



Department of **Mines,
Petroleum and Exploration**

**Response to
submissions**

Petroleum, Geothermal Energy and Greenhouse Gas Storage

(Greenhouse Gas Injection and Storage) Regulations 2026

Petroleum and Greenhouse Gas Storage (Submerged Lands)

(Greenhouse Gas Injection and Storage) Regulations 2026

May 2026

Background

The Department of Mines, Petroleum and Exploration (DMPE) released consultation drafts of the *Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2026* and the draft *Petroleum and Greenhouse Gas Storage (Submerged Lands) (Greenhouse Gas Injection and Storage) Regulations 2026* (GHG Regulations) for public comment from 15 July 2025 to 5 September 2025.

These regulations follow the assent of the *Petroleum Legislation Amendment Act 2024* (PLAA24) which, among other things, amended the existing *Petroleum and Geothermal Energy Resources Act 1967* (PGERA67), *Petroleum Pipelines Act 1969* (PPA69) and the *Petroleum (Submerged Lands) Act 1982* (PSLA82) to provide a legislative framework for pipeline transport and permanent underground storage of greenhouse gas substances.

While Part 1 of the PLAA24 commenced on 14 May 2024, (sections 1 and 2), a secondary stage of regulation amendments is required to give effect to the Bill and allow for commencement of the remainder of the PLAA24.

The GHG Regulations were developed to facilitate and regulate greenhouse gas (GHG) injection and storage operations under the amended PGERA67 and the amended PSLA82.

As part of the consultation, DMPE committed to provide a response to submissions document and all submissions will be collectively published verbatim, with the submitter listed in this document.

Stakeholder comments

There were nine submissions received from the following stakeholders:

- Australian Energy Producers (AEP)
- Australian Marine Conservation Society
- The Chamber of Minerals and Energy (CME)
- Conservation Council of WA
- Fortescue
- MEPAU
- Martuwarra Fitzroy River Council
- Hon Sophie McNeill

- Woodside Energy Group Ltd

DMPE has considered all submissions received and has revised the GHG Regulations where appropriate.

DMPE thanks all stakeholders for their considered input into the process.

Australian Energy Producers

Ref #	COMMENT	DMPE RESPONSE
1	<p>Australian Energy Producers (AEP) appreciates the effort of the Department of Mines, Petroleum and Exploration (Department) to align State and Commonwealth regulatory frameworks as much as possible. Alignment between jurisdictions is particularly important for the smooth regulatory oversight and operation of projects that span both Western Australia and Commonwealth jurisdictions.</p> <p>In general, the approach of these regulations should be flexible and project specific, and AEP appreciates the Department's effort to develop an effective regulatory framework which promotes workable interaction across multiple jurisdictions. This framework is essential for enabling the safe and efficient deployment of carbon, capture, utilisation, and storage (CCUS) projects which are critical to achieving emissions reduction targets and supporting Western Australia's energy transition.¹</p> <p>AEP is supportive of the Draft Regulations and submits the following comments for consideration:</p> <p>¹ Net Zero Australia, Modelling Summary Report, 2023</p>	DMPE thanks AEP for providing a submission.
2	<p>1. Enhancing Economic Viability: Repurposing of Petroleum Assets</p> <p>To maximise CCUS opportunities in Western Australia, the Draft Regulations should explicitly facilitate repurposing of existing hydrocarbon producing assets (e.g., wells, pipelines, facilities) for safe and permanent GHG storage. Greenfield CCUS developments require significant costs. Repurposing, when economically and technically viable, can leverage useful infrastructure, avoid waste, minimise environmental impacts, and improve the economic viability of projects.</p> <p>The Regulations should allow appropriate mechanisms for repurposing, with the Department verifying safety and integrity through existing technical processes. Where appropriate, GHG operators can assume ownership and responsibility during project life, including closure, while prior owners are absolved of liability post-transfer of repurposed assets. This approach would encourage mutual benefits such as shared data, reduced conflicts, and minimised Departmental intervention which would improve efficiencies and enhance project viability.</p>	Comments noted, and it is acknowledged that future carbon capture and storage (CCS) developments will require amendments to the current legislative framework to enable the seamless transition of petroleum pipelines, wells and infrastructure for GHG transport and storage purposes.

	The Draft Regulations reference overlapping titles but lacks mechanisms for seamless asset transfer. AEP urges amendments including explicit provisions to enable repurposing. Aligning with Federal offshore regulations enables and positioning Western Australia for efficient CCUS deployment.	
3	<p>2. Publicly Available Information</p> <p>AEP supports the approach of the Regulations in making project specific information publicly available, notably the site plan summary, aimed at fostering transparency through increasing public awareness of projects while balancing commercially sensitive and unproductive publication of technical information.</p>	Comment noted.
4	<p>3. Overlapping Petroleum and GHG Titles and Graticular Block Amalgamation</p> <p>AEP emphasises the importance of having a regulatory framework that enables the amalgamation of graticular blocks to accommodate project requirements and the facilitation of hub development. The regulatory framework lacks provisions to permit the consolidation of blocks into larger title areas (e.g., the conversion of a production to injection licence with addition of a nearby graticular block(s) in order to maximise storage capacity of a reservoir). This process remains critical for efficient project planning, and enabling cooperative arrangements between overlapping petroleum and GHG title holders would minimise conflicts and facilitate the seamless CO2 movement across blocks.</p> <p>The prioritisation of amendments to the Act and the Draft Regulations is critical, as these limitations will prove restrictive to the successful deployment of CCUS in Western Australia.</p>	<p>Comment noted and agreed. It is noted the Commonwealth OPGGSA's section 302A enables a single holder of two adjacent work-bid GHG assessment permits, which are both in Commonwealth waters and which together are reasonably suspected to contain a GHG storage formation that crosses the title boundary, to apply for a replacement consolidated work-bid permit which covers the area of the two existing permits.</p> <p>Including any provision to allow for consolidation of additional blocks will require overarching amendments to the PGERA67 and PSLA82 and not the subsidiary regulations. DMPE will include this recommendation for consideration in the first set of amendments to the GHG provisions in the PGERA67 and PSLA82.</p>
5	The proposed amendments to the Draft Regulations will enhance the economic viability, environmental sustainability, and regulatory efficiency of CCUS projects in Western Australia. AEP's members eagerly await the completion of the regulatory framework and the subsequent GHG Injection and Storage acreage release. The completion of the regulatory framework and the commencement of new CCUS projects in Western Australia is a significant milestone in the decarbonisation journey of the State.	Comment noted.

Australian Marine Conservation Society

Ref #	COMMENT	DMPE RESPONSE
6	<p>The Australian Marine Conservation Society (AMCS) is Australia’s peak marine conservation organisation and Australia’s leading national charity dedicated solely to protecting our precious ocean wildlife – a community of ocean lovers across the nation working for healthy seas.</p> <p>We work to protect our oceans and coastal environments for the benefit of all marine life, and current and future generations. AMCS welcomes the opportunity to provide a public comment to the WA Draft Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025 (“the draft regulations”).</p>	DMPE thanks AMCS for providing a submission.
7	<p>Recommendation 1: Include a precautionary principle for proposed greenhouse gas (GHG) activities and stringently define “as low as reasonably practicable” to prevent significant impacts to the environment as well as to worker health and safety</p> <p>The draft regulations require a GHG operations site plan that outlines how the titleholder will reduce risks to “as low as is reasonably practicable” (ALARP). AMCS asserts that ALARP as it is currently applied in the offshore petroleum and greenhouse gas sector provides inadequate, if any, protection for vulnerable marine wildlife, especially in light of the significant unknown impacts of GHG leakage in deep water ecosystems.</p> <p>AMCS, in partnership with The Wilderness Society, has previously raised this issue in the offshore Commonwealth marine area in a joint statement of concern, “The Failing Regulation of the Offshore Oil and Gas Industry Clean Up in Australia”. In it, we explain that the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has failed to issue timely clean up notices for major accidents and has failed to escalate compliance and enforcement action to deter misbehaviour. In mirroring the Commonwealth legislation, Western Australia is missing the opportunity to learn from the Commonwealth’s mistakes and employ a stronger, more functional regulatory framework.</p> <p>Peak body Seafood Industry Australia has also previously raised the disparities between risk assessments for the petroleum/GHG industry –</p>	<p>DMPE acknowledges AMCS’s recommendation and notes that in Western Australia’s legislative framework, proposals with significant impacts to the environment, including marine wildlife, are matters for consideration under the <i>Environmental Protection Act 1986</i>. For the kinds of proposals described by AMCS, DMPE notes that the precautionary principle is already applied in the decisions of the WA Environmental Protection Authority.</p> <p>These draft regulations deal with particular matters that are not already addressed within WA’s existing legislative framework and that will apply to proposed greenhouse gas activities in Western Australia.</p>

	<p>which work to ALARP – and other industries, like fisheries – where risk assessments work to a zero tolerance, particularly related to interactions with threatened, endangered, and protected species.¹</p> <p>To adequately protect marine ecosystems and offshore worker health and safety, AMCS recommends a precautionary approach be applied to all GHG operations, particularly because of the lack of GHG injection and storage projects from which to draw environmental, health and safety data.</p> <p>¹ Seafood Industry Australia. <i>Inquiry into impact of seismic testing on fisheries and the marine environment</i>. www.aph.gov.au/DocumentStore.ashx?id=a481c68d-d324-41b1-abfb-c5d8f15b2e50&subId=674794</p> <p>² Malz, N., Oei, P.-Y., & Herpich, P. (2025). Assessing the Prospects, Costs, and Risks of Carbon Capture and Storage Implementation in Germany. <i>Carbon Capture Science & Technology</i>, 15, 100418. https://doi.org/10.1016/j.ccst.2025.100418</p> <p>³ IEEFA. (2022, September). <i>The Carbon Capture Crux: Lessons Learned</i>. https://ieefa.org/sites/default/files/2022-09/The%20Carbon%20Capture%20Crux.pdf</p> <p>⁴ IEEFA. (2023, June). Norway’s Sleipner and Snøhvit CCS: Industry models or cautionary tales? https://ieefa.org/sites/default/files/2023-06/Norway%E2%80%99s%20Sleipner%20and%20Sn%C3%B8hvit%20CCS-%20Industry%20models%20or%20cautionary%20tales.pdf</p>	
8	<p>Recommendation 2: Require review of site plans every 2 or 3 years maximum instead of every 5 years, particularly in the first 15 years of operations.</p> <p>Carbon capture and storage (CCS) projects, a type of greenhouse gas injection and storage, experience high geographic variability and location specific constraints.² Because of this, these projects have frequently faced unexpected challenges which have led to reduced storage capacity, CO2 plume migration, and suspension of operations.</p> <p>As the Institute for Energy Economics and Financial Analysis (IEEFA) have outlined in several briefing notes and reports, these unexpected challenges have occurred as early as 17-18 months into operations, as was the case with Snøhvit in Norway and Gorgon in Western Australia.³ Challenges can persist into the second decade, as evidenced by the</p>	<p>The five-year timeframe is a standard legislative period which recognises an accepted length of time where there would be relatively constant technology and employee retention for both industry and Regulators. The timeframe is consistent with that for other management plans in WA petroleum regulations such as Environment Plans and Well Management Plans, and also with Commonwealth petroleum and greenhouse gas storage regulations.</p> <p>Within the site plan regulations in Part 3 of the GHG Regulations are in-built mechanisms to address ‘unexpected injection and storage issues’, where in regulation 33 an approved site plan is required to be varied following the occurrence of certain events described in the regulations as:</p>

	<p>Sleipner project’s loss of containment from the original storage formation that required consistent monitoring and followup plume modelling.⁴</p> <p>The government should see unexpected injection and storage challenges as likely to occur for CCS projects and design its regulatory framework to require more frequent updates to a GHG injection and storage site plan to reflect this expectation.</p> <p>² Malz, N., Oei, P.-Y., & Herpich, P. (2025). Assessing the Prospects, Costs, and Risks of Carbon Capture and Storage Implementation in Germany. <i>Carbon Capture Science & Technology</i>, 15, 100418. https://doi.org/10.1016/j.ccst.2025.100418</p> <p>³ IEEFA. (2022, September). <i>The Carbon Capture Crux: Lessons Learned</i>. https://ieefa.org/sites/default/files/2022-09/The%20Carbon%20Capture%20Crux.pdf</p> <p>⁴ IEEFA. (2023, June). Norway’s Sleipner and Snøhvit CCS: Industry models or cautionary tales? https://ieefa.org/sites/default/files/2023-06/Norway%E2%80%99s%20Sleipner%20and%20Sn%C3%B8hvit%20CCS-%20Industry%20models%20or%20cautionary%20tales.pdf</p>	<ul style="list-style-type: none"> • The site plan is no longer accurate and up to date because there is new information that significantly alters the determination of any of the following: <ul style="list-style-type: none"> (a) the fundamental suitability determinants of the formation; (b) the expected migration pathway or pathways of each greenhouse gas substance stored in, or to be injected into and stored in, the formation; (c) predictions set out in Part A of the site plan for the behaviour of each greenhouse gas substance stored in, or to be injected into and stored in, the formation; (d) interactions between the formation and the method by which a greenhouse gas substance is injected into the formation; or (e) any other matter relevant to the safe and secure storage of a greenhouse gas substance in the formation. • The licensee proposes to make a change, or a series of changes, to the way the operations in the approved site plan are carried out that will affect: <ul style="list-style-type: none"> (a) predictions set out in Part A of the site plan for the behaviour of each greenhouse gas substance stored in, or to be injected into and stored in, the formation; or (b) the risks associated with those operations. • The licensee proposes to make a significant change to the way the operations in the approved site plan are managed that will affect the integrated operations management plan <p>A variation of a site plan can also be made at any time, either initiated by the licensee in regulation 34 or required by the Minister in regulation 35.</p>
9	<p>Recommendation 3: Require public consultation on site plan applications</p> <p>Exploration and development of offshore areas for GHG injection and storage carries with it a multitude of environmental, financial and economic risks, including from the potential inadvertent leakage of CO₂ into marine environments. These projects will require monitoring for many years, a responsibility that ultimately falls to governments under</p>	<p>There are existing consultation processes that will apply to proposals to inject and store greenhouse gases:</p> <ul style="list-style-type: none"> • For proposals that may have significant environmental impacts, there are appropriate public consultation processes as part of the assessment of proposals under Part IV of the <i>Environmental Protection Act 1986</i> (WA).

	<p>WA and Commonwealth legislation. These risks underscore the need for a robust regulatory assessments process, including public consultation.</p> <p>As described by the Environmental Defenders Office:</p> <p><i>“The consultation process allows people who are impacted by offshore gas activities the subject of environment plans to have their say. In the absence of this process, titleholders may not otherwise be able to obtain this information. It also ensures that these people are properly informed of the scope and impact of the proposed activities.”</i>⁵</p> <p>The WA Government could adopt the wording of Commonwealth petroleum/GHG regulations, requiring titleholders to consult with, amongst others, “a person or organisation whose functions, interests or activities may be affected by the activities to be carried out” under the site plan.</p> <p>⁵ Environmental Defenders Office. (2024, March 8). <i>Submission regarding the consultation requirements for offshore oil and gas storage regulatory approvals</i>. www.edo.org.au/wp-content/uploads/2024/03/240305-EDO-submission-re-consultation-requirements-review-V3.pdf</p>	<ul style="list-style-type: none"> • For other proposals, the consultation requirements set out in other applicable legislation, including regulations as to environment plans, will apply. <p>The existing WA regulatory requirements for environment plans include a requirement that the operator of an activity “<i>must include a report on all consultations between the operator and relevant authorities and other relevant interested persons and organisations in the course of developing the environment plan</i>”. This requirement will also apply to GHG injection and storage activities.</p> <p>As outlined on page 51 of the <u><i>Guideline for the development of Petroleum, Geothermal and Pipeline Environment Plans in Western Australia</i></u> (2024), this requirement is taken to mean “... <i>any relevant person or organisation whose functions, interests or activities may be affected by the ... activity ...</i>”.</p> <p>DMPE’s position remains that these existing consultation processes in WA’s legislative framework are consistent with full and meaningful consultation and are effective as to the rights of titleholders and also the functions, interests or activities of relevant organisations and/or relevant persons.</p>
10	<p>Recommendation 4: Site plans should include infrastructure monitoring plans and infrastructure remediation plans</p> <p>In the consultation draft, section 31(3) requires Part B of the site plan to include programs for monitoring and detecting leakages and the plan for carrying out any work to remediate the formation. Interpretation of s31(3)(c) should be broad enough to also include the monitoring of infrastructure deterioration such as by corrosion. Additionally, a provision should be added that, in addition to s31(3)(d), a plan for carrying out remediation work in case of infrastructure deterioration, such as corrosion, occurs.</p>	<p>The monitoring and verification requirements for Part B of a Site Plan in clauses 5, 6 and 7 of Schedule 2 of the GHG Regulations are concerned with the subsurface behaviour of the injection GHG substances, leakage from injection wells and leakage from legacy wells.</p> <p>The WA legislative framework includes overlapping and complementary aspects for the maintenance of infrastructure, including environment, integrity and safety.</p> <p>Environment</p> <p>The subsidiary Environment Regulations under the Acts include monitoring and reporting requirements for an environment plan, and the resource management and administration (RMA) regulations (in Draft) require monthly and annual GHG accounting reports that are made publicly available. Both of these reports require reporting of greenhouse gas substances lost, and this would include reporting of any amounts leaked from infrastructure.</p> <p>Integrity</p>

	<p>At the Gorgon CCS project in Barrow Island, technical problems including leaking valves, valves that could corrode, and excess water in the pipeline from the LNG plant to the injection wells that could cause the pipeline to corrode caused the operator (Chevron) to halt injections and instead vent the CO2 to the atmosphere.⁶ These contingency plans must be considered by the government to decide whether or not a project is suitable to go ahead.</p> <p>⁶ Milne, P. (2017, December 18). Gorgon CO2 injection stopped by leaks and corrosion. <i>Boiling Cold</i>. www.boilingcold.com.au/gorgon-co2-injection-stopped-by-leaks-and-corrosion/</p>	<p>The GHG Regulations consider integrity aspects at the approvals phase and are supported by the Acts. Regulation 11(3)(f) of the GHG Regulations requires demonstration that all operations will be carried out in accordance with sound engineering principles, codes, standards and specifications. Regulation 13(1)(b) of the GHG Regulations requires that a site plan must set out the information specified in Schedule 2. Clause 2 of the Schedule requires that information be set out in sufficient detail to demonstrate that adequate planning has taken place for the proposed operations and management of the plan. Clause (3)(a) of Schedule 2 lists that this includes a description of the infrastructure facilities for engaging in the activities involved in the proposed operations of the site plan. The Minister would take the information supplied in Schedule 2 into consideration of whether the infrastructure in the site plan met the requirements of regulation 11(3)(f).</p> <p>Post approval of a site plan, all operations must be carried out in a proper and workmanlike manner and the Minister has powers under the Acts to issue directions that might include the remediation or maintenance of infrastructure.</p> <p>Safety</p> <p>In addition to the environmental and integrity aspects of the legislative framework mentioned above, certain safety provisions under the <i>Work Health and Safety Act 2020</i> and the <i>Dangerous Goods Safety Act 2004</i> and subordinate regulations may apply, depending on the circumstance.</p> <p>Comment noted.</p>
11	<p>Recommendation 5: An applicant’s description of its decommissioning plans should include an estimate of the costs,</p>	<p>Schedule 2 clause 8 of the WA GHG Regulations follows the equivalent Commonwealth GHG Regulations 2025 in Schedule 2 clause 9 in not</p>

expenses and liabilities arising in connection with, or as a result of decommissioning, and it must maintain financial assurance to do so

Schedule 2, clause 8 of the draft regulations requires that, when drafting a site plan, an applicant must describe its plans for site closure, including decommissioning, remediation and monitoring. To mirror the financial assurance requirements in the Commonwealth Offshore Petroleum and Greenhouse Gas Storage Act 2006 (**OPGGSA**), the applicant should be required to estimate the costs of site closure and maintain financial assurance to do so.

Without strong regulation from the WA government to ensure petroleum/GHG companies have the means to pay for clean up, these companies could propose to abandon their cleanup obligations and eventually leave the long-term liability to the state and taxpayer. This also introduces the risk of hazardous waste and chemical pollution in WA oceans, which are poorly researched and understood.

requiring that the plans for site closure, decommissioning, remediation and monitoring include an estimate of costs, expenses and liabilities.

The financial assurance requirements referred to in the OPGGSA currently only apply to petroleum titles. However, the Australian Government Department of Industry, Science and Resources is seeking feedback on reforms to decommissioning and financial assurance arrangements for the offshore oil and gas industry.

Section 571 currently requires that a petroleum titleholder must, at all times while the title is in force, maintain financial assurance sufficient to give the titleholder the capacity to meet costs, expenses and liabilities arising in connection with, or as a result of:

- (a) the carrying out of the petroleum activity; or
- (b) the doing of any other thing for the purposes of the petroleum activity; or
- (c) complying (or failing to comply) with a requirement under this Act, or a legislative instrument under this Act, in relation to the petroleum activity.

For greenhouse gas titles, section 571A of the OPGGSA states that:

(1) The conditions of:

- (a) a greenhouse gas assessment permit; or
- (b) a greenhouse gas holding lease; or
- (c) a greenhouse gas injection licence; or
- (d) a greenhouse gas search authority; or
- (e) a greenhouse gas special authority;

may include a condition that the registered holder maintain, as directed by the responsible Commonwealth Minister from time to time, insurance against:

- expenses; or
- liabilities; or
- specified things;

arising in connection with, or as a result of:

- the carrying out of work under the permit, lease, licence or authority; or
- the doing of any other thing under the permit, lease, licence or authority;

including insurance against expenses of complying with directions relating to the clean-up or other remediation of the effects of the escape of a greenhouse gas substance.

These provisions are replicated for WA greenhouse title where sections 91A of the PGERA, section 97A of the PSLA and section 37A of the PPA have been amended by the PLAA24 to include the requirement for insurance for greenhouse gas.

Notwithstanding the above, the comments provided on the need for strong regulation of the decommissioning of petroleum and greenhouse operations, wells and infrastructure are acknowledged.

In 2024, the former Department of Energy, Mines, Industry Regulation and Safety, now DMPE, released its Policy for *Decommissioning of petroleum and geothermal energy property, equipment and infrastructure in Western Australian onshore areas and State coastal waters* and the supporting Guideline. The Policy and Guideline establish DMPE's baseline expectations for decommissioning and rehabilitation and provide guidance to registered holders and operators on how to address DMPE's expectations.

Relevantly, the Policy and Guideline are consistent with DMPE's principal objective for environment regulation, being that resource industry activities are designed, operated, closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed environmental outcomes and agreed post-activity land use without unacceptable liability to the State. Further, the Policy and Guideline affirm the requirement that property, equipment, and infrastructure are decommissioned and rehabilitated, consistent with DMPE's Environmental Regulatory Strategy:

- a) to be safe, stable and non-polluting;
- b) carried out in an ecologically sustainable manner;
- c) consistent with agreed environmental outcomes and end land uses; and

		<p>d) without unacceptable liability to the State.</p> <p>www.wa.gov.au/government/announcements/decommissioning-policy-and-guidelines-released</p>
12	<p>Other considerations outside the scope of this consultation but relevant to the development of the broader GHG operations framework include:</p> <ul style="list-style-type: none"> • Ensuring future pipelines / GHG transport regulations are complementary to GHG injection and storage regulations and mitigate integrity and containment risks such as pipeline corrosion and phase change of GHG substances • Creating strong regulatory policy that empowers the state regulator to be able to implement progressive and escalating compliance action (including title revocation and substantial penalty fees) for repeated negligent behavior in contravention of relevant legislation and regulations • Ensuring a strong environmental regulations framework exists that specifically addresses the risks associated with petroleum / GHG activities, either through the <i>Environmental Protection Act 1986</i> (WA) or through future environmental regulations. 	<p>The two sets of GHG Regulations are supported by further amendments which are proposed to the existing suite of petroleum regulations to cover GHG injection and storage. These include three sets of Petroleum Environment Regulations to broaden the scope of these regulations and amendments to the PPA REGs 1970 and the P(SL) P Regs 2022 to require a pipeline licensee to provide an annual pipeline performance report to demonstrate how the integrity of a pipeline is being maintained.</p> <p>DMPE has a published statement of Environmental Compliance and Enforcement Administrative Procedures which covers petroleum activities.</p> <p>www.wa.gov.au/system/files/2025-04/environmental_compliance_enforcement_administrative_procedure.pdf</p> <p>This document is being updated to include the regulation of greenhouse gas storage and transport activities.</p> <p>The \$10,000 penalty in the GHG Regulations are the maximum currently allowable under the PGERA67 and the PSLA.</p> <p>However, this penalty rate is for an individual, and under the <i>Sentencing Act 1995</i>, companies are penalised at a rate of five times the individual penalty amount.</p> <p>It should also be noted that while a breach of a site plan provision in regulation 10 of the GHG Regulations only has a penalty of \$10,000, the ultimate overriding penalty for not having an approved site plan or for operating not in accordance with an approved site plan is that the Minister has the authority to shut down injection operations. This action will have added financial operation implications as well as tarnishing a company's name with investors and/or shareholders.</p>

Chamber of Minerals and Energy of WA

13	<p>The Chamber of Minerals and Energy of WA (CME) is the peak representative body for the resources sector in Western Australia. CME is funded by member companies responsible for 90 per cent of the State's mineral workforce employment.¹</p> <p>In 2023-24, the WA resources sector accounted for 45 per cent of WA's economic activity,² 93 per cent of goods exports³ and 43 per cent of investment.⁴ The sector contributed one third (31.5 per cent) of the WA Government's general revenue via royalties, payroll and other taxes and fees,⁵ enabling the provision of essential public goods and services such as doctors and nurses, teachers and police. CME's 2023-24 Economic Contribution Survey found that the WA resources sector supported 3 in 10 jobs in the State.⁶</p> <p>CME and its members support⁷ the Paris Agreement and its goal of limiting global warming to well below 2 degrees Celsius and pursuing efforts to limit temperature increase to 1.5 degrees Celsius, and accept the scientific consensus as assessed by the Intergovernmental Panel on Climate Change (IPCC). CME members support the promotion of lowest-cost abatement across the economy and recognise that the achievement of Australia's 2050 Net Zero target will require investment in a broad range technologies and projects.</p> <p>For many CME members whose emissions are hardest-to-abate at scale, including where carbon dioxide is generated as a result of chemical processes or existing gas use in industrial processes, the current leading option is for deployment of Carbon Capture, Utilisation and Storage (CCUS). CCUS is a proven⁸, safe and deployable technology which provides an enabler for the hardest-to-abate sectors of the economy to reduce emissions, while longer-term technological solutions are developed. WA's unique carbon dioxide storage potential offers potential to not only support the decarbonisation of industry in WA, but our international trading partners' decarbonisation efforts as well, offering scope for economic diversification.</p> <p>As such, CME welcomed the passing in May 2024 of the Petroleum Legislation Amendment Act 2024 ('the Act'), to provide, amongst other things, a legislative framework for the transport and permanent storage of greenhouse gases. CME acknowledges the work carried out by the state government over the last year to develop the draft Petroleum,</p>	DMPE thanks CME for providing a submission.
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Geothermal and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) regulations 2025 ('the draft regulations'), complementing existing Commonwealth regulations that apply in offshore waters.

CME members consider that the level of consultation with stakeholders during the development of the draft regulations results in them being fit-for-purpose, balancing the need for a robust and credible regulatory framework against the need for efficient processes and administrative requirements. We also acknowledge that these draft regulations were prioritised to allow CCUS projects in the development pipeline to proceed, and that further work is required to develop and finalise associated regulations.

Separate to the progression of these regulations, CME notes the WA government's 2024 CCUS Action Plan⁹ which underlines the state government's commitment to seeing CCUS projects deployed in the state. CME looks forward to continuing to work with the state government to support the investment case for CCUS within Western Australia, including to deploy cross-industry 'CCUS clusters' to enable decarbonisation of hard-to-abate industrial facilities, reduce the risks to investment, and drive down the costs of deployment. CME members have the view that pace is needed here, if Western Australia is to compete with other jurisdictions who are leveraging investment through their industrial strategies.

CME looks forward to engaging further with the state government on the opportunity to further CCUS projects in WA.

¹ Government of Western Australia, 2023-24 Economic Indicators Resource Data File, full-time equivalents onsite under State legislation, Department of Energy, Mines, Industry Regulation and Safety, 29 October 2024.

² As measured by gross value add (GVA). Australian Bureau of Statistics, 5220 Australian National Accounts: State Accounts, Table 6.

³ Department of Energy, Mines, Industry Regulation and Safety (DEMIRS), 2023-24 Economic Indicators Resource Data File, released 29 October 2024.

⁴ Includes Gross Fixed Capital Formation plus minerals and petroleum exploration. Australian Bureau of Statistics, 5220 Australian National

	<p>Accounts: State Accounts, Table 25. Australian Bureau of Statistics, 8412 Mineral and Petroleum Exploration, Table 4.</p> <p>⁵ Includes royalties, Commonwealth grants from North West Shelf royalties and iron ore lease rentals plus surveyed expenditure on payroll and other taxes and fees. Government of Western Australia, 2023-24 Annual report on State finances, Department of Treasury, 27 September 2024, Table 2.1 Operating Revenue: General Government, pp 164-165; CME 2023-24 Economic Contribution Survey.</p> <p>⁶ Direct and indirect jobs. CME, 2023-24 Economic Contribution: Western Australia, March 2025.</p> <p>⁷ CME Climate and Energy policy statement, December 2024</p> <p>⁸ Commonwealth Scientific and Industrial Research Organisation (CSIRO)</p> <p>⁹ WA Government CCUS Action Plan, November 2024</p>	
	<p>Key recommendations</p> <p>Some detailed comments on the draft regulations are provided in an appendix to this letter. More generally, CME’s key recommendations are as follows:</p>	
14	<ul style="list-style-type: none"> The Department for Mines, Petroleum and Exploration (DMPE) to work with stakeholders to ensure that appropriate guidance is developed to support these draft regulations once they are enacted, and that appropriate resources are available to facilitate projects entering the approvals process. Investment in streamlined systems and processes will be crucial. 	<p>Work on the supporting policy, guidelines, and processes has been advanced in parallel with regulation drafting. These materials have been organised into tranches for public consultation, with priority given to approval types expected to be required soon after commencement, ahead of those anticipated later or updates of a more general nature (such as new DMPE templates and amended Act references).</p> <p>DMPE has also been progressing upgrades to the online Petroleum and Geothermal Register to allow for the new application types introduced under the amended Acts. The system is currently in user acceptance testing and remains on track for production release to coincide with the commencement of PLAA24.</p>
15	<ul style="list-style-type: none"> In line with the WA CCUS Action Plan, it is crucial that CCUS projects are carried out with the support of local communities and Traditional Owners. The risk-based approach taken in the draft regulations is an important step in underlining the safety of carbon dioxide sequestration and the obligations on proponents to manage any residual risks. We recommend that the state government continue to 	<p>Comment noted.</p>

	work, in partnership with industry and the Commonwealth, to engage local communities and Traditional Owners to build social licence for CCUS projects.	
16	<ul style="list-style-type: none"> That the state government more generally should work closely with industry, and with the Commonwealth where possible, to identify and deploy CCUS projects at scale, including in CCUS clusters. Similar to the approach for development of Strategic Industrial Areas, this could involve supporting investment in common-use infrastructure such as carbon dioxide pipelines, and derisking foundational investments in capture and storage facilities. This might also include consideration of asset re-use opportunities, such as pipelines. 	Comment noted
	Appendix - Summary comments on the exposure draft regulations and summary document	
17	<p>Applications for Declaration of Identified GHG Storage Formations (DOSF)</p> <p>CME members consider Part 2 (and Schedule 1) to outline a proportionate approach to identifying risks and for their management, drawing from the principles of the Commonwealth's regulatory framework.</p> <p>It will be important for DPME to work at pace with industry to develop appropriate guidance on processes and expectations, particularly for the modelling required as part of an application for a DOSF, to ensure that minimum requirements are understood.</p>	<p>The importance of supporting guidelines for these regulations and, in particular applications for DOSFs, is acknowledged.</p> <p>A response on the development of explanatory guidelines to support the Injection and Storage Regulations has been provided at item 14.</p>
18	<p>Site Plans</p> <p>Similarly, CME considers Part 3 (and Schedule 2) to outline a proportionate approach for the application and management of site plans. CME members agree with the principles and requirements set out, including the five-yearly timing of regular reviews, and process for removing site plans where a licensee has not met its obligations.</p> <p>On notifying the Minister on 'the occurrence of certain events' CME notes under Regulation 33(3)(a) that the licensee is required to submit a notification within 60 days of which an event 'occurred'. However, we caution that it is feasible that knowledge of some of the events outlined in the table in this regulation might not be known about for some time after</p>	DMPE acknowledges the potential for a time gap between the occurrence of an event and when it can be observed or identified. The impact of this gap on the performance of subregulation 32(2) would be taken into consideration by the Minister should a longer period be granted pursuant to subregulation 33(3)(b).

	<p>occurrence. We suggest that this line of the regulation is updated to say '60 days beginning on the date on which the event is identified'.</p> <p>On the development of CCUS clusters, CME acknowledges that the Act does not provide for prospective applications to be made, and that this will mean that multiple applications would need to be made for expansions of storage sites. While this is the case, we recommend that DMPE in developing guidance retains an element of flexibility, within the terms of the Act and the regulations, in order to facilitate cluster development.</p>	<p>DMPE appreciates the feedback provided and acknowledges that the efficiency of regulatory approvals for cluster developments may be enhanced through future amendments to the legislative framework. In the meantime, DMPE will develop processes and issue clear guidance materials to support and facilitate cluster development within the current framework.</p>
19	<p>Serious Situations</p> <p>CME acknowledges the approach for identifying and for notifying and reporting to the Minister the occurrence of any 'serious situations' relating to the storage of greenhouse gases. We acknowledge that Part 4 is modelled on existing Commonwealth regulations, albeit within the terms of the Act, with some flexibility on the timing.</p>	<p>Comment noted.</p>
20	<p>Information that May be Made Publicly Available</p> <p>CME agrees that to retain public confidence it is important for a level of information to be made publicly available. The regulations outlined in Part 5 take a high-level approach to outline that the Minister retains the latitude to publish site plans and certain information in the event of a leakage.</p> <p>It is important that guidance is developed to provide expectations on what information should be published and how information might be best contextualised. Given the technical nature of the data in question relating to subsurface greenhouse gas management, it will be important to ensure that there is a level of interpretation for non-technical audiences to ensure that data are not misconstrued or misunderstood.</p> <p>Guidance should give clarity on the roles and responsibilities of licensees as well as the Minister on what information might be best published proactively and reactively.</p>	<p>Comments noted and acknowledged.</p> <p>A response on the explanatory guidelines to support the GHG Regulations is provided at item 14.</p>

<p>21</p>	<p>Relationship With Other Subsidiary Regulations</p> <p>CME acknowledges the outline plans for the state government to develop parallel regulations under the Act. It will be important to ensure that stakeholders are engaged through the development and drafting of these regulations.</p> <p>As noted above, it will be important that guidance is drafted to complement the regulations, and that systems and processes are developed at pace to enable project proponents to begin to lodge applications.</p>	<p>The GHG Regulations are supported by further amendments which are proposed to the existing suite of petroleum regulations to cover GHG injection and storage by way of the <i>Mines and Petroleum Regulations Amendment Regulations 2025</i>. The important amendments are to the:</p> <ul style="list-style-type: none"> • <i>Petroleum and Geothermal Energy Resources (Environment) Regulations 2012, Petroleum (Submerged Lands) (Environment) Regulations 2012, and the Petroleum Pipelines (Environment) Regulations 2012</i> to provide for environmental regulation of greenhouse gas activities; and • well management, data management and release of information regulations in the <i>Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2015</i> and the <i>Petroleum (Submerged Lands) (Resource Management and Administration) Regulations 2015</i> to include greenhouse gas activities. <p>There are also amendments of a more procedural nature or to update Act name changes to the:</p> <ul style="list-style-type: none"> • <i>Petroleum and Geothermal Energy Resources Regulations 1987.</i> • <i>Petroleum (Submerged Lands) Regulations 1990.</i> • <i>Petroleum Pipelines Regulations 1970.</i> • <i>Petroleum and Geothermal Energy Resources (Registration Fees) Regulations 1990.</i> • <i>Petroleum (Submerged Lands) (Registration Fees) Regulations 1990.</i> • <i>Petroleum (Submerged Lands) Pipelines Regulations 2022.</i> • <i>Petroleum and Geothermal Energy Resources (Hydraulic Fracturing) Regulations 2017.</i> <p>Consultation on the <i>Mines and Petroleum Regulations Amendment Regulations 2025</i> has been conducted and closed 30 January 2026.</p> <p>Amendments to the explanatory guidelines for the three sets of Environment Regulations and the two sets of Resource Management and Administration will be undertaken following approval of the <i>Mines and Petroleum Regulations Amendment Regulations 2025</i>. These guideline amendments will be released for public comment prior to finalisation.</p>
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Conservation Council of WA

22	<p>About the Conservation Council of WA</p> <p>The Conservation Council of WA (CCWA) is the state's foremost non-profit, non-government conservation organisation representing close to 100 environmental organisations across Western Australia, with tens of thousands of engaged individuals state-wide. This broad collective of like-minded groups and individuals creates a vibrant and passionate community, dedicated to the conservation of our unique and diverse state.</p> <p>CCWA has been a prominent and forthright voice for conservation for more than 50 years working directly with the government, media, industry, community groups, and political parties to promote a more sustainable WA and to protect our natural environment.</p> <p>Background</p> <p>The Department of Mines, Petroleum and Exploration (DMPE) is seeking public comment on the draft Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025 and the draft Petroleum and Greenhouse Gas Storage (Submerged Lands) Greenhouse Gas Injection and Storage) Regulations 2025.</p> <p>The <i>Petroleum Legislative Amendment Act 2024</i> (PLAA2024), amongst other things, amends the existing <i>Petroleum and Geothermal Energy Resources Act 1967</i> (PGERA67) and the <i>Petroleum (Submerged Lands) Act 1982</i> (PSLA 82) to provide a legislative framework for pipeline transport and permanent underground storage of greenhouse gas substances.</p> <p>These two sets of draft greenhouse gas injection and storage regulations, presented for consultation, deal with a number of matters to facilitate and regulate greenhouse gas (GHG) injection and storage operations under the amended PGERA 67 and the amended PSLA 82.</p> <p>Preamble</p> <p>CCWA thanks DMPE for the opportunity to comment on the draft Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025 and the draft Petroleum and Greenhouse Gas Storage (Submerged Lands)</p>	DMPE thanks CCWA for providing a submission.
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	Greenhouse Gas Injection and Storage) Regulations 2025 (the Regulations).	
23	<p>CCWA has previously provided its comments to DMPE (DEMIRS) relating to petroleum legislation amendments, mining development and closure; decommissioning; exploration rehabilitation; GHG storage acreage release; and others.</p> <p>For these submissions, CCWA voiced its concerns relating to:</p> <ul style="list-style-type: none"> • the operations of injection and storage of GHG substances (CCUS) and its associated environmental risks; • decommissioning requirements; • rehabilitation strategies; • environmental review processes; and • the adequacy of public consultative processes. <p>CCWA reiterates these concerns in this submission.</p>	DMPE notes the regular comments provided by CCWA to issues the Department has published on its open consultation webpage.
24	<p>CCWA's submission points</p> <p>CCWA previously submitted to the consultative process for the Petroleum Legislation Amendment Bill (B) 2023. This legislative amendment supports a range of changes to align the state legislation with the Commonwealth controls and includes provisions to allow for the injection and storage of GHG substances. CCWA submitted its concerns as they related to:</p> <ul style="list-style-type: none"> • The injection and storage of GHG substances as a carbon pollution reduction strategy. • Trailing liability for decommissioning. • The public consultative mechanisms. • The definition of 'GHG substances'. • The expertise of GHG exploration proponents in the event of a pollution release. • The need for explicit exclusions in regard to petroleum and geothermal exploration as part of the proposed amendment. 	<p>DMPE notes that CCWA provided comments on the <i>Petroleum Legislation Amendment Bill (B) 2023</i> which proposed amendments to the <i>Petroleum and Geothermal Energy Resources Act 1967</i>, <i>Petroleum Pipelines Act 1969</i> and <i>Petroleum (Submerged Lands) Act 1982</i> to provide a legislative framework for the transport and geological storage of greenhouse gases in Western Australia. Responses to the comments received were incorporated in a response paper for all submissions and is provided below.</p> <p>www.wa.gov.au/media/64727/download?inline</p>

25	<p>CCWA stresses that impact assessments for new and emerging technologies relating to CCUS are riddled with uncertainties and unknown risks. The Regulations, being the subject of this submission, have been progressed without further clarification of the benefits, the risks, and the remedies to environmental failures or impacts. Accordingly, CCWA will reiterate several of its concerns as they relate to the viability of CCUS.</p>	<p>Comment noted.</p>
26	<p>Public consultation</p> <p>Reiterating its previous submissions, CCWA argues that public consultation for petroleum, geothermal, and GHG substance injection and storage proposals, where administered by DMPE, use mechanisms similar to those available through other environmental regulatory agencies, in addition to consultative mechanisms adopted by proponent bodies.</p> <p>CCWA notes that the Regulations provide improved opportunities for public overview and comment, provisions for public transparency of site plans, operations and monitoring (and leakages), and closures. Nevertheless, CCWA expects that transparency of process be supported by improved opportunities for public comment. Through public comment, problems can be identified, and the fundamental democratic right of citizens to be involved in decision-making reinforced. Simply making information public, but without providing improved opportunities for public comment on, or appeal, a finding or decision, undermines the value of full and meaningful public consultative process.</p> <p>Furthermore, CCWA notes that under r.46(2), there is an exclusion clause that allows the Minister to publicly withhold information on the results of detection and monitoring, and any raw data collected during detection monitoring. The public availability of information is critically important to uphold transparency of process.</p> <p>CCWA also argues that other documents relating to CCUS projects be available for public review, comment and appeal, for example, variations or amendments to a site plan, the overarching environmental management plan, and the departmental environmental assessments.</p>	<p>DMPE acknowledges CCWA’s position and reiterates that there are existing consultation processes that will apply to proposals to inject and store greenhouse gases:</p> <ul style="list-style-type: none"> • For proposals that may have significant environmental impacts, there are appropriate public consultation processes as part of the assessment of proposals under Part IV of the <i>Environmental Protection Act 1986</i> (WA). • For other proposals, the consultation requirements set out in other applicable legislation, including regulations as to environment plans, will apply. <p>The existing WA regulatory requirements for environment plans include a requirement that the operator of an activity “<i>must include a report on all consultations between the operator and relevant authorities and other relevant interested persons and organisations in the course of developing the environment plan</i>”. This requirement will also apply to GHG injection and storage activities.</p> <p>As outlined on page 51 of the <u><i>Guideline for the Development of Petroleum, Geothermal and Pipeline Environment Plans in Western Australia</i></u> (2024), this requirement is taken to mean “... any relevant person or organisation whose functions, interests or activities may be affected by the ... activity ...”.</p> <p>This Guideline will be updated to cover GHG activities when the regulations are finalised.</p> <p>DMPE’s position remains that these existing consultation processes in WA’s legislative framework are consistent with full and meaningful consultation, and are effective as to the rights of titleholders and also the</p>

		functions, interests or activities of relevant organisations and/or relevant persons.
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27	<p>Permanent storage of GHG substances</p> <p>CCWA agrees that all operations should support permanent storage of GHG substances, without risk of aquifer contamination or State liability. CCWA asserts that under the current knowledge-base there is insufficient evidence that this is possible. CCWA has previously submitted that the injection and storage of GHG substances:</p> <ul style="list-style-type: none"> • is unproven as a long-term strategy to manage increasing industrial GHG emissions within the WA context, and that legislative changes should not be the mechanism through which GHG injection and storage technologies or processes are trialled, especially for offshore applications; • supports the continuing operations and emissions of industry, producing a reduced obligation to avoid, minimise or abate emissions; and • will ease the path for big polluters by presenting this strategy as a carbon pollution reduction strategy, when it is not. 	<p>As stated in the Response Paper for submissions received on the <i>Petroleum Legislation Amendment Bill (B) 2023</i>, the WA Government has declared a commitment to mitigating climate change and working with all sectors of the Western Australian economy to achieve net zero GHG emissions by 2050. Media statements announcing the commencement of drafting of proposed greenhouse gas storage and transport (GGST) legislation advised that the proposed legislation is one of a number of options the WA Government is dealing with climate change and addressing emissions reduction.</p>
28	<p>The injection and storage of GHG substances should, therefore, be supported by stronger legislative arrangements to prevent activities where there is insufficient data to demonstrate environmentally safe outcomes.</p>	<p>DMPE believes the legislative provisions in the Acts and proposed in the two sets of Injection and Storage Regulations are sufficiently strong and rigorous to safeguard the environment. These are supported by further amendments which are proposed to the three sets of Petroleum Environment Regulations and the two sets of the RMA Regulations to broaden the scope of these regulations to cover GHG injection and storage.</p> <p>This complete package of GHG legislation will ensure that GHG projects will not be approved until the Minister is satisfied that the environmental risk is as low as reasonably possible.</p>
29	<p>Regulatory controls and penalties for breaches</p> <p>CCWA questions whether the regulatory controls and penalties for breaches are sufficient. For example, will the proposed financial penalty of \$10,000 deter proponents to operate without an approved site plan? Regardless of whether environmental harm is caused (and other penalties under the <i>Environmental Protection Act 1986</i> or Commonwealth legislation invoked), bypassing operational approvals processes creates a range of significant risks to the environment, for example, a failure to have established the proponent body's capacity to</p>	<p>The penalty of \$10,000 in the GHG Regulations is the maximum currently allowable under the PGERA67 and the PSLA. However, this penalty rate is for an individual and that under the <i>Sentencing Act 1995</i>, companies are penalised at a rate of five times the individual penalty amount.</p> <p>It should also be noted that while a breach of a site plan provision in regulation 10 of the GHG Regulations only has a penalty of \$10,000, the ultimate overriding penalty for not having an approved site plan or for operating not in accordance with an approved site plan is that the Minister has the authority to shut down injection operations. This action</p>

	operate to a required environmental standard or the ability to fund remedial or decommissioning activities.	will have added financial operation implications as well as tarnishing a company's name with investors and/or shareholders.
30	Furthermore, Part 4 of the Regulations addresses 'serious situations'. This Part only applies if under Regulation 42 (b) "the GHG licensee becomes aware of the situation." Accordingly, there is the possibility, where the licensee is not aware (or claims not to be aware) of a serious situation, the Minister will not be notified and the specified mitigations not applied, until the serious situation is obvious, for example, due to evident environmental harm.	<p>Site plans implement a risk-based monitoring and verification plan. Regulation 11(3) outlines the requirements for risk management that are informed by the requirements of regulations 12 and 13 and the information in subclauses 4, 5, 6 and 7 of Schedule 2. In complying with these regulations, the proponent will have demonstrated that appropriate measures are in place for detecting serious situations.</p> <p>It is also intended that the proposed greenhouse gas amendments to the <i>Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2015</i> include requirements for the submission of monitoring and verification reports and data to the Minister. These would alert the Minister to the presence of a serious situation that had not been reported.</p>
31	Regulation 44(d), provides a range of criteria to be assessed in the event of a serious situation and, under r.44(d)(i) allows mechanisms that would, effectively, delay or avoid acting or initiating a cleanup. Regulatory controls should direct rapid and effective cleanup of an event resulting from a serious situation.	<p>There is no likelihood of a delay or an avoidance of a cleanup of a GHG leak as under regulation 43(2), the licensee is required to notify the Minister of this as part of a serious situation.</p> <p>Sub reg (b) requires details of action taken to mitigate any environmental impacts and sub-reg (c) requires details of corrective action that has been taken</p>
32	<p>Addressing uncertainties of knowledge</p> <p>CCWA has previously highlighted the underlying uncertainties of CCUS. The events listed in r.33 prompt a variation in the site plan/licence. However, if the listed events were to occur, they could produce significant environmental harm. As CCWA has pointed out in previous submissions, under conditions of knowledge uncertainties, inadequate regulatory controls and delayed actions, remedial measures would likely be retrospective of serious environmental harm. Regulation 33 highlights the uncertainties of the process and the uncertainties that relate to correcting the problem, but without consideration of the serious environmental harm that could occur if plans are inaccurate and the predicted activities do not go according to plan.</p>	<p>DMPE notes CCWA's previous comments that there are uncertainties with CCUS.</p> <p>However, regulation 33 is in place to act upon the current knowledge of certain events that may occur and update the site plan to ensure that the site plan is appropriate for the nature and scale of the GHG injections operations that it covers.</p> <p>Regulation 33 applies if an approved site plan is in force in relation to an identified GHG storage formation and a circumstance, mentioned in the table in subregulation (1), occurs. In broad terms those circumstances are where:</p> <ul style="list-style-type: none"> the plan is no longer accurate and up to date because of new information that significantly alters the determination of key matters; the licensee proposes to change the way operations are carried out in a manner that will affect predictions in Part A of a site plan

		<p>for the behaviour of a GHG substance stored in, or to be injected and stored in, the formation or the risks associated with those operations; or</p> <ul style="list-style-type: none"> the licensee proposes to make a significant change to the way operations are managed that will affect the integrated operations management plan (required to be set out in Part B of a site plan under section 20). <p>If an event of the type outlined above occurs, the GHG licensee must, within 60 days beginning on the day the circumstance occurs or a longer period agreed by the Minister, prepare and give to the Minister a draft variation of the plan for the purpose of addressing the circumstance. The ability for the Minister to agree a longer period reflects that, given the technical complexity and range of matters that a site plan covers, it may take some months for a licensee to prepare a draft variation.</p>
33	<p>Miscellaneous</p> <p>Regulation 3 (a)(i) should be reworded to apply contemporary language traditions to convey professionalism in relation to operations.</p>	<p>'Workmanlike' is a term that is used in the overarching Acts and other associated regulations.</p>
34	<p>Summary areas in need of review</p> <p>The following aspects of the Regulations require review:</p> <ol style="list-style-type: none"> Public documentary and procedural transparency, and public consultation should be upheld across the multiple activities of the CCUS process. The withholding of information under Ministerial ruling, should be re-evaluated to improve documentary transparency. The safety of CCUS is unproven as a long-term strategy for the management of industrial GHG emissions. The trial of CCUS, especially at offshore locations, through largescale, data deficient projects, should not be supported. Uncertainties of knowledge should be addressed. CCUS must be preceded by a detailed understanding of the risks and impacts to the environment. Penalties for breaches of CCUS process must reflect the harm that could be done to the environment and the cost of remediation. 	<p>Refer to individual responses above provided for each of these comments.</p>

	<p>6. Regulations to address serious situations must be strengthened to reflect the risks and impacts to the environment.</p> <p>7. The Regulations should adopt contemporary language.</p>	
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Fortescue

35	<p>Fortescue welcomes the opportunity to provide comment on the draft <i>Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025</i>.</p> <p>Established in 2003, Fortescue is a proud Western Australian company that has evolved from being a Pilbara-based iron ore producer into a global business. Today, we are the fourth largest iron ore producer in the world.</p> <p>Fortescue is also an industry leader in decarbonisation. In 2022, we committed to Real Zero: the elimination of all Scope 1 and 2 emissions (a total of 2.4 million tonnes per annum of CO₂-equivalent) from our terrestrial iron ore operations by 2030, without offsets or Carbon Capture and Storage (CCS).</p> <p>Accordingly, Fortescue's comments on the draft regulations are made in the spirit of strong ambition towards genuine decarbonisation across the economy.</p> <p>CCS has a contested role in emissions reduction, with the Intergovernmental Panel on Climate Change (IPCC) noting that it currently faces technological, economic, institutional, ecological-environmental and socio-cultural barriers¹.</p> <p>As exemplified by Gorgon, the success of CCS projects is highly unpredictable; technical challenges quickly become economic challenges. As every subsurface environment is unique, learnings cannot be quickly scaled and replicated. The scale of investment in these projects and their significant planned operation lifetimes means that if the CCS does not work effectively, it is extremely difficult if not impossible to not proceed with operation once commenced.</p> <p>Moreover, while the technical potential for geologic carbon storage has traditionally been assumed to be significant (on the order of up to 40,000 GtCO₂), more recent analyses place the limit at just 1,500 Gt of CO₂.²</p> <p>To this end, Fortescue notes its concern at potential overreliance on CCS projects in emissions reduction forecasts for Western Australia.</p> <p>Thank you for the opportunity to comment on these draft regulations.</p>	DMPE thanks Fortescue for providing a submission.
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	<p>¹ IPCC, <i>Synthesis Report of the IPCC Sixth Assessment Report (AR6)</i> (2023), www.ipcc.ch/report/sixth-assessment-report-cycle/.</p> <p>² Gidden at al. (2025) A prudent planetary limit for geologic carbon storage Nature</p>	
36	<p>Given the State’s decision to accept long-term liability for storage of greenhouse gases, Fortescue believes that transparency in the performance of CCS projects, should they reach operational status, is vital for maintaining public trust.</p> <p>Fortescue makes comment on item 46 in <i>Part 5 - Information that may be made publicly available</i> of the draft regulations.</p> <p>46. Information relating to leakages during injection or from well bores</p> <p>1. This regulation applies to information that —</p> <ul style="list-style-type: none"> (a) is held by the State; and (b) relates to detecting and monitoring, under the programs mentioned in Schedule 2 clauses 6 and 7 set out in Part B of the site plan in relation to an identified GHG storage formation, leakages of greenhouse gas substances — <ul style="list-style-type: none"> (i) during injection; or (ii) from well bores. <p>2. The Minister may make publicly available —</p> <ul style="list-style-type: none"> (a) the results of the detection and monitoring; and (b) any raw data collected during the detection and monitoring. <p>Fortescue would support automatic periodic publication of all information relating to leakages of greenhouse gases either during injection of CO₂ underground, or any other leakages that occur once a project is complete. Pressurisation can lead to unpredictable subsurface outcomes, including migration of the CO₂ away from the site of injection and abrupt or gradual leakage of the CO₂ out of the storage site.</p> <p>New technologies and monitoring systems are critical to ensure that any CO₂ leakage that occurs is detected rapidly. Given the risk that leaking CO₂ poses, to human and environmental health, it is critical that this information be readily available. As the Government will be aware, accidents involving CO₂ pose a substantial risk to human life and</p>	<p>The comments and requirement for transparency are noted and supported.</p> <p>Regulation 46 provides powers for the Minister, subject to discretion and at any time, to publicly release information relating to leakage during injection or from well bores.</p> <p>Additional reporting is required under proposed amendments to the Resource Management and Administration Regulations (in draft) and in monthly and annual GHG accounting reports, and the Minister is required to publicly release these reports within 15 and 30 days respectively. Both of these reports require reporting of the amounts GHG substances lost and emissions at a project level.</p> <p>The annual GHG accounting report also includes a summary of the measurements made under the monitoring and verification plan and a summary of the interpretation of those measurements. Monitoring reports and raw data are submitted in the annual GHG injection report and it is proposed the Minister must make these publicly available after three years.</p>

	<p>welfare, as illustrated by the explosion of a CO2 pipe in Mississippi in 2022.³</p> <p>If the public release of this information relies on ministerial discretion, in practice it is likely that ministers or the public service will tend to opt for the lower risk option of not publishing. A lack of full transparency on a State liability may result in public trust in WA CCS projects being undermined, which would in turn undermine public trust in WA's decarbonisation strategy.</p> <p>³ www.youtube.com/watch?v=yGIXeWktiWU</p>	
37	<p>We also seek transparency on the financial costs that long-term storage liability will place on the Western Australian Government. Specifically, the envisaged cost burden for the lifetime of the storage project, including monitoring technologies, and for clean-up of any leakages.</p>	<p>The purpose of the greenhouse gas legislative amendments to the three Petroleum Acts is for the permanent storage of greenhouse gases.</p> <p>As part of these amendments, a GHG licensee is fully responsible for the stored GHG substance during the injection operations and the costs associated with any monitoring and remediation action required due leakage of GHG or failure of injection operations.</p> <p>The WA Government will assume the long-term liability for the stored GHG only when the Minister is satisfied that:</p> <ul style="list-style-type: none"> • the GHG injected is behaving as predicted; and • there is no significant risk that the GHG will have a significant adverse impact on geological integrity of the formation, the environment, human health or safety. <p>The timeframe for the WA Government assuming long-term liability is a minimum of 15 years after issue of a site closing certificate.</p> <p>In regard to potential liabilities, the expectation from the WA community would be that the WA Government would assume complete and total liability only when there are no doubts or uncertainties about the stored GHG. If there were unresolved liability issues, the injection licensee would remain responsible for them and the continued management of the injection licence as the title cannot be surrendered until the WA Government has assumed liability.</p>

		<p>DMPE accepts there is a need for appropriate mechanisms to deal with long-term liability associated with petroleum, geothermal and GHG titles both when currently under title and following relinquishment.</p> <p>DMPE has proposed a complete decommissioning package for petroleum, geothermal and GHG titles to strengthen the regulatory framework for decommissioning of property, equipment and infrastructure to reduce the potential for liabilities to be left to the State and community where property and associated disturbance areas are not decommissioned in an appropriate or timely manner.</p> <p>As the proposed decommissioning package is to deal with unplanned or events that cannot be forecast, it is not possible to provide any potential liability costs to the WA Government.</p>
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MEPAU

38	<p>MEPAU wishes to thank DMPE for the opportunity to comment on the Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025. MEPAU has actively participated in the industry consultation on the drafting process for these important regulations and are supportive of the outcomes that have been achieved.</p> <p>Please find below our comments/suggestions</p>			<p>DMPE thanks MEPAU for providing a submission.</p>
39	<p>Section</p> <p>Part 1. 4. Terms Used (2)</p>	<p>Regulation Text</p> <p><i>spatial extent of an eligible GHG storage formation</i></p>	<p>MEPAU Comment</p> <p>Is spatial extent required for Eligible or Identified SF? Does this require detailed plume modelling for an Eligible SF? Section 69E says the DOSF is for an Identified GSF. It would be good to have clear expectations for an Eligible vs Identified GSF.</p>	<p>Regulation 4(2) has been adopted from the equivalent regulation 5(2) in the Commonwealth regulations. The term 'spatial extent' relates to both eligible GHG storage formations and an application for an identified GHG storage formation. The term 'spatial extent' is defined in Section 6C(3) of the Act in relation to an eligible GHG storage formation. In practical terms, this 'spatial extent' is a dynamic modelling concept that includes the migration pathway or pathways determined pursuant to Division 3 of Schedule 1.</p> <p>Relevant title holders may apply to the Minister for a declaration of identified GHG storage formation under Sections 69B of the Act if, among other things, a part of a geological formation is an eligible GHG storage formation. Pursuant to Section 69B(3)(b)(ii), an application for a declaration of an identified GHG storage formation must include an estimate of the spatial extent and, per 69B(4), this must be compliant with regulations. The regulations (clause 1(2) and Division 3 of Schedule 1) as drafted refer to both the estimates of spatial extent per the Act definition of an eligible GHG storage formation (Section 6C) and the requirements for an application for an identified GHG storage formation (Section 69B).</p> <p>Further clarification will be contained within the Guideline for Declaration of an Identified GHG Storage Formation currently in draft.</p>

40	Division 2 – Requirement for draft site plans Part A requirements 12. (2) (a) (ii)	<i>the comparison of the actual and predicted behaviours</i>	Please consider a simple mechanism to allow for updating the predicted plume (probably based on new data such as MMV), if it differs from original site plan plume but does not create a serious situation, without having to redo the DoSF.	Future guidelines will clarify the probability range of the predicted behaviours referred to in regulation 12(1)(b) that would be provided for the time steps referred to in 12(2)(a)(ii). Regulation 12(2)(c) requires these predictions to be consistent with the spatial extent of the DOSF. The range would be taken into consideration of whether a serious situation of the type outlined in section 69HB(c) had occurred or whether a review or variation of the site plan would occur pursuant to Part 3, Division 6. A variation of the DOSF may be initiated if the long-term prediction of the plume behaviour is inconsistent with the DOSF spatial extent or fundamental suitability determinants.
41	21. (4)	<i>Within 10 days after receiving a notice under subregulation (3) in relation to a summary of the approved site plan, the applicant must modify and resubmit the summary</i>	This is a very short period to write a new summary and get JVP approvals. How much lead time would there be before the Ministerial Notice? Would 30 days be possible?	A 10-day timeframe has been used for public transparency that would enable the public to be informed of the approval that has been granted. This timeframe was adopted from the equivalent environment regulations in relation to an environment plan summary. A longer timeframe could result in inaccurate speculation as to what had been approved. In practice, the summary and the site plan should be developed in parallel to allow for this timeframe to be achieved.
42	41. (4)	<i>Within 10 days after receiving a notice under subregulation (3), the licensee must modify and resubmit the summary of the approved site plan.</i>	Suggest this be 30 days to allow for JV approvals, etc.	As per the answer to 41 above, this is an enforceable measure for public transparency. Progressing these in parallel might be considered for effective joint venture management.

43	<p>46. (2)</p>	<p><i>The Minister may make publicly available —</i></p> <p><i>(a) the results of the detection and monitoring; and</i></p> <p><i>(b) any raw data collected during the detection and monitoring.</i></p>	<p>Suggest this be by agreement with the operator.</p>	<p>Regulation 46(2) has been adopted from the equivalent regulation 54(2) in the Commonwealth regulations.</p> <p>The purpose of this regulation is to provide powers for the Minister, subject to discretion and at any time, to make some or all this information publicly available for transparency, and to assure the public of ongoing monitoring to ensure continued safe and sustainable operations.</p> <p>In deciding whether to release the information the Minister may consider, on a case-by-case basis such things as the public interest, the timing of release in relation to other information and reports made publicly available pursuant to the RMA regulations, the interpretability of raw data, and the size/volume of the raw data among other factors.</p>
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Martuwarra Fitzroy River Council

44	1. Does the legislation require that the processes used by companies who are involved in carbon capture, to capture carbon dioxide (CO ₂), are made transparent?	No, the GHG amendments made to the legislation are for greenhouse gas storage and transport. The WA Government does not regulate the capture of CO ₂ or greenhouse gases.
45	2. Does the legislation adequately account for the production of carbon dioxide, arising from the processes used to effect carbon capture and storage?	<p>No, the proposed Greenhouse Gas Injection and Stage Regulations only relate to permanent underground storage of greenhouse gas substances, which include carbon dioxide. However, as identified in the WA <i>Government CCUS Action Plan</i>, carbon capture, utilisation and storage (CCUS) will have a crucial role in the challenge for Western Australia to decarbonise the hard-to-abate mining, resources and processing sectors.</p> <p>Carbon dioxide arising from the processes used to effect carbon capture and storage projects is reported to the Clean Energy Regulator, including scope 1 and 2 emissions. Most projects would probably be under the Safeguard Mechanism, but future projects (e.g. direct air capture) may be under the Australian Carbon Credit Unit (ACCU) Scheme.</p>
46	3. Does the legislation adequately account for and protect against the environmental harm that may result from the processes used in carbon capture and storage?	<p>Yes, the fundamental principle with permanent storage of GHG is that DMPE, under delegated authority of the Minister, will not approve any proposals if there is an unacceptable risk to the environment.</p> <p>The GHG Regulations are supported by further amendments which are proposed to broaden the existing suite of petroleum regulations to include cover GHG injection and storage. These regulations include the three sets of Petroleum Environment Regulations to broaden the scope of these regulations to ensure that any greenhouse gas storage and transport activity petroleum activity or geothermal activity carried out in the State is:</p> <ul style="list-style-type: none"> (a) carried out in a manner consistent with the principles of ecologically sustainable development; and (b) carried out in accordance with an environment plan that: <ul style="list-style-type: none"> (i) demonstrates that the environmental impacts and environmental risks of the activity will be reduced to as low as is reasonably practicable; (ii) has appropriate environmental performance objectives and environmental performance standards; and

		(iii) has appropriate measurement criteria for determining whether those objectives and standards have been met.
47	4. Does the legislation recognise that, because financial incentives to engage in carbon capture and storage are negative, there is a high risk that required protections against environmental harm will not be, or will not be adequately, implemented?	No, as detailed in the response above, the fundamental principle with permanent storage of GHG is that DMPE, under delegated authority of the Minister, will not approve any proposals if there is an unacceptable risk to the environment.
48	5. Does the legislation put into place stringent guidelines to ensure that CO2 is safely transported and injected into the storage facility?	<p>Yes, greenhouse gas geological storage and transport is regulated under the following three Acts which provide a legislative framework for the transport and geological storage of greenhouse gases in Western Australia.</p> <ul style="list-style-type: none"> • <i>Petroleum and Geothermal Energy Resources Act 1967</i> (PGERA), • <i>Petroleum Pipelines Act 1969</i> (PPA), and • <i>Petroleum (Submerged Lands) Act 1982</i> (PSLA) <p>The PGERA and PSLA amendments include the requirement for a site plan which must be approved before any GHG injection operations into an identified GHG storage formation can occur.</p> <p>The site plan must be appropriate for the nature and scale of the proposed GHG injection operations and must demonstrate, on the basis of available data and current technical knowledge, that the identified GHG storage formation will be safe and secure for the permanent storage of:</p> <ol style="list-style-type: none"> a) any greenhouse gas substances that are already stored in the formation; and b) the greenhouse gas substances that are proposed to be injected into and stored in the formation. <p>The PPA amendments provide for the approval of greenhouse gas pipeline licences and the definition of pipeline has been broadened to include the conveyance of greenhouse gas substances.</p> <p>A second suite of regulation amendments is currently being drafted to broaden the existing Petroleum Environment and Resource Management and Administration (RMA) Regulations to include greenhouse storage and transport</p>

The Environment Regulation amendments are to ensure that any geological greenhouse gas storage and transport activity petroleum activity or geothermal activity carried out in the State is —

(a) carried out in a manner consistent with the principles of ecologically sustainable development; and

(b) carried out in accordance with an environment plan that:

(i) demonstrates that the environmental impacts and environmental risks of the activity will be reduced to as low as is reasonably practicable; and

(ii) has appropriate environmental performance objectives and environmental performance standards; and

(iii) has appropriate measurement criteria for determining whether those objectives and standards have been met.

The GHG amendments to the RMA regulation are

(a) to ensure that operations relating to the exploration for greenhouse gas storage formations or injection operations relating to greenhouse gas substances, in the State are:

- carried out in a proper and workmanlike manner; and
- carried out in a way that reduces the risk of aquifer contamination outside the storage formation;

(b) to ensure that the Minister is informed, in a timely and consistent manner, of:

- the exploration for greenhouse gas storage formations; and
- the discovery of potential greenhouse gas storage formations; and
- the appraisal of discoveries; and
- injection operations relating to greenhouse gas substances and the results of these operations;

(c) to provide a framework for encouraging the adequate collection, retention and timely dissemination of greenhouse gas data.

		Lastly, WorkSafe at the Department of Local Government, Industry Regulation and Safety, has commenced work on amending its applicable work health and safety legislation to include coverage for greenhouse gas storage and transport operations.
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49	<p>6. Does the legislation put into place stringent guidelines to ensure that CO₂ is safely stored in the storage facility within a very long time frame?</p>	<p>The legislative amendments made to the PGERA and PSLA provide for the permanent geological storage of greenhouse gases.</p> <p>The Act amendments are supported by the Injection and Storage Regulations, which prescribe that an approved site plan is required before GHG injection operations can commence, and that these operations must be undertaken in accordance with the approved site plan.</p>
50	<p>There are serious risks associated with carbon capture and storage, both to human health and to the environment. Unless the legislation adequately addresses the risks so that its provisions are fit for purpose, it must be reconsidered. It is our opinion that the entire legislative program developed to regulate carbon capture and storage is inadequate and is not fit for purpose. In that event we call upon the government to reconsider the legislative program and to return it to the Department for further consideration and to undertake more comprehensive research that addresses the whole of the supply chain.</p> <p>Submissions</p> <p>On its website, the British Geological Survey introduces the approach to carbon emissions as follows:</p> <p style="padding-left: 40px;">Carbon capture and storage (CCS) is one way Britain and the world can <i>maintain industrial production and economic growth while reducing emissions</i> (emphasis added).¹</p> <p>The sentiment expressed in this statement is what underpins much of the attitude to global warming. There are actually at least three concepts expressed in this statement which it may or may not be appropriate to lump together. The first is that, in order to maintain economic growth we must maintain industrial production. The second is that we have to maintain economic growth in order to survive as a society. The third is that carbon capture and storage is an appropriate way to reduce greenhouse gas emissions. By progressing to passing of legislation to permit carbon capture and storage it can be assumed that the respective governments, that is the Federal and Western Australian governments, have concluded that</p> <p>(i) we must maintain industrial production;</p> <p>(ii) we must maintain economic growth in order to survive as a society; and</p>	<p>Comments made by Martuwarra Fitzroy River Council on pages 34 to 54 inclusive are noted.</p>

(iii) carbon capture and storage is an appropriate way to reduce green house emissions.

That these assumptions are correct is not in any way conceded in these submissions but, except in so far as they relate to the proposed regulations, they will not be addressed further. This is because each concept is a very big topics in its own right, encompassing environmental, economic and legal questions which, while they form the assumptions that underpin the legislation, are beyond the scope of the submissions. They are being addressed here to ensure that the assumptions underpinning the carbon, capture and storage legislation, are made visible and to indicate that they are contested.

Leaving these assumptions aside for present purposes, carbon capture and storage has its own assumptions. The first assumption is that the removal of carbon for storage quantifiably exceeds the discharge of carbon, and other pollutants, arising from its removal, transport and storage. The second is that the costs associated with its removal, transport and storage are justified in comparison to other methods of reducing greenhouse gas emissions The third is that the short and long term risks of carbon capture and storage are known, fully understood and adequately accounted for. However, harking back to the statement by the British Geological Survey, set out above, there is a very real risk that it will be assumed that we can increase carbon emissions indefinitely. If we recognise that even if it is an effective solution, and this is highly doubtful, carbon capture and storage is a short term solution. We are just kicking the problem down the road and may be exacerbating it at the same time.

There are three incidents to carbon capture and storage. They are: capture; transport; and storage.

Carbon capture

Carbon capture is not a single process, there are several available mechanisms used to reduce discharge of carbon into the atmosphere or to remove it from the atmosphere, including: 'post-combustion capture, pre-combustion capture, oxyfuel combustion, and electrochemical separation'.² It is not appropriate to discuss the different methods here. The intention was to look at existing practices in Australia. However, despite diligent research, there does not appear to be any detailed discussion of the methods used in Australia to capture greenhouse gases. The Gorgon and Moomba projects are the two most advanced Australian projects. The relevant websites, each refer to carbon capture in similar terms. Chevron Global runs the Gorgon project. The Chevron Global website provides:

CCS takes naturally occurring carbon dioxide (CO₂) from industrial processes and permanently traps it in geological formations deep underground.³

The Moomba project is run by Santos and the Santos website provides:

CO₂ is captured at the Moomba Gas Plant and fed into the main CO₂ processing facility where water is removed ...⁴

Neither of these statements indicate, in any way, what is involved in 'taking' or 'capturing' CO₂.

Given the dearth of information on the process or processes used in Australia, two methods are discussed below. The first method is amine absorption, which research suggests is the most commonly used method. The second is 'HYCAPS technology' developed by the Australian based Otway International Test Centre, which is owned and operated by CO₂CRC. Otway International Test Centre is:

(an) ... independent, not-for-profit research organisation undertaking targeted and applied Carbon Management Technologies' research, development and demonstration in CCS, CCUS, and CDR.⁵

1. Amine absorption

As indicated above, research suggests that the most commonly used method for carbon capture is amine absorption. Amines are described as:

organic compounds derived from ammonia. Released through the decomposition of amino acids, amines are common by-products of natural biological processes. However, they can be produced artificially through various chemical processes.⁶

The chemical formula for ammonia is NH₃, that is, each molecule has one nitrogen atom and three hydrogen atoms. Nitrogen is the seventh element on the periodic table therefore it has seven electrons. Two of the electrons reside on the inner shell and five on the outer shell. With five electrons on the outer shell, nitrogen can pick up another three electrons to create a complete set of eight. To become ammonia, nitrogen must obtain hydrogen electrons. Ammonia is a naturally occurring molecule but is used extensively in industry and agriculture so is also produced commercially, using:

the catalytic reaction of nitrogen and hydrogen *at high temperature and pressure* (emphasis added).⁷

In 2020 the American Chemical Society provided the following information on ammonia production:

the worldwide ammonia production capacity was 224 million tonnes (Mt). Actual production was 187 Mt. It ranks ninth among chemicals produced globally. ... Most ammonia production - (about) 85% - is used directly or indirectly in agriculture.⁸

It seems very likely that production of ammonia will need to increase if its use is to be included in carbon capture and storage to any great extent. There is a problem with increasing production, as identified by the Massachusetts Institute of Technology (MIT):

ammonia has to be made at a high pressure under high temperatures - meaning it takes a lot of energy to manufacture. Most of that energy comes from burning fossil fuels like coal and methane gas, which give off the greenhouse gas carbon dioxide, the main cause of climate change ...⁹

This problem may be solved by having respective industries compete for the available ammonia rather than increasing production. If this is the outcome, it could create problems for food production. Since such a high percentage of produced ammonia is used in agriculture and, as a general rule, farmers are less able to compete for available resources than the mining industry, agricultural production may suffer. Analysing this potential conflict is beyond the scope of these submissions but it is something to be aware of.¹⁰

The next step in the process is the production of amines. The Bellona Report, a report prepared for the 'EU Technology Platform on Zero Emission Fossil Fuel Power Plants', indicates that:

MEA (monoethanolamine) is today the most commonly used amine in CO₂ capture processes. MEA has a relatively high biodegradability, and ... will in itself have no adverse effect to ... human health, animals, vegetation and water organisms. The airborne emissions of nitrogen and ammonia generated from amine decomposition can however, if emitted in high concentrations, cause eutrophication and acidification.¹¹

Production of monoethanolamine (MEA) is a process which it is not necessary to elaborate here but it involves a reaction between ammonia and ethylene oxide in which:

no catalyst is involved ... (It) is an exothermic reaction (requiring an operating pressure (of) 50–70 bars to keep the NH₃ in a liquid phase.¹²

The environmental impacts of MEA production are considered to involve: 'energy consumption and direct and indirect CO₂ emissions.'¹³ It is not clear whether Luis, the author of the referenced paper, is including the environmental impacts associated with ammonia production in this assessment but they conclude:

These emissions have to be considered in the global account of captured CO₂ in order to develop a realistic approach in which the increase of global MEA production does not cause a negative balance in the general strategy of CO₂ capture.¹⁴

Luis also notes that there are other environmental impacts which must be considered:

In addition, within the MEA process, published results have pointed out that the reduction of CO₂ emissions into the atmosphere is achieved at the expense of increasing other emissions and corresponding environmental impacts (mainly those related to human toxicity and eutrophication) ... e.g. emission of MEA and other amines to the environment is not negligible. Post combustion capture leads to amines losses from the absorber column, involving a potential source of amines and amine degradation products, such as nitrosamines and nitramines.¹⁵

Ethylene oxide, the second constituent of MEA, is a colourless gas with the chemical formula C₂H₄O. Luis notes that:

Ethylene oxide ... is a very versatile chemical ... because of its high reactivity ... However, this reactivity together with its toxicity makes it a hazardous compound.¹⁶

Ethylene oxide is a known human irritant and carcinogen. DCCEEW describes its potential environmental effects as follows:

The immediate effects of exposure to high concentrations of ethylene oxide can mean death of animals, birds or fish and death or low growth rate in plants. Long-term effects on animal life may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behaviour. Ethylene oxide has moderate long term toxicity to aquatic life.¹⁷

This means that the processes that are used to prepare the MEA so that it strips carbon dioxide from industrial waste gases, can be a contributor to green house gas emissions. They can also be environmentally harmful. If the proposed regulations do not account for and regulate the discharge of carbon dioxide, and the potential environmental harm, the problems associated with the production of MEA may do more harm than good.

The next step in the carbon capture and storage process is the treatment of the carbon rich industrial discharge. The use of MEA (and other amines) is a chemical process whereby the MEA (or other amines) establish 'a strong interaction with CO₂ ... (leading) to the formation of carbamate compounds. At the end of the capture process the CO₂ must be stripped from the amines and compressed for transport. This process is described by Haffner, senior engineer at Power Engineers, as follows:

The rich solvent loaded with CO₂ is transferred to the regeneration column where heat is used to break the bonds between the CO₂ and the solvent. Solvent regeneration accounts for around 70-80% of the energy requirements for carbon capture with most amine-based solvent requiring between 2.8 - 3.4 GJ per metric tonne ... of CO₂ recovered.¹⁸

Haffner identifies the biggest challenges to carbon capture as: high overheads; lack of pipeline access; dependence on end users; energy and water consumption; permitting; and information dissemination.¹⁹ Of these problems, the problems that relate directly to carbon capture are: high overheads; and energy and water consumption.

Haffner points out that establishing a carbon capture facility is not cheap, and further, that the challenge is to ensure that the operations:

remain economically sustainable after adopting CCUS/CCS technologies. There is no revenue produced with storing CO₂ outside of government subsidies and there are limited options to monetize CO₂ utilization outside of 'enhanced oil recovery'.

Balancing the cost of implementing carbon capture with maintaining operational profitability is a delicate task that requires careful planning and strategic decision-making.²⁰

This challenge would, by itself, encourage cutting of corners, thereby increasing the risk of detrimental outcomes. If the costs of implementing safety procedures negatively impact financial returns to the enterprise, they will be inadequate or dispensed with altogether. One way in which companies avoid loss of revenue is

to use 'enhanced oil recovery' (EOR) or 'enhanced gas recovery' (EGR), which are not intended to, but have the effect of offsetting losses associated with the implementation of carbon capture and storage. Companies also claim carbon credits because they use EOR and EGR. The claim is made on the basis that they are removing CO₂ from the atmosphere. This is a highly problematic claim. 'Enhanced oil recovery' (EOR) and 'enhanced gas recovery' (EGR) are respectively, processes that involve:

the injection of CO₂ into the reservoir rock of an existing oil field to recover more oil and natural gas than would otherwise have been produced.²¹

The way EOR (and EGR) work is as described below:

The injected CO₂ trades places with oil that is released from minute pore spaces within the reservoir rock. This exchange results in the CO₂ becoming trapped by capillary pressure within this same pore space, dissolving in the residual fluids present in the pore space, or eventually becoming mineralized. The trapping of CO₂ during the EOR process is incidental to the primary purpose of producing oil.²²

This process is regarded as detrimental because the recovered CO₂ is effectively returned to the environment in the form of increased fossil fuel production.²³ In relation to energy and water consumption, Haffner says:

Post-combustion carbon capture requires an enormous amount of water and energy input.²⁴

In Australia, the majority of mining enterprises are located in arid and semi arid environments, for example, the Moomba project is located in the north east of South Australia, which is in zone 4. It has hot dry summers and cold winters and is classified as within a 'low rainfall' area.²⁵ The drawdown on water resources in these arid and semi-arid environments is a further stress on the environment. The HyCAPS method purports to reduce, to some extent, the additional power requirements attendant on amine absorption.

2. The HyCAPS method

On their website the Otway International Test Centre discusses a process which they describe in the following terms:

HyCaps is a hybrid technology that combines mature solvent technology with membrane technology. A typical flowsheet of the HyCaps process is similar to that of conventional solvent CO₂ capture systems, but the HyCaps module replaces the conventional packed columns for absorption

and solvent regeneration. The process involves the transfer of CO₂ from the gas mix through a hollow-fiber membrane, where it is chemically absorbed into a solvent. In solvent regeneration with HyCaps, the physical separation of the solvent and gas phases by the membrane enables CO₂ to be drawn from the enriched solvent phase into the gas phase. This enables solvent regeneration to be achieved at temperatures lower than conventional packed columns, and the solvent regeneration can be achieved without boiling of the solvent. Hence, in HyCaps CO₂ capture, there is no reboiler in the regeneration section of the process. By avoiding solvent boiling, the HyCaps process significantly reduces the energy demand for solvent regeneration.²⁶

This method appears to use amine absorption but differs at the end of the process when the captured CO₂ is separated out. It appears that the process is not yet in commercial production but that CO₂CRC are seeking investment partners.²⁷

It is noted here because it is an Australian initiative.

While these methods may or may not be used in Australia, they are likely to be representative of whatever method is used. However, it needs to be said that a full description of the method that is used to capture CO₂ should be required and readily publicly available, so that an assessment of the risks associated with a particular project can be made. Once carbon capture has been effected the captured carbon must be compressed and transported to the injection site. Compression is effected in a 'compression and dehydration unit' at the end, but as part of, the capture process. The end product is: a relatively clean and dry CO₂ stream which is delivered to the transportation system.²⁸

Carbon transport

An issue identified by Haffner is the availability of pipelines to transport CO₂ to injection sites. CO₂ is transported in large quantities, under pressure, in pipelines that carry the CO₂ from the capture site to the injection site. Wilday et al. identify the hazards associated with this method of transport, as follows:

- CO₂ is a known asphyxiant, and has an established toxicology;
- CO₂ has very low surface tension and near zero viscosity (leading to sealing difficulties);
- CO₂ forms an acid solution in its aqueous phase (leading to corrosion issues);

- Release of CO2 may lead to low temperatures in plant (resulting in embrittlement);
- There can be degradation of sealing compounds and seals;
- There is no significant initial human sensory response to pure CO2 release (that is it is not detectable to human senses);
- There is a large thermal cooling envelope from a supercritical release;
- Explosive decompression: elastomer seals having absorbed gas at high pressures following sudden pressure drops;
- Powerful solvent: possible toxic contamination effects on release.²⁹

This is a long list of the negative impacts that may result from a release of CO2 from the pipeline or at the injection site of projects associated with carbon capture and storage. A 2017 report noted the problems Chevron had carrying out the Gorgon project. The Report to the Department of Water and Environmental Regulation said:

start-up checks this year found leaking valves, valves that could corrode and excess water in the pipeline from the LNG plant to the injection wells that could cause the pipeline to corrode.³⁰

It was further noted that:

Technical problems with Chevron's landmark effort to store carbon dioxide from the Gorgon LNG project may see more than five million tonnes of greenhouse gas released into the atmosphere over two years.

Reporting on risks with pipeline transport in the USA, where there are substantially more pipelines than in Australia, the Massachusetts Institute of Technology reported that:

failure rates for CO2 pipelines are similar to those for pipelines carrying oil and gas - which is to say, failures are relatively rare, but are worth taking serious precautions to prevent. From 1986 to 2021, the U.S. recorded around three accidents related to onshore CO2 pipelines per year. (Although it's important to remember that our small network of CO2 pipelines means we have limited safety data.) And while big ruptures could release large amounts of CO2, which would be both dangerous to people and a problem for the climate, the data shows smaller leaks have been

much more common. From 1994 to 2021, leaks accounted for 48 percent of CO2 pipeline incidents while ruptures accounted for 3 percent.

At the injection site there are surface facilities through which the CO2 must be pumped to introduce it into the reservoir each of which is a potential source of fugitive emissions or the failure of which could result in fugitive emissions.

These include:

any distribution manifold at the end of the transport pipeline, distribution pipelines to wells, additional compression facilities, measurement and control systems, wellhead(s) and the injection wells.³¹

Consideration of the risks associated with transport of CO2 in pipelines, and transfer into the reservoir, must be given a high priority because of the associated risk of substantial damage, including possible deaths from CO2 asphyxiation, if there is an accidental release.

Carbon storage

The *Petroleum and Geothermal Energy Resources Act 1967* (PGER Act) as amended by the *Petroleum Legislation Amendment Act 2024* (PGER Act as amended) provides for storage of greenhouse gases. The *Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025* (PGER Regulations) provide details on some aspects of the provisions for greenhouse gas storage. The provisions in both pieces of legislation are based on an heroic assumption, namely that we can identify geological structures into which it will be safe to pump large quantities of greenhouse gases, so that they will be trapped for 1,000 years and more, without any adverse environmental consequences. Santos describes the Moomba Project in South Australia as,

Australia's first large-scale onshore hub for the capture and geological storage of carbon dioxide (CO2).³²

The approach to the Moomba Project illustrates why the legislation designed to ensure that selection and use of underground storage of carbon dioxide is suitable for purpose, is an exercise in self delusion. Section 6B(1) of the PGER Act as amended, purports to establish what is a suitable repository for carbon dioxide using the following definition that is not a definition:

(1) For the purposes of this Act, a potential GHG storage formation is a part of a geological formation that is suitable for the permanent storage of a greenhouse gas substance injected into that part.

Section 5 defines 'geological formation' to include:

- (a) any seal or reservoir of a geological formation; and
- (b) any associated geological attributes or features of a geological formation

After reading this definition we are none the wiser as to what is meant by geological formation that is 'suitable' for permeant storage of greenhouse gases. Citing the International Commission on Stratigraphy, Earle identifies formations as: 'the main stratigraphic unit' defined as:

The contrast in lithology between formations required to justify their establishment varies with the complexity of the geology of a region and the detail needed for geologic mapping and to work out its geologic history. No formation is considered justifiable and useful that cannot be delineated at the scale of geologic mapping practiced in the region. The thickness of formations may range from less than a meter to several thousand meters.³³

Thus, a geologic formation is a more or less homogenous segment that is one of number of other geologic formations, different from the subject formation, but also more or less internally homogenous, which is part of a larger number of underground rocky structures. These formations come in many shapes, sizes and compositions. Identifying the formations within which greenhouse gases are to be stored does not bring us any closer to knowing what is a suitable formation for permanent storage of greenhouse gases. Some geological formations are highly permeable and others are barely permeable. Divisions 2 and 3 of Schedule 1 of the PGER Regulations set out what an applicant for a greenhouse gas injection licence must show to establish that the proposed formation is suitable. Clause 3(1) sets out the information an applicant must provide to demonstrate the suitability of a proposed formation. These are:

Information relating to the geological formation, set out in sufficient detail to demonstrate that the applicant has an understanding of the subsurface environment that is sufficient to allow the applicant to —

- (a) identify all risks relating to
 - (i) the containment of the greenhouse gas substances to be stored; and
 - (ii) the geotechnical integrity of the formation or structure; and

(iii) the displacement of the formation fluids; ...

With all due respect, because of the depth below ground of these formations, this is an entirely unrealistic requirement so, of necessity it will devolve into a series of assumptions in practice. The assumptions may be based on scientific knowledge but this still means they are no more than an educated guess.

Discussing cap rocks and seals in relation to petroleum, the 2003, 'Encyclopedia of Physical Science and Technology (3rd Edition)' notes:

A cap rock need have only one property: It must be impermeable. It can have porosity, and may indeed even contain petroleum, but it must not permit fluid to move through it. Theoretically any impermeable rock may serve as a seal. In practice it is the shales and evaporites that provide most examples. Shales are probably the commonest, but evaporites are the more effective ... shales generally make excellent seals to stop petroleum migration. When strata are folded or faulted, however, brittle shales may fracture ... fractures enhance permeability most dramatically. In such instances, petroleum may leak from an underlying reservoir and ultimately escape to the surface of the earth.

The evaporites are a group of sedimentary rocks that were originally thought to have formed from the evaporation of sea water. They are composed of crystalline layers of halite, or rock salt (NaCl), anhydrite (CaSO₄), carnallite (KCl), and other minerals. The evaporites exhibit a number of anomalous physical properties. Unlike most sedimentary rocks, when they are subjected to stress they do not respond by fracturing, but by plastic flow. Thus, a petroleum saturated reservoir may undergo all sorts of structural deformation and may even be fractured, but an overlying evaporite may still provide an effective unfractured impermeable seal.³⁴

The Encyclopaedia also notes that evaporites are rare and are also commercially valuable making it less likely that they will be used as caps for reservoirs.³⁵ Thus, what appears to be necessary is that a shale layer that has not been damaged by earlier geological activity must be identified as suitable when it is approximately 1 - 2 km below ground. This is a very big ask and, almost inevitably will lead to skimping on the detail.

The Moomba project, a Santos project, is approved for 'CO₂ storage. Santos asserts that:

The Moomba CCS project utilises depleted oil and gas reservoirs for CO2 storage. These reservoirs are ideal storage sites and have previously stored hydrocarbons for tens of millions of years.³⁶

The implication is that they can safely store CO2 for tens of millions of years, too. With all due respect to Santos the reservoirs that 'stored hydrocarbons for ten million years' are not the same reservoirs that they are pumping CO2 into. The formation and deposition process that resulted in oil and gas being trapped within the reservoirs from which we extract them is entirely different than the process used to deposit CO2 today. The Brooklyn Botanic Garden provides a brief description for the formation of oil and gas, as follows:

The origin of oil is still a matter of scientific controversy. However, it is generally believed that the world's great oil deposits were formed from diatoms. These tiny, mostly single-celled, photosynthetic organisms were, and still are, extremely important components of phytoplankton, the basis of the food chain for all marine and freshwater animals ... The diatoms that became the crude oil so coveted today lived during the Jurassic period, 213 to 144 million years ago, ... The diatoms were deposited on the beds of inland seas, lagoons, lakes, and river deltas, then transformed into liquid gold by forces like high temperature and geologic pressure. The origin of natural gas, like that of oil, is not entirely clear. The leading theory is that it also came from ages-old diatoms, but under different degrees of heat and pressure.

From this description we can conclude:

- (i) Oil and gas started out as living organisms located at the surface of the earth;
- (ii) Those organisms died and sank to the bottom of the water body in which they resided;
- (iii) Over millions of years the environment changed because further depositions and geological upheaval pushed these residues further and further beneath the Earth's surface at the same time altering the structure by the application of heat and pressure.

The 'Sandatlas' describes the process as follows:

Another major and economically very important process that takes place during diagenesis³⁷ is the maturation of kerogen into hydrocarbons. Kerogen is a waxy (organic) substance trapped in the rock, but it will mature into lighter hydrocarbons that are able to move out of the shale

and migrate upwards. This process can take place at temperatures between about 50-150°C (oil window). This corresponds usually to 2 - 4 km of burial depth. Lighter hydrocarbons liberated during the processes (known as catalytic and thermal cracking) are now free to migrate upwards. They can form exploitable oil and gas reservoirs if stopped by some sort of structural trap which may be an anticline or a fault boundary. The rock layer that stops the upward movement is in many cases another layer of shale because compacted shale is a tough barrier for liquids and gas. Shale can also form an aquiclude between water-bearing layers for the same reason³⁸— it does not allow water to flow easily through the rock (has low permeability).³⁹

The upward migration is through pores and faults in the overlying rock. Gas also migrates into and out of horizontal reservoirs and can migrate downwards depending on the temperature and pressure differentials within the structure. Gas, and water, move down the pressure gradient, that is, from areas of higher pressure to areas of lower pressure, which is not the same thing as moving downhill.

Gas was discovered in the Cooper Basin in 1963 and the Moomba natural gas field was discovered in 1966. In 1968 construction of the Moomba gas processing facility began and in 1969 gas was produced for the first time. Therefore there is a long history of disturbance of the reservoirs within which the trapped gas was stored. Inevitably the disturbances will have altered the structure of the reservoirs. Each well, constructed to extract the gas creates a fracture in the rock and the plug used to close off the mine is materially different to the excavated rock which means that there is an interface between the mine shaft and the plug. Over the intervening years large quantities of oil and/or gas were withdrawn from the reservoir changing relationships within it.

The relationships within undisturbed gas and oil reservoirs depend on pressure, temperature and other inclusions in the reservoir, for example water. WildDesert is a company that is involved in providing well servicing rigs, to the oil and gas industry. They must understand the environment within wells to understand the impact on drilling rigs. They describe the 'in-reservoir' environment as follows:

In oil and gas operations, few variables are as critical or as volatile as well-bore pressure and temperature. These parameters directly impact well integrity, production performance, safety, and equipment longevity.⁴⁰

WildDesert describe the parameters for pressure and temperature in the following terms:

During drilling, completion, and well servicing, well-bores are exposed to dynamic geological and operational pressures. These forces include:

Hydrostatic Pressure – Caused by the fluid column in the well. Formation Pressure – The pressure of fluids in the surrounding rock formation.

Annular Pressure – The pressure in the space between casing and tubing or tubing and the borehole wall.

Temperatures can exceed 150°C in deep wells, impacting ... fluid viscosity ... Rapid temperature or pressure shifts can trigger dangerous events like well kicks, formation damage, or mechanical failures in the wellbore.

There are mathematical formulas that define these relationships but it is not necessary to elaborate them here. As oil or gas, and undoubtedly other constituents such as water, are withdrawn from the aquifer the dynamic relationships change. It is also possible that, in addition to the damage caused by the drilling of wells, other areas of the substrate are damaged by the drilling activity resulting in micro faults which reduce the integrity of the reservoir's cap. By the time that CO₂ is injected into the reservoir it is no longer the same reservoir it was when it was initially breached, and CO₂ is a completely different constituent than the substances it is replacing. However, the reservoir is treated as if it and the relationships are the same.

Hager describes the process as:

a major challenge of engineering, policy and economics. But keeping the CO₂ underground once it's injected is relatively simple - you just need to inject it carefully *and put it in the right place* (emphasis added).⁴¹

Hager claims that :

CO₂ can be injected into a few different types of underground formations, including saline aquifers, which are deposits of briny water, or past oil and gas formations.

He does not provide include any information that provides a basis for this claim but assuming for present purposes that he is correct, he continues:

Geologists look for a particular sequence of different rock types to hold CO₂ in place. The lower rock layer needs to be porous, like sandstone or limestone, allowing injection and capture of CO₂ in the rock's "pore spaces." Above, there must be a non-porous "cap rock" that will seal in the carbon dioxide and keep it from escaping. CO₂ also needs to be injected

more than 3,000 feet⁴² below the surface. This ensures the CO₂ will stay at the high temperatures and pressures needed to keep it in a fluid form, which makes it very dense and causes it to take up less space underground. It also places it deeper than deposits of groundwater used for drinking.

However, in relying on this type of reservoir Hager is drawing on the industry's experience with observation of the behaviour of oil and gas within the reservoirs. They do not indicate that any research has been done on whether CO₂ will exhibit the same behaviour. He does indicate that:

(it is) important to make sure previous drilling operations didn't leave the ground compromised, because CO₂ could escape from uncapped wells. "You would want to make sure that you're not in an area which had been turned into Swiss cheese by previous drilling operations

The integrity of the subsurface is a critical consideration and is tested by, for example:

sending seismic waves into the earth, which then bounce off of underground formations. That creates ... a "seismic image" that can be verified with drilled rock samples, which provide information about how well the rock can hold liquid and how easily liquid flows through it.

The problem with this supposition is that it requires further drilling which creates additional fractures in the cap rock reducing its integrity further. This does not really matter if substances are being withdrawn from the reservoir, as is the case with oil and gas, but it certainly does if substances are being injected into the reservoir as with CO₂.

There are very good reasons to question the advisability of carbon capture and storage. There are considerable risks through the entire process which are not adequately addressed by the available research. There are also heroic assumptions made about the longevity of carbon capture and storage solutions. They are based on what appears to be the past history of storage processes of oil and gas which occurred over much longer time frames and in entirely different conditions. Another potential failing is that the removal of carbon dioxide from the atmosphere is not nearly as effective as it is purported to be. The Centre for International Environmental Law, refers to research conducted by Hodge in relation to the use of ammonia as a fuel in the shipping industry. As already indicated, production of ammonia is a major source of CO₂ emissions. Hodge notes that:

CCS ... is ineffective at eliminating CO₂ emissions. Despite years of research and subsidies, there is no evidence that commercial-scale CCS projects capture anywhere near the 90 to 95 percent efficacy touted by the fossil fuel industry. In fact, a 2023 analysis of commercial-scale facilities operating with CCS found that not a single one captured even 80 percent of the CO₂ produced, with most capturing far less. Far from being a silver bullet, CCS adds another layer of emissions through the energy-intensive process needed to power its own infrastructure.⁴³

A very real limitation, that does not appear to have been considered, is that the availability of suitable reservoirs is limited. Even if there are reservoirs that meet the requirements for safe storage of CO₂, they are not going to allow continued expansion of CO₂ production on the basis that the supply of suitable reservoirs is inexhaustible. At the very best it can only be a temporary solution. Unless we develop real solutions we are just kicking the problem down the road.

Thank you for the opportunity to provide these submissions. Should you want to discuss them with us, please do not hesitate to contact us.

¹ British Geological Survey, (2025), *Understanding carbon capture and storage: Discovering geology - 1 climate change*, retrieved 01 September 2025 from the British Geological Survey website: www.bgs.ac.uk/discovering-geology/climate-change/carbon-capture-and-storage/.

² Luis, P., (2016), 'Use of monoethanolamine (MEA) for CO₂ capture in a global scenario: Consequences 2 and alternatives', *Desalination*, 380, 93-99, 93.

³ Chevron Global, (2025), *Gorgon carbon capture and storage: reducing greenhouse gas emissions for a 3 lower carbon future*, retrieved 04 September 2025 from the Chevron Global website:

⁴ Santos, (2024), *Moomba Carbon Capture and Storage*, retrieved 02 September 2025 from the Santos 4 website: www.santos.com/moombaccs/.

⁵ CO₂CRC, (n.d.), *Who we are: About us*, retrieved 04 September 2024 from the CO₂CRC website: <https://5.co2crc.com.au/about-us/who-we-are/>. CO₂Tech is CO₂CRC's commercial arm. It 'provides technical solutions for a low emissions future' and explicitly embraces the use of CO₂ to extract residual oil or gas from depleted reservoirs, a practice considered to defeat the purpose of carbon capture and storage.

⁶ Clifton, J., (2022, April 8), *A level chemistry: Organic chemistry - Amines*, retrieved 01 September 2025 6 from the ReAgent website: www.chemicals.co.uk/blog/a-level-chemistry-revision-organic-chemistry-

amines?

srsIid=AfmBOorK9xqiCvrx1S2MDSaclzydj2SdG56k_fuFeH_ueUmFd7mTQ_vV.

⁷ American Chemical Society, (2021, February 08), *Molecule of the week archive - Ammonia*, retrieved from 7 the American Chemical Society website: www.acs.org/molecule-of-the-week/archive/a/ammonia.html.

⁸ American Chemical Society above n. 3.

⁹ Manthiram, K. and Gribkoff, E., (2025, 31 July), *Fertiliser and climate change*, retrieved 1 September 2025 9 from the MIT website: <https://climate.mit.edu/explainers/fertilizer-and-climate-change>.

¹⁰ It is arguable that agriculture's use of nitrogen is inefficient and having to compete for it will make use of nitrogen more efficient. However, this should not be taken as a given. The costs and benefits must be comprehensively assessed against the costs and benefits of carbon capture and storage.

¹¹ Shao, R. and Stangeland, A., (2009) *Amines Used in CO2 Capture - Health and Environmental Impacts*, retrieved 01 September 2025 from the Bellona Environmental Foundation website:

¹² Luis, above n. 2, p. 93.

¹³ Luis, above n. 2, p. 95.

¹⁴ Luis, above n. 2, p. 95.

¹⁵ Luis, above n. 2, p. 95.

¹⁶ Luis, above n. 2, p. 95.

¹⁷ Department of Climate Change, Energy, the Environment and Water, (2022, June 30), *Ethylene oxide*, 17retrieved 02 September 2025 from the DCCEEW website: [www.dcceew.gov.au/environment/ protection/npi/substances/fact-sheets/ethylene-oxide](http://www.dcceew.gov.au/environment/protection/npi/substances/fact-sheets/ethylene-oxide)

¹⁸ Haffner, R., (28 June 2024), *Solvent-Based Post Combustion Carbon Capture*, retrieved 04 September 18 2025 from the Power Engineers website: www.powereng.com/library/solvent-based-post-combustion-carbon-capture.

¹⁹ Haffner above n. 18.

²⁰ Haffner above n. 18.

²¹ National Petroleum Council, (2021, 12 March), *Meeting the dual challenge: A roadmap to at-scale 21 deployment of carbon capture, use and storage*,

retrieved 4 September 2025 from the National Petroleum Council website: www.energy.gov/sites/default/files/2022-10/CCUS-Chap_8-030521.pdf, 8-1.

²² National Petroleum Council, above n.

²³ Ogge, M., Hemming, P. And Campbell, R., (2021, October), Santos' CCS scam, The Australia Institute: 23 Canberra, Australia.

²⁴ Haffner above n. 18.

²⁵ Bureau of Meteorology, (2025), Climate classification maps, retrieved 05 September 2025 from the Bureau of Meteorology website: www.bom.gov.au/climate/maps/averages/climate-classification/?maptype=seasgrp. 7

²⁶ CO2CRC above n. 5.

²⁷ CO2CRC above n. 5.

²⁸ IPCC, (2006), *IPCC Guidelines for National Greenhouse Gas Inventories*, retrieved 05 September 2025 28 from the IPCC website: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_5_Ch5_CCS.pdf, p. 5-6

²⁹ Wilday, J., McGillivray, A., Harper, P. and Wardman, M., 'A comparison of hazard and risks for carbon dioxide and natural gas pipelines.(2009) ,' *IChemE Symposium series No. 155, Hazards XXI*, p. 392 - 398, p. 392.

³⁰ Milne, P., (2017, 19 December), *Gorgon CO2 injection stopped by leaks and corrosion*, retrieved 04 September 2025 from the Boiling Cold website: www.boilingcold.com.au/gorgon-co2-injection-stoppedby-leaks-and-corrosion/.

³¹ IPCC above n. 28.

³² Santos, above n. 4.

³³ Earle, S., (2019), *Physical Geology*, (2nd ed.), retrieved 02 September 2025 from the BCcampus website: [tps://opentextbc.ca/physicalgeology2ed/chapter/6-5-groups-formations-and-members/](https://opentextbc.ca/physicalgeology2ed/chapter/6-5-groups-formations-and-members/)

³⁴ Selley, R. C., (2003), *Encyclopedia of Physical Science and Technology* (3rd Edition), retrieved 05 September 2025 from the science direct website: www.sciencedirect.com/topics/engineering/impermeable-rock

³⁵ Selley above n. 34.

³⁶ Santos above n. 4

³⁷ aka catagenesis, which is the physical and chemical changes occurring during the conversion of sediment to sedimentary rock.

³⁸ There are possible implications here for contamination of aquifers which occupy the same rock pores as the CO₂ but this topic is beyond the scope of these submissions.

³⁹ Sandatlas, (2025), *Shale: Composition and Origin of This Common Sedimentary Rock*, retrieved 03 39 September 2025 from the Sandals website: <https://sandatlas.org/shale/>.

⁴⁰ WildDesert , (2021), *Understanding and managing well-bore pressure and temperature variations in oilfield operations*, retrieved 04 September 2024 from the WildDesert website: <https://wilddesert.com.au/wellbore-pressure-and-temperature/>.

⁴¹ Hager, B., (2024, 23 February), What is the risk that CO₂ stored underground after carbon capture will escape again?, retrieved 03 September 2025 from the MIT Climate Portal website: <https://climate.mit.edu/ask-mit/what-risk-co2-stored-underground-after-carbon-capture-will-escape-again>.

⁴² The depth of 3,000 feet is approximately 900 m.

⁴³ Hodge, T., (2025, 8 April), *The false promise of blue ammonia for shipping and beyond*, retrieved 1 September 2025 from the Centre for International Environmental Law website: www.ciel.org/the-false-promiseof-blue-ammonia-for-shipping-and-beyond/.

Hon Sophie McNeill

<p>51</p>	<p>Introduction</p> <p>I respectfully acknowledge the enduring sovereignty of First Nations peoples over the land and waters of this state. I pay respects to the Elders, past and present. Their ancestral ties to Country have never been extinguished, and sovereignty never ceded. I acknowledge the devastation that colonisation has caused for First Nations peoples in this state, including the impacts of mining industry and rising emissions on the dispossession of land and culture and the creation of the current state of climate emergency.</p> <p>Submission</p> <p>I adopt and reiterate the submission made by the Conservation Council of WA (CCWA), namely in relation to the following concerns:</p> <ul style="list-style-type: none">• ‘The injection and storage of GHG¹ substances as a carbon pollution reduction strategy.• Trailing liability for decommissioning.• The public consultative mechanisms.• The definition of ‘GHG substances’.• The expertise of GHG exploration proponents in the event of a pollution release.• The need for explicit exclusions in regard to petroleum and geothermal exploration as part of the proposed amendment’.² <p>Impact assessments for ‘new and emerging technologies relating to CCUS³ are riddled with uncertainties and unknown risks’.⁴</p> <p>I share CCWA’s concern that the Regulations ‘have been progressed without further clarification of the benefits, the risks, and the remedies to environmental failures or impacts’.⁵</p> <p>I echo the concerns of the Australian Marine Conservation Society (AMCS): ‘carbon pollution dumping through so-called carbon capture and storage (CCS) is a proven failure the fossil fuel industry wants to dump in our fragile oceans, threatening every living thing in them’.⁶</p>	<p>DMPE thanks Hon. Sophie McNeill MLC for providing a submission.</p>
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The risk that permitting CCUS to operate underwater poses to WA's marine life and oceans is extreme. 'There are risks of leaks and pollution at every stage of CCS development and operation. When carbon pollution leaks it acidifies the seawater around it, which can harm and suffocate nearby marine life. Pressure also builds up under the seafloor from burying the carbon pollution, further increasing the risk to marine plants and animals.'⁷

Woodside Energy claims that CCS will help to offset its emissions from its Browse proposal at Scott Reef. Greenpeace noted that 'Woodside's carbon dumping plans for Browse involve injecting the carbon pollution from its offshore gas production into a reservoir underneath the ocean — both environmentally reckless and doomed to fail.' The plan 'involves running seismic surveys periodically for over thirty years, which can deafen whales, as well as harm marine life and threatened species'.⁸

Woodside Energy's CCS plan posed such significant risks to the environment that it was provisionally refused by the Commonwealth Department of Climate Change, Energy, the Environment and Water.⁹ The Department highlighted 'the risks of the new technology to our oceans and protected animals, as well as the risk of the injection site failing'.¹⁰

If the government wishes to take climate action and reduce emissions, it must make serious moves to 'stop emissions before they are produced' as 'CCS is a failed experiment and has not been proven to work at the scale required to tackle the climate crisis anywhere in the world'.¹¹

CCS operations at Gorgon on Barrow Island in Australia and overseas in Norway have proved ineffective at delivering the 'promised amounts of carbon storage'.¹²

Chevron's Gorgon CCS project on Barrow Island has been a failure. Last year, Gorgon captured only 30% of carbon dioxide from its gas fields. Gorgon's target is 80%. The WA government's environmental approval of Chevron's Gorgon gas fields included a commitment to CCS.¹³

In 2023, Chevron estimated that Gorgon was operating at a third of capacity, and had buried approximately 10 million tonnes of CO₂ (under a third of what was promised by 2023).

The WA Department of Mines, Petroleum and Exploration stated in Budget Estimates that it has no estimates on the cost to the government if liability for injection projects falls to them.

The regulations must include harsh penalties for fossil fuel industry that fail to safely conduct CCS. These penalties must include sufficient funds to remediate any damage caused to the environment.¹⁴

CCS poses serious risks to the environment and climate. The regulations must be strengthened and properly reflect the dangers of CCS.

¹ Greenhouse gas (GHG).

² Conservation Council of WA (CCWA) Submission on the draft Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025, 1 September 2025, pg 3-4 ('CCWA submission').

³ Carbon Capture Utilisation and Storage ('CCUS'), also referred to as Carbon Capture Storage ('CCS').

⁴ CCWA submission pg 4.

⁵ Ibid.

⁶ Australian Marine Conservation Society (AMCS), Carbon capture and storage: A dangerous distraction. Available at: www.marineconservation.org.au/wp-content/uploads/2025/07/AMCS_carbondumping-DL-flyer_July-2025-updates_web.pdf.

⁷ Ibid.

⁸ Kate O'Callaghan, 'Woodside's Browse carbon dumping plans an expensive distraction from real climate action', Greenpeace (10 January 2025). Available at: www.greenpeace.org.au/news/woodsides-browse-carbon-dumping-plans-an-expensivedistraction-from-real-climate-action/.

⁹ Ibid.

¹⁰ Ibid.

¹¹ Kate O'Callaghan, 'Woodside's Browse carbon dumping plans an expensive distraction from real climate action', Greenpeace (10 January 2025). Available at: www.greenpeace.org.au/news/woodsides-browse-carbon-dumping-plans-an-expensivedistraction-from-real-climate-action/.

	<p>¹² Australian Marine Conservation Society (AMCS), Carbon capture and storage: A dangerous distraction. Available at: www.marineconservation.org.au/wp-content/uploads/2025/07/AMCS_carbondumping- DL-flyer_July-2025-updates_web.pdf.</p> <p>¹³ Daniel Mercer, 'A climate solution or distraction? The carbon capture facility at Chevron's Gorgon project tells a cautionary tale' ABC News (18 November 2024). Available at: www.abc.net.au/news/2024-11-18/chevron-gorgon-fails-to-deliver-on-carbon-capturepromises/104587894.</p> <p>¹⁴ CCWA submissionpg6.</p>	
52	<p>Conclusion</p> <p>I call on the Department to review the Regulations.</p> <p>Our environment and oceans are already fragile from the effects of GHG emissions caused by fossil fuel industry operating in WA and around the world. WA's environment and the climate that it supports is precious and unique to the world. All efforts must be made to protect the environment from all negative effects of emissions, including the dangers posed by CCS.</p> <p>CCS has not been proven to effectively and safely manage GHG emissions from fossil fuel industry anywhere in the world. Accordingly, the trial of these measures, including in the ocean, through large projects that lack data is a dangerous proposition that many in the community do not support.</p> <p>The lack of knowledge and information about CCS processes and their long-term effectiveness must be remedied. The government cannot continue to support CCS without a full understanding of its environmental risks and future climate impacts.</p> <p>CCS poses serious risks to the environment and climate. The regulations must be strengthened and properly reflect the dangers of CCS.</p>	<p>As stated in WA CCUS Action Plan www.wa.gov.au/system/files/2025-10/ccus_action_plan_nov_2024.pdf , there will also be a crucial role for carbon capture, utilisation and storage (CCUS) in the challenge for Western Australia to decarbonise hard-to-abate mining, resources and processing sectors.</p> <p>CCUS technologies now have numerous proven applications across the world, including in Western Australia. In the short to medium term, it will play a key role in the gas sector. In the longer term, it will have an increasingly important role in hard-to-abate and low carbon industries. There are also multiple technologies aimed at removing carbon directly from the atmosphere.</p> <p>Action area 1 of the <i>CCUS Action Plan</i> is to implement a leading legislative and regulatory framework for CCUS while continuing to uphold high standards of operational, maintenance, and health, safety and environmental practices</p> <p>The fundamental principle with permanent storage of GHG is that DMPE, under delegated authority of the Minister, will not approve any proposals if there is an unacceptable risk to the environment</p> <p>The GHG Regulations are supported by further amendments which are proposed to broaden the existing suite of petroleum regulations to include cover GHG injection and storage. These regulations include the three sets of Petroleum Environment Regulations to broaden the scope of these regulations to ensure that any greenhouse gas storage and transport activity petroleum activity or geothermal activity carried out in the State is:</p>

		<p>(a) carried out in a manner consistent with the principles of ecologically sustainable development; and</p> <p>(b) carried out in accordance with an environment plan that:</p> <ul style="list-style-type: none"> (i) demonstrates that the environmental impacts and environmental risks of the activity will be reduced to as low as is reasonably practicable; and (ii) has appropriate environmental performance objectives and environmental performance standards; and (iii) has appropriate measurement criteria for determining whether those objectives and standards have been met.
53	<p>The regulations must include harsh penalties for fossil fuel industry that fail to safely conduct CCS. These penalties must include sufficient funds to remediate any damage caused to the environment.¹⁴</p> <p>¹⁴ CCWA submissionpg6.</p>	<p>The penalty of \$10,000 in the GHG Regulations is the maximum currently allowable under the PGERA and the PSLA.</p> <p>However, this penalty rate is for an individual, and under the <i>Sentencing Act 1995</i>, companies are penalised at a rate of five times the individual penalty amount.</p> <p>It should also be noted that while a breach of a site plan provision in regulation 10 of the GHG Regulations only has a penalty of \$10,000, the ultimate overriding penalty for not having an approved site plan or for operating not in accordance with an approved site plan is that the Minister has the authority to shut down injection operations. This action will have added financial operation implications as well as tarnishing a company's name with investors and/or shareholders.</p>

Woodside Energy Group Ltd

<p>54</p>	<p>Woodside Energy Group Ltd. (Woodside) refers to the Department of Mines, Petroleum and Exploration (the Department) public consultation on the draft Petroleum, Geothermal Energy and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2025 (GHG Regulations) in relation to the <i>Petroleum Legislation Amendment Act 2024</i>. We welcome the opportunity to comment.</p> <p>Woodside understands the draft GHG Regulations aims to deal with a number of matters to facilitate and regulate greenhouse gas (GHG) injection and storage operations.</p> <p>As a participant in various joint ventures, Woodside holds five greenhouse gas assessment permits enabling carbon capture and storage (CCS) assessments in the Browse Basin, Northern Carnarvon Basin, Bonaparte Basin and Gippsland Basin. We have also entered into three non-binding memoranda of understanding to enable studies of a potential CCS value chain between Japan and Australia.</p> <p>Given the extensive and positive industry engagement to date by the Department, which supported a fit for purpose and robust outcome, Woodside’s comments primarily address technical matters contained within the public consultation. However, Woodside appreciates the effort of the Department to align State and Commonwealth regulatory frameworks as much as possible and the State Government’s recently published CCUS Action Plan which outlines actions required to provide policy certainty and guidance to attract investment and accelerate deployment of proven technologies and infrastructure.</p> <p>Woodside also draws the Department’s attention to input it may receive from the Australian Energy Producers (AEP) and Chamber of Minerals and Energy (CME) WA.</p>	<p>DMPE thanks Woodside Energy Group Ltd for providing a submission.</p>
<p>55</p>	<p>It is recommended that the Department should continue collaboration with stakeholders to develop guidance for the draft regulations once enacted. Ensuring adequate resources and investing in systems and processes will streamline implementation and regulatory approvals obtention.</p>	<p>Work on the supporting policy, guidelines, and processes has been advanced in parallel with regulation drafting. These materials have been organised into tranches for public consultation, with priority given to approval types expected to be required soon after commencement, ahead of those anticipated later or updates of a more general nature (such as new DMPE templates and amended Act references).</p>

<p>56</p>	<p>General</p> <p>Woodside draws the Department’s attention to the use of the terms “sound basis” and “soundly based” throughout the GHG Regulations. The lack of clear definition or criteria for assessing what constitutes a “sound basis” introduces uncertainty for both proponents and regulators. Clarification is requested on the standards, benchmarks, or methodologies to be used in determining whether supporting information or technical work meets this threshold. Establishing explicit guidance or reference frameworks would improve transparency and ensure consistent interpretation across applications.</p>	<p>The term ‘sound basis’ is used twice in regulation 12, which details the criteria, requirements and information that must be included in Part A of a site plan, at subregulations (2)(a)(i) and (b). The term ‘soundly based’ is used once in Schedule 1, which describes the information required for identified GHG storage formations and estimates of spatial extent, in subclause 7(2) in regard to describing the predicted expected migration pathways.</p> <p>These three occurrences have been adopted from the equivalent regulations in the Commonwealth OPGGS (GGI&S) Regs 2023.</p> <p>The need for clarification of DMPE’s expectations in regard to both terms is acknowledged. It is intended that this will be provided in Guidelines for the GHG Regulations to be developed following completion of these regulations.</p>
<p>57</p>	<p>Part 5 - Information that may be made publicly available</p> <p>46. Information relating to leakages during injection or from well bores</p> <p>(2) (b) “<i>any raw data collected ...</i>”</p> <p>In certain situations, implementing this clause may be challenging due to the large volume of some raw data, making storage and transmission to the Department difficult. Raw data may also risk being misinterpreted if taken out of context. Woodside considers Clause (2) (a) may provide sufficient coverage of relevant information that serves the public interest.</p>	<p>Regulation 46(2) has been adopted from the equivalent regulation 54(2) in the Commonwealth.</p> <p>The purpose of this regulation is to provide powers for the Minister, subject to discretion and at any time, to make some or all of this information publicly available for transparency, and to assure the public of ongoing monitoring to ensure continued safe and sustainable operations.</p> <p>In deciding whether to release the information the Minister may consider, on a case-by-case basis, such things as the public interest, the timing of release in relation to other information and reports made publicly available pursuant to the RMA regulations, the interpretability of raw data and the size/volume of the raw data amongst other factors.</p>
<p>58</p>	<p>46(2) and 47(2) Information release:</p> <p>As per current wording, only the Minister has discretion over public release, with no titleholders involvement beforehand, especially regarding measurement and monitoring data. Recommendation for the Minister to have an obligation to consult with titleholders before public disclosure of relevant data.</p>	<p>Regulation 46(2) has been adopted from the equivalent regulation 54(2) in the Commonwealth.</p> <p>The purpose of this regulation is to provide powers for the Minister, subject to discretion and at any time, to make some or all of this information publicly available for transparency, and to assure the public of ongoing monitoring to ensure continued safe and sustainable operations.</p> <p>In deciding whether to release the information the Minister may consider, on a case-by-case basis, such things as the public interest, the timing of release in relation to other information and reports made publicly</p>

		available pursuant to the RMA regulations, the interpretability of raw data and the size/volume of the raw data amongst other factors.
59	<p>Schedule 1 – Information required for identified GHG storage formations and estimates of spatial extent, Division 2 – Information about part of geological formation</p> <p>3. Understanding of the subsurface environment</p> <ul style="list-style-type: none"> • (3) (c) “any faults in the structure...” <p>It is recommended this phrase includes a qualifier or caveat. Faults are fractal and arbitrarily small faults are universally present in geological formations, however such faults are usually of no relevance to the behaviour of a CO2 plume and not usually detectable in the subsurface. It would therefore be impossible to identify. A qualifier such as “any faults that may affect fluid movement in....” or “any macroscopic faults in...” would result in an achievable requirement without sacrificing any relevant information regarding subsurface fluid flow and risk.</p>	<p>Comment noted and agreed. It is intended that the regulations be amended to replace ‘any’ with ‘the’ to remove the ambiguity that ‘any’ faults must be identified. Applicants may also refer to seismically undetectable faults originating from predictable geological processes.</p> <p>The subsequent inclusion or exclusion of these faults in static and dynamic modelling or geomechanical analysis would be subject to the material impact these faults have on the injection and permanent storage of greenhouse gas substances.</p>
60	<p>4. Model of reservoirs and seal rocks</p> <ul style="list-style-type: none"> • “A 3-dimensional static earth model...” <p>Providing the actual digital model is likely to present many challenges in terms of software access, format compatibility, archiving, and data interpretation. Woodside considers the wording used in 5. <i>Dynamic modelling</i>: “Details of any...modelling...” is likely to be clearer for the regulator (or other relevant parties) to assess and interpret, and less likely to present ongoing challenges for data management and interpretation.</p>	<p>The intent of clauses 4 and of Schedule 1 is to require that applicants construct a static model and perform dynamic simulations. Guidelines and online submission processes will clarify that the models themselves are not submitted as part of the initial online application process. However, it is expected that the applicant retains all models referred to in the application in case the Minister requires further information or analysis pursuant to section 69C of the Act. DMPE has both the software and capability to perform analysis of these models if necessary.</p> <p>Schedule 1, clause 4 will be updated to clarify there is no requirement to provide the model during the application process.</p>
61	<p>5. Dynamic modelling</p> <ul style="list-style-type: none"> • (2) <i>The details of dynamic modelling described in subclause (1) must demonstrate probability distributions for, at a minimum...</i> • (a) <i>the behaviour of the injected greenhouse gas substance</i> <p>Woodside considers assigning a probability to this scenario to not be feasible. Woodside recommends focusing on the spatial extent of the plume, as it aligns with established migration pathways.</p>	<p>The intention of clause 5(2) is to require that details of a suitable number of (multiple) simulations are performed for sensitivity characterisation of relevant coupled and reactive processes with the objective of demonstrating the storage formation is suitable and capable of permanently storing a particular volume of an injected GHG substance. Subclauses (a) and (b) deal with the coupled processes of plume migration and formation pressure for consideration in such matters as geomechanical integrity and potential conflict with other resource projects. Subclause (c) refers to any other coupled or reactive processes that may impact the suitability of the storage formation.</p>

		<p>There is no requirement to perform or provide dynamic simulation results of the full range of parameter combinations for a declaration of identified GHG storage formation. The requirement is to demonstrate that, consistent with the fundamental suitability determinants and spatial extent, the storage formation is suitable and capable of permanently storing a particular volume of an injected GHG substance.</p> <p>Subclause 5(2)(a) is also intended to inform the specific requirements of subsequent Division 3 of Schedule 1. Edits have been made to clause 5(2) to further clarify these requirements. Guidelines will provide further information on DMPE expectations for compliance with this regulation.</p>
62	<p>• <i>(c) any other parameter of change...</i></p> <p>We suggest adding examples of parameter types in section c).</p>	<p>The intention of clause 5(2) is to require that details of a suitable number (multiple) simulations are performed for sensitivity characterisation of relevant coupled and reactive processes with the objective of demonstrating the storage formation is suitable and capable of permanently storing a particular volume of an injected GHG substance. Subclauses (a) and (b) deal with the coupled processes of plume migration and formation pressure for consideration in such matters as geomechanical integrity and potential conflict with other resource projects. Subclause (c) refers to any other coupled or reactive processes that may impact the suitability of the storage formation.</p> <p>There is no requirement to perform or provide dynamic simulation results of the full range of parameter combinations for a declaration of identified GHG storage formation. The requirement is to demonstrate that, consistent with the fundamental suitability determinants and spatial extent, the storage formation is suitable and capable of permanently storing a particular volume of an injected GHG substance.</p> <p>Edits have been made to clause 5(2) to further clarify these requirements. Additionally, guidelines will provide further information on DMPE expectations for compliance with this requirement. Examples of subclause (c) will be provided in subsequent guidelines.</p>
63	<p>Schedule 1 - Division 3 – Requirements for estimates of spatial extent</p> <p>7-9. Spatial Extent definition</p> <p>Please consider amendments to the Spatial Extent definition to incorporate a caveat to allow for Ministerial discretion to consider inclusion of graticular blocks that may not adhere to the >10% probability</p>	<p>The prescribed level of probability of more than 10% in clause 7 has been adopted from Commonwealth Schedule 1, Clause 6. DMPE consider this level of probability an adequate quantum for the purpose of spatial extent. Implementing a discretionary approach would introduce further challenges in ensuring clarity and practical execution.</p>

	<p>of modelled GHG plume pathway (if there is sufficient justification from applicants for their inclusion).</p> <p>This is particularly pertinent to depleted hydrocarbon fields that may serve as future storage locations since the GHG plume tends to be largely constrained within the existing structural traps. This could lead to restrictive injection licence areas if solely based on the existing definition. Ministerial discretion would also allow for situations where the modelled probability plume pathway is very close to but not crossing graticular block boundaries, or where including graticular blocks may support a GHG Projects' MMV or risk management plan (even if those blocks do not contain GHG modelled probability plume pathways).</p>	<p>For the specific circumstance mentioned in the submission, a GHG access authority could be used for monitoring operations outside of the GHG injection licence.</p> <p>Future Act amendments may consider the option to add an adjacent block(s) to a title when the storage formation (plume) extends outside of the existing title boundary.</p>
64	<p>Schedule 2 – Information: draft site plan Part B</p> <p>5. Monitoring and Verification Plan</p> <ul style="list-style-type: none"> • (1) (b) “...will detect any variations...” <p>This sentence may be considered too broad. As such, it is suggested to include a qualifier such as “...will detect any material or relevant variations...” to help reflect the intent of the regulations without suggesting a level of monitoring precision that cannot be achieved.</p>	<p>The wording used in subclause 5(1)(b) has been adopted directly from the Commonwealth Schedule 2 Clause 6(1)(b).</p> <p>The intent with subclause (1)(b) is that the monitoring plan must be set out in sufficient detail to demonstrate that the timing and nature of the monitoring will detect any variations from the predictions set out in Part A of the draft site plan (see discussion at section 19). Under section 379 of the OPGGS Act, (69HB(c) or 74AJ(c) in the WA Acts) a serious situation exists if a GHG substance has behaved or is behaving otherwise than as predicted in Part A.</p> <p>Guidelines will specify that a suitable range of probability predictions be provided in Part A. This range will account for the inherent uncertainty of subsurface predictions.</p>
65	<ul style="list-style-type: none"> • (2) “...or an aquifer.” <p>Woodside understands this phrase likely refers to a “freshwater aquifer”. It is more likely that CO2 will be injected into a formation which contains a brine aquifer, however this does not impact safety or environmental outcomes. Using ‘freshwater’ would more accurately reflect community expectations.</p>	<p>The wording used in subclause 5(2) has been adopted directly from the Commonwealth Schedule 2 Clause 6(4) but modified to be PGER relevant by adding ‘land or soil’ and ‘or an aquifer’.</p> <p>The term aquifer is not restricted to a freshwater aquifer and could, if applicable, be monitoring of a porous zone above the storage formation. The term leakage implies that the greenhouse gas substance has moved into an area outside of the storage formation (where the storage formation may be a deep saline aquifer).</p>
66	<ul style="list-style-type: none"> • (6) “A description of each measurement...that would be regarded as a significant deviation from the predicted subsurface behaviours...” 	<p>Comment noted. The intent of subclause (6) was to require the specification of a range of normal observations for each monitoring activity to enable the Minister to be informed of the occurrence of abnormal observations. It is intended that subregulation (6) be removed following subsequent drafting of the reporting requirements in</p>

	<p>The current level of detail appears excessive for these regulations and does not reflect the intended objectives of being risk-based, site-specific, and adaptable.</p> <p>Best practice risk management plans should not depend on specific measurements but instead require operators to assess an ongoing suite of measurements over time to identify signs of increased risk or deviation from normative behaviour, as well as to undertake supplementary measurements as necessary. This approach enables timely and efficient response to events, ensuring optimal safety for both personnel and the community.</p> <p>Furthermore, any specific information tied to this clause may quickly become obsolete as new data regarding subsurface dynamics emerge and thresholds are updated. A more suitable provision might state: “A contingency management plan describing how monitoring measurements will be used to identify and mitigate increases in the subsurface risk levels identified in (1).”</p>	<p>accompanying amendments to the Resource Management and Administration Regulations, and the recognition this is more appropriate as an iterative risk management practice rather than as a regulation.</p>
67	<p><i>8. Site closure: decommissioning, remediation and monitoring</i></p> <ul style="list-style-type: none"> <i>• (2) A plan for monitoring the behaviour of greenhouse gas substances stored in an identified GHG storage formation after the ceasing of operations for the injection of greenhouse gas substances into the formation.</i> <p>Woodside suggests including the timeline and objectives for post-closure monitoring would clarify this clause.</p>	<p>The wording used in subclause 8(2) has been adopted from the Commonwealth Schedule 2 Clause 9.</p> <p>Further information on the timeline and objectives of post-closure modelling will be provided in guidelines. The timeframe for post-closure monitoring is case-by-case but will be a minimum of 15 years after a site closure certificate is issued.</p>

Government of Western Australia

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