure on the righting reflex and moult cycle of Southern Rock Lobster (*Jasus edwardsii*) puerulus larvae and juveniles' (2022) 309 *Environmental Pollution* 119699. An overview of the relevant research program can be found at University of Tasmania, 'Scientist find seismic surveys impact reflexes and moulting in young rock lobsters' (13 September 2021) <https://www.imas.utas.edu.au/news/news-items/scientists-find-seismic-surveys-impact-righting-reflex-and-moulting-in-young-rock-lobsters>.
[5] See the research synthesis and overview in A.S. Kavanagh et al, 'Seismic surveys reduce cetacean sightings across a large marine ecosystem' (2019) 9 *Nature: Scientific Reports* 19164 <https://www.nature.com/articles/s41598-019-55500-4>. See also Lucia Di Iorio and Christopher W. Clark, 'Exposure to seismic survey alters blue whale acoustic communication' (2010) 6(1) *Biology Letters* 51 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2817268/>; Natural Resources Defence Council, 'Boom, Baby, Boom: The Environmental Impacts of Seismic Surveys' (2010) <https://www.nrdc.org/sites/default/files/seismic.pdf>.

function.[6] Large-scale CO_2 leaks would result in localised but significant ocean acidification, with a flow-on impacts including to fisheries and the ability of marine animals to build shells.

16. Importantly, the rights conferred by a 'greenhouse gas assessment permit' include the injection and storage of greenhouse gases,[7] meaning that the risks associated with CO_2 leakages are present from the first stages of the CCS project development and approval process. While assessment permittees are confined to injection and storage 'on an appraisal basis',[8] this phrase is not defined in the legislation and no upper limit on the quantity of greenhouse gases that could be injected appears elsewhere in the framework. This means that the environmental risks of a comparatively large CO_2 leak arise from the earliest stages of a CCS project as regulated by the OPGGSA framework.

3 Overview of the regulatory framework

17. In this submission, we refer to the 'OPGGSA framework'. By this phrase, we mean the current legislative and regulatory framework governing the exploration of permanent offshore carbon capture and storage locations,[9] consisting of the:

A. *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth);
B. Offshore Petroleum and Greenhouse Gas Storage (Resources Management and (Administration) Regulations 2011*;* ('Resource Management Regulations');
C. Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 ('Safety Regulations');
D. Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*;* ('Environment Regulations');
E. Offshore Petroleum and Greenhouse Gas Storage (Regulatory Levies Regulations 2004; ('Regulatory Levies Regulations'); and
F. Offshore Petroleum and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2011 ('GHG Injection Regulations').

[6] E. Rastelli et al, 'CO_2 leakage from carbon dioxide capture and storage (CCS) systems affects organic matter cycling in surface marine sediments' (2016) 122 *Marine Environmental Research* 158.
[7] *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cth), s 290.
[8] OPGGSA, s 290(1).
[9] Defined in s 20 of the OPGGSA.

4 Key issues in the offshore CCS regulatory framework

18. The serious actual and potential impacts of CCS, in combination with the process' relatively nascent development status, means that a robust regulatory framework must be in place prior to the deployment of offshore CCS in Australian waters. In our view, the OPGGSA framework fall short of this standard.

19. The issues we have identified for the Department's consideration fall within the following three themes:
    1. The framework provides no assurance that CCS projects will result in a net reduction in greenhouse gas emissions.
    2. The calculation and attribution of long-term liability for CCS project failure may expose the Australian public to significant risk.
    3. There is inadequate public reporting and transparency around CCS project impacts and risk management.

20. This is not an exhaustive analysis of the gaps in the OPGGSA framework. Rather, we wish to highlight several key problems which should prompt a comprehensive review of the framework prior to the release of further acreage for offshore CCS. We submit that a significantly strengthened framework should be in place before any new acreage releases, ensuring that the risks associated with offshore CCS are effectively minimised by the framework from the outset, and that there are clear and sufficient avenues for redress in place for when issues inevitably arise.

4.1 No assurance of net negative emissions

21. Australia has legislated national emissions reduction targets for 2030 and 2050. A range of measures are being pursued to achieve these targets, including facilitating the use of CCS to capture and reduce emissions from hard to abate sectors. In that context, federal agencies such as the Climate Change Authority have explored and reported on the role that carbon capture and storage could play in accelerating Australia's move towards decarbonisation. Most significantly, such reports have sought to emphasise that the use of CCS as a means to reduce emissions must be done against the overarching objective of ensuring the need for net-negative emissions.[10]

[10] Climate Change Authority, *Reduce, remove and store: The role of carbon sequestration in accelerating Australia's decarbonisation* (April 2023) <

22. Despite the policy and industry focus on CCS, there are currently no federal frameworks or guidelines which provide guidance or clear definitions on the objectives and targets to be met through this technology. EJA submits that in the absence of such a framework, the acreage release and subsequent permitting processes will occur without any guarantee or necessary consideration of the extent to which each CCS project may, or may not, result in the prevention of CO_2 emissions, significantly undermining both the effectiveness of, and justification for, the deployment of this technology.

23. Within the OPGGSA framework specifically, there is currently no explicit reference made to Australia's emissions reduction targets nor is there any underlying net-zero or net negative emissions targets associated with the regulation of exploration and injection activities carried out by GHG titleholders.

24. Further, with the exception of section 21 of the OPGGSA, which provides that a GHG storage formation will only be regarded as suitable where the geological formation permits the permanent storage of at least 100,000 tonnes of GHG,[11] there is no specification within the OPGGSA framework which quantifies the rate and duration in which those emissions should be captured.

25. EJA notes that section 3 of the OPGGSA outlines that the object of that Act is to provide an effective regulatory framework for the injection and storage of GHG substances in offshore areas.[12] In EJA's submission, the absence of an overarching net-negative emissions goal within the OPGGSA framework within the context of exploration or injection activities[13] highlights the fact that the current framework falls short in achieving its objective to provide an "effective regulatory framework" for the abovementioned activities.

26. More broadly, the existing OPGGSA framework does not currently address or acknowledge how offshore CCS aligns with Australia's international obligations to reduce Australia's GHG emissions by 43% below 2005 levels by 2030 and to reach net-zero by 2050 under the *Paris Agreement.*[14] The necessity of the proposed acreage release of the above

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www.climatechangeauthority.gov.au/sites/default/files/2023-04/Sequestration%20Insights%20Paper%20-%20Publication%20Report_0.pdf>.

[11] OPGGSA, S 21.

[12] OPGGSA, s 3(b).

[13] OPGGSA, ss 290, 357.

[14] *Australian NDC 2022 Update*, 16 June 2022.

nominated areas for the purpose of exploring permanent offshore storage locations should be considered in light of Australia's international obligations as well as the fact that the current framework provides no clear requirement that CCS projects will result in a net reduction in greenhouse gas emissions.

27. EJA submits that an evidence-based, target focused framework which allows the Regulator to assess and identify the rate, duration and volume of CCS that can be captured through proposed offshore CCS projects is integral to ensuring that future activities carried out through CCS projects result in a net reduction in greenhouse gas emissions.

4.2 Minimising, quantifying and apportioning future liability

28. As noted above, all CCS projects carry the risk of a CO_2 leak, whether from the transport and injection infrastructure, or whether from the target storage reservoir itself. Such a leak could have serious localised impacts – such as the significant human health harms of the 2020 explosion of a high-pressure CO_2 pipeline in Mississippi, USA – as well as contributing to the global accumulation of greenhouse gases in the atmosphere.

29. The OPGGSA purports to manage these risks in various ways, but we are concerned that gaps remain which could expose the Australian public to significant – and unfair – costs in the event of a technical failure and CO_2 leak from an offshore CCS facility.

Calculation of security for long-term monitoring

30. Once a CCS proponent ceases injection, it must apply to the Minister for a site closing certificate, which triggers the process for transferring responsibility for the monitoring and management of the site to the Commonwealth. If the Minister is satisfied that injection operations have ceased (or never took place), the Minister may issue a pre-certificate notice that describes a program for monitoring the behaviour of the GHG plume and estimates the costs and expenses of that program.[15] This estimate then forms the basis of a security paid to the Commonwealth by the proponent to cover monitoring operations while the site closing certificate is in force.

[15] OPPGSA, ss 388, 391.

31. The Act also provides that costs recoverable by the Commonwealth are limited to expenses incurred in carrying out the program described in the pre-certificate notice, and are capped at the estimate provided in that notice.[16]

32. It is unclear what recourse the Commonwealth would have to recover costs incurred outside the monitoring program during the 15+ years prior to the issue of the site closing certificate – for example, costs in remediating a sudden leak in the reservoir seal.

33. Further, multiple factors make it highly possible that costs and expenses incurred by the Commonwealth may ultimately exceed the security, including the technical complexity of CO_2 injection in a deep sea environment, challenges in monitoring the behaviour of the injected CO_2 plume, the inherent uncertainties in modelling matters like seismic activity and CO_2 movement, and the possibility of unforeseen events such an earthquake at or around the injection site. In such circumstances, the Australian public would be left to meet additional costs. Concerningly, it appears that this would extend to instances in which such additional costs have resulted from the provision of incomplete or inadequate information by the proponent, given Commonwealth's dependence on information provided by the proponent in the site-closure certificate application in determining the security amount.

15-year assurance period

34. The minimum period of time that must pass before the process for initiating the transfer of responsibility for a CCS site is 15 years.[17]

35. Ideally, CCS should result in the permanent storage of the injected greenhouse gas plume. Any leakage or other failure means that the emissions prevention objective of CCS has not been met.

36. As noted throughout this submission, CCS for the purpose of permanent storage (as opposed to Enhanced Oil Recovery) is still a nascent process, and there is a dearth of long-term monitoring data about the effectiveness of this technology. In these circumstances, and given the myriad of ways in which storage could fail over time and the liability to which the Australian public would then be exposed, we are concerned that 15 years is insufficient to provide adequate assurance that the CCS process has been successful.

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[16] OPGGSA, s 398.
[17] OPGGSA, s 399.

Extent of potential liability

37. Under the OPGGSA, the Commonwealth must indemnify former CCS proponents in relation to liabilities arising from acts done (or omitted to be done) in the course of operations authorised by their CCS licence.[18] There is no cap – at least within the OPGGSA framework – on the scale of the potential sum of public money that could be required of the Commonwealth under this indemnity, and no explicit exclusion within the legislation of liabilities arising from the negligence or wilful misconduct of the former licence-holder.

38. While there are sound policy reasons for ensuring that there are avenues for redress for persons who may be adversely affected by a failed CCS project in the event that the licence-holder no longer exists, this is achieved by section 401, which transfers liability to the Commonwealth in such circumstances.

39. We are concerned that given the extent of the potential damages that could arise from, for example, a large-scale CO_2 leak near a commercial fishery or other vulnerable ecosystem, in circumstances where offshore CCS is still a very early-stage technology, these provisions expose the Australian public to potentially very significant liabilities.

40. Further, it should be noted that these liabilities for damages arise *in addition to* the costs of whatever rehabilitation or remediation work required to address the leak. There is no express provision in the OPGGSA framework for the Commonwealth to recover rehabilitation costs from the proponent in the event of a serious leak, and while this issue may be covered in individual indemnity agreements, this is not guaranteed, providing the public with no assurance that such costs would be fairly apportioned.

4.3 Accountability and transparency

41. In light of the fact that the development of CCS technologies and strategies remains at the early stages, there is a paramount need to ensure that the processes and guidelines within the OPGGSA framework to approve exploration and injection permits are open and transparent.

[18] OPGGSA, s 400.

42. While preliminary project and impact information is published through the initial environmental plan process under the Environment Regulations,[19] very little information about the ongoing conduct of CCS activities is made available to the public.

43. By way of example, under section 420 of the OPGGSA, a holder of a greenhouse gas assessment permit is required to provide a monthly report to the Regulator about the exploration activities and operations carried out in the block that is the subject of the permit.[20] Further, the provisions within Schedule 1 and 2 of the GHG Injection Regulations sets out specific information that must be provided in support of an application under Part 2.1 of the GHG Injection Regulations for the declaration of a part of a geological formation as an identified GHG storage formation.[21]

44. Despite the inclusion of such broad reporting obligations for GHG permit and licence holders (including those outlined above), the decision to publish the reports or information produced as a result of those reporting requirements, is discretionary.[22] We understand that, in practice, this discretion is not used. To ensure transparency during the application process for GHG assessment permits[23] and GHG injection licences,[24] EJA submits that the OGGPSA framework should incorporate a robust reporting framework which ensures that the Regulator or Minister regularly publishes information relating to the scope and objectives underpinning applications. Such reporting should also outline how CCS exploration and injection activities measure up against appropriate emissions reduction benchmarks.

45. In that respect, in order to ensure that the processes by which permits and licences are approved *and* maintained by titleholders remain open and transparent, EJA submits that the Department should take the following actions:

    a. Support an amendment to s 465 of the OPGGSA which imposes a positive statutory duty on the Regulator to regularly publish information regarding the monitoring of the behaviour of GHG stored in offshore areas; and

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[19] Reg. 9ab. EJA notes that NOPSEMA publishes submitted environment plans submitted for offshore energy activities.
[20] OPGGSA, s 420.
[21] OPGGSA, Part 2.1.
[22] OPGGSA, s 465.
[23] OPGGSA, Part 3.2.
[24] OPGGSA, Part 3.4

b. Consider the establishment of baseline targets or requirements which outline how the Regulator will measure and monitor the capture and storage of GHG through offshore CCS projects.

5 Conclusion

46. EJA thanks the Department for its consideration of this submission. We welcome any questions or requests for further material arising from this submission.