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OFFSHORE CARBON CAPTURE AND SEQUESTRATION UNDER THE SEA DUMPING ACT | *CONSULTATION*

Australian Energy Producers | 23 SEPTEMBER 2025

Australian Energy Producers welcomes the opportunity to provide feedback on *Offshore Carbon Capture and Sequestration (CCS) under the Environment Protection (Sea Dumping) Act 1981* (the Act) consultation.

The London Protocol highlights the importance of CCS as a key technology for the protection of the oceans. The central objective of the London Protocol is the protection of the marine environment. In this regard, the London Protocol highlights that CCS has the *"potential to make a substantial contribution to reducing CO_2 emissions to the atmosphere, thus preventing these emissions from being absorbed into the oceans and providing mitigation of ocean CO_2, carbonate and pH change, effects on sensitive biological systems and nutrient availability and cycles*."[1]

To ensure the National Action List (NAL), National Assessment Guidelines for Offshore CCS (NAGOCCS) and updated Sea Dumping Permit application form align with the objectives of the London Protocol, it is recommended that:

- **The safety factor of five used in the NAL is overly conservative and should be reduced**. The current safety factor is unduly conservative with limited scientific justification and risks impacting the roll-out of CCS in Australia.
- **The NAL should clearly state that upper levels represent a reference point and not a hard limit** on what can be handled without undue risk to marine ecosystems or human health.
- **The NAL should adopt as low as reasonably practicable (ALARP) principles throughout** as part of a risk-based approach to the approval and oversight of CCS projects.
- **The Sea Dumping Permit should avoid duplication of approvals** under the Offshore Petroleum and Greenhouse Gas Storage Act (OPGGSA) and other permitting processes to ensure an efficient and transparent permitting process.

Australian Energy Producers welcomes the opportunity to provide feedback into the regulatory framework for offshore CCS under the Sea Dumping Act.

Further comments and recommendations are provided below.

[1] International Maritime Organization, *London Protocol Risk Assessment and Management Framework*, 2006

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Offshore CCS National Action List (NAL)

Question 2: Does the draft Offshore CCS NAL clearly outline the proposed requirements in relation to the sequestration of domestically sourced CO_2 offshore Australia under the Sea Dumping Act?

Australian Energy Producers has identified several areas of the NAL where further clarity is needed.

The methodology for determining the lower threshold in seawater is problematic | The examples provided for converting the Incidental Associated Substance (IAS) molar stream concentration into a mass per litre of seawater for an equivalent litre of CO_2 gas appear incorrect. The examples look to have been calculated at atmospheric pressure, ignoring hydrostatic pressure subsea, and for a specific operating temperature. Concentrations in water inherently rely on an understanding of solubility (relative to CO_2) and assumptions on leak rate and water diffusion. Currently no internationally accepted or reliable methodology/model is available for predicting the dispersion or subsurface migration of IAS at low concentrations from either subsea infrastructure or a storage site. As a result, it is not feasible to accurately calculate expected IAS concentrations in seawater following a leak from either a CO_2 store or associated subsea system.

Clarity is required on the interaction of IAS levels for air and water | Two distinct upper concentration levels have been established for each IAS in the NAL, one for release to air and another for release to seawater. While this differentiation reflects the varying environmental dynamics of each medium, it also introduces risks around interpretation of the IAS levels. Specifically, there may be instances where a substance's concentration falls below the designated 'lower level' in one medium, while exceeding the defined 'upper level' for the other medium. This would result in the substance being considered both "*of little environmental concern in relation to dumping*"[2] and in breach of an upper threshold. This potential inconsistency can complicate compliance decisions and risk determination, particularly for operators and regulators trying to interpret which standard takes precedence. It also raises questions about the scientific basis and practical implications of setting multiple upper levels without harmonising them with the lower-level benchmarks.

Question 3: What further information, if any, would make it easier to understand and comply with the draft Offshore CCS NAL?

Australian Energy Producers recommends the following actions to improve the understanding of, and compliance with the NAL.

The NAL should clearly state that the upper levels should be used as a reference point, and not as a strict limit | The NAL would benefit from explicitly stating that the designated upper levels should not be interpreted as a strict or absolute ceiling. Rather, they serve as a reference point or benchmark for typical concentration ranges. Applicants may propose levels that exceed

[2] International Maritime Organization. (2006). *1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters*, 1972 (as amended in 2006). Annex 2, 10.2.,

this upper threshold, provided they can present robust scientific justification demonstrating that the proposed exceedance poses no undue risk to marine ecosystems or human health.

The safety factor of five is unduly conservative and should be reduced | The safety factor of five applied to the upper levels in air is overly conservative and risks impacting the viability of some CCS projects. The *de Visser et al. (2008)* paper does not provide sufficient scientific justification for its use and clearly indicates that the safety factor of five is the "*maximum*" safety factor to be considered, not the only safety factor to be considered. As outlined below, if all upper concentration levels for air are derived using an additional safety factor of five, the resulting thresholds will be unduly conservative and restrictive on industry.

Additional guidance is needed on evidence requirements and management techniques and processes | The NAL should provide clear guidance on the expected "*evidence*" required to demonstrate that an IAS concentration is acceptable, as well as what is meant by "*management techniques and processes*". Such an explanation would enable industry to compile relevant evidence and information more efficiently, rather than submitting excessive volumes of documentation to cover all possible scenarios. It would also help streamline the government's review process by reducing the volume of information that needs to be assessed.

The NAL should be based on an 'ALARP' approach | The offshore industry operates on risk-based principles. Statements such as "*no human will be exposed to this IAS during operational activities*" undermine the industry's ability to apply risk-based methodologies effectively. Instead, it is proposed the NAL adopt the 'ALARP' principle throughout. ALARP is a core concept in NOPSEMA's regulatory framework, requiring operators to reduce risks to ALARP levels through justified, practical measures. Operators must demonstrate through reasoned arguments, via a safety case or environment plan, that further risk reduction is not "*reasonably practicable*" due to a disproportionate cost or effort. Such an approach would see a rephrasing this sentence to acknowledge that some minimal risk of human exposure may remain, e.g. "*risk of human exposure to this IAS during operational activities will be reduced to a level that is ALARP".*

Similarly, given the challenges around accurately measuring CO_2 concentration levels in seawater, it is recommended that government considers allowing applicants to use the 'ALARP' approach for such concentrations. Further, there are currently no removal processes that can reliably achieve absolute zero, nor is there a measurement method capable of detecting it, therefore having upper limits for IAS of zero is unrealistic. Establishing an upper IAS limit that is both technically achievable and analytically measurable – based on the ALARP principle – would enhance the practicality and credibility of the NAL.

The NAL should provide flexibility to accommodate future capture technologies and not prescribe a minimum CO_2 concentration | The NAL should explicitly provide flexibility to accommodate emerging capture technologies. Specifically, while the NAL specifies a minimum CO_2 concentration of 95 mol%, the London Protocol does not prescribe a specific threshold.

Rather it states only that CO_2 streams must "*consist overwhelmingly of carbon dioxide*."[3] Similarly, ISO 27913 states that "*a carbon dioxide stream consists of usually more than 95 mol% CO_2.*"[4] Future innovations such as membrane separation or Direct Air Capture which may result in captured CO_2 streams with concentrations below this threshold. The NAL should avoid imposing a strict minimum CO_2 concentration that could limit the adoption of these technologies once they become commercially viable.

Question 4: How does the draft Offshore CCS NAL affect you or your organisation's functions, interests, or activities? Please provide data to support your feedback, where relevant.

The NAL remains unduly restrictive which risks impacting the viability of many CCS projects.

The upper and lower limits in the NAL are overly restrictive, in a large part due to the overly conservative safety factor | It is expected that most CO_2 streams from current and envisaged CCS projects would have IAS concentrations above the NAL upper level in air and/or the lower level in seawater. In part this is due to the safety factor of five added to the upper level for air.

The proposed safety factor is based on the Dynamis method in *de Visser et al. (2008)*[5], which states:

"*A safety factor of 5 is applied to the maximum concentration limit to reach the recommended value qualitatively substantiated by the following four reasons:*

1. *exposure limits are always subject to uncertainties and effects on the human body may differ from human to human;*
2. *there may be some synergy effects by the various impurities, although no evidence has been found yet on this effect;*
3. *similar diffusion is assumed of CO_2 and the impurities, although unlikely, this may slightly differ from substance to substance;*
4. *to account for potential additive effects that may arise from the various impurities involved, although no evidence has been found yet on this effect*."

Determining a Short-Term Exposure Limit (STEL), with uncertainty factors already applied, satisfies the first bullet point. The other three reasons, which use language such as "*no evidence has been found yet to this affect*", "*unlikely*" and "*slightly*", do not provide compelling a rationale to apply a 500 per cent safety factor. Especially as such an approach risks significantly impacting the emerging CCS sector in Australia.

[3] International Maritime Organization. (2006). *1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*, 1972 (as amended in 2006).
[4] International Standard. (2024). Carbon dioxide capture, transportation and geological storage — pipeline transportation systems.
[5] de Visser, E., Hendriks, C., Barrio, M., Molnvik, M.J., de Koeijer, G., Liljemark, S., and Le Gallo, Y. (2008). Dynamis CO2 quality recommendations. *International Journal of Greenhouse Gas Control*. 2(4), 478-484.

National Assessment Guidelines for Offshore Carbon Capture and Sequestration (NAGOCCS)

Question 2: Does the draft NAGOCCS clearly outline the proposed considerations and information required to apply for a permit to sequester domestically sourced CO_2 offshore Australia under the Sea Dumping Act?

Australian Energy Producers has identified opportunities to provide applicants with more clarity and to improve the robustness of the NAGOCCS.

There remains significant duplication between the Sea Dumping Permit Application and the OPGGSA | Certain areas offshore have been gazetted for Greenhouse Gas Assessment Permits under the OPGGSA. These are Commonwealth verified sites, suitable for CCS, and applicants will have Assessment Permits in place for several years before they need to submit a Sea Dumping permit application. However, the Guideline appears to suggest that the Department of Climate Change, Energy, the Environment and Water (DCCEEW) will also undertake an assessment of many considerations already approved under OPGGSA which implies a duplication of effort by government. See further discussion of duplication below.

The guidelines should clearly state that the permit covers both State and Commonwealth waters | It is understood that the sea dumping permit boundary encompasses both State and Commonwealth waters up to the waterline mark but excludes land-based infrastructure. This should be clearly stated in the NAGOCCS.

The guidelines should include a well-defined and transparent appeals process | Without a well-defined and transparent decision appeal framework, proponents face uncertainty in forecasting regulatory outcomes, potential delays, and associated contingencies. Clear guidance on appeal timelines, decision-making criteria, and procedural steps would enable proponents to consider possible appeal scenarios in their project schedules and risk registers. This would not only improve alignment with governance and compliance obligations but also enhance confidence in regulatory processes, reduce the administrative burden, and support timely investment decisions. Establishing a fit-for-purpose appeals process is particularly important for CCS projects which are large and complex and where regulatory uncertainty can have significant financial and operational implications.

Further detail is required regarding potential fees | Further detail is needed regarding potential fees associated with the agreement between applicants and the Commonwealth. Specifically, clarification is required on the process by which the Minister or their delegate may decide to undertake additional research or analysis, as applicants may reasonably assume that they have the primary right to conduct such work.

Question 3: What further information, if any, would help improve the NAGOCCS and clarify the proposed requirements under the Sea Dumping Act?

Australian Energy Producers recommends the following actions to improve the NAGOCCS.

The guidelines should clearly detail how government will work across departments and agencies to reduce duplication in the permitting process | Greater clarity is required regarding how DCCEEW will coordinate with other government departments and agencies to prevent duplication of effort and ensure efficient use of resources. Presently, the framework does not clearly articulate how responsibilities will be shared or delineated across agencies, nor does it specify mechanisms for collaboration or information exchange. Notably, there is no reference to the role of the National Offshore Petroleum Titles Administrator (NOPTA) in assessing and managing storage formations, nor in developing and overseeing long-term monitoring and verification plans. Similarly, the role of National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) is absent, despite its critical responsibilities in relation to safety, environmental oversight, and well integrity, including ongoing inspection and compliance monitoring throughout the life of the project.

Presently, there remains uncertainty regarding the extent to which the Sea Dumping Permit process will incorporate, or rely upon, previously granted Commonwealth primary approvals. Clarification is needed to determine whether these existing approvals will be considered sufficient, require reassessment, or be integrated into the current permitting framework. For example, a Declaration of an Identified Storage Formation (DOSF) will already be accepted by NOPTA 18-24 months before the Sea Dumping Permit may be considered by DCCEEW. There is a significant risk that the reviewing authority may arrive at a different conclusion regarding the suitability of the storage formation, particularly if alternative resources or assessment criteria are applied. Such duplication and inconsistency poses an unacceptable risk for applicants seeking regulatory certainty and confidence in the approval process for their projects.

Without explicit recognition of these government agency functions, there is a risk of overlapping mandates, fragmented accountability, and missed opportunities for leveraging existing expertise. Applicants are seeking certainty that each government agency understands their roles and responsibilities as projects move through the approvals process. Acknowledgment in the NAGOCCS that the Sea Dumping Permit is part of a larger government approvals process and that engagement with relevant government agencies improves permitting efficiency and minimises government resources. It also provides industry with confidence that there will be strong regulatory coherence, effective interfaces between government agencies, and that the administrative burden will be minimised where possible.

The guidelines should clearly state the source of each proposed obligation | To enhance accuracy and transparency of the guidelines, they should consistently identify the source of each obligation throughout the document. For example, Australia's requirement to implement a permitting system is explicitly established in Annex 2 of the London Protocol. This approach builds confidence that the obligations are grounded in valid authority, eliminate overlap between different regulatory instruments and jurisdictions, and streamlines interactions with regulators by showing alignment with known frameworks.

Areas for improvement in Part II on Guidelines and permit assessment guidance | Several areas have been identified in Part II that could be improved. The guidelines should:

- Include a description should be provided for what information is required in the application form. Currently some sections do not provide any of the necessary additional clarity on what is required to complete the application form.
- Outline DCCEEW's expectations regarding the level of detail and information to meet those information requirements.
- Provide examples on what other background information may be useful for applicants for meeting DCCEEW's information requirements e.g. regarding modelling approaches, etc.
- Remove the procedural information in this section and relocated it to Section I as it is considered unnecessary in this section. Alternatively, procedural details could be published separately as a 'Sea Dumping Permit Procedure' and a 'Sea Dumping Guideline' to clearly outline the information relevant to permit decision-making.

Sensitive and technically complex information should be kept confidential with only a summary made available for public review | The obligation for applicants to publish Long-Term Management Plans, associated documentation, the granted permit, and ongoing reporting on a publicly accessible website is of concern. This material often contains sensitive and technically complex information that may be misinterpreted without appropriate subject matter expertise. Applicants would not reasonably anticipate such documents being made publicly available, and it is important that the government confirms whether this requirement is mandated by legislation. Rather a summary containing only non-sensitive information could be made available for public review.

Updated Sea Dumping Permit Application Form

Question 2: Does the updated application form clearly outline what proposed information is required to apply for a permit to sequester domestically sourced CO_2 offshore Australia under the Sea Dumping Act?

The Sea Dumping Permit should not duplicate the DOSF or other approvals | The detailed submission requirements for site selection closely mirror those in the DoSF application to NOPTA, an approval that precedes the sea dumping permit application. To streamline the process for prospective projects and reduce duplication of effort, for both applicants and government agencies, it is recommended that the DoSF application either fulfill this requirement directly or be submitted to DCCEEW as supporting evidence. Similarly, overlap exists with Environmental Approval applications. This duplication could be addressed by referencing relevant approvals within the Sea dumping permit application form, thereby simplifying the overall process

Engineering IAS should be removed from the Sea Dumping Permit Application | Certain IAS, referred to as 'Engineering IAS', have been removed from the NAL as they do not pose risks to human health or the marine environment. This aligns with the scope of the London Protocol. However, the permit application form still requires these Engineering IAS to be reported, and risk assessed as though they remain listed in the NAL. It is unclear if this means a permit could be rejected due to the presence of Engineering IAS, despite them being removed from the NAL. It

is recommended that Engineering IAS are removed from the application form for consistency and to eliminate confusion for both assessors and applicants.

The guidelines should not duplicate regulations for the disposal for IAS | The Application Form states that applicants must develop a plan to manage the disposal of removed or extracted IAS in accordance with other guidelines. It is understood that this requirement also falls under separate regulations and therefore should not be duplicated as part of the sea dumping permit.

The Application Form should allow for circumstances where a project proponent does not have oversight of the full CCS value chain | There appears to be an assumption that all applicants will have full oversight and control over entire CCS chain from capture through to storage. This is most evident in the requirement for a waste prevention audit and waste management options assessment. In the case of a multi-user CCS hub, the customers (domestic or international) will conduct their relative assessment of different greenhouse gas reduction and prevention techniques options for their parts of the CCS-hub. Accordingly, this section should be revised to reflect circumstances where a project proponent does not have oversight of the full CCS value chain.

Question 3: Does the updated application form provide enough information to inform your project planning in relation to potential or actual offshore CCS sea dumping activities?

Australian Energy Producers does not feel that the updated application form provides sufficient information for project planning. There appears to be much overlap between the form and other legislative requirements in different Acts that will be in agreed before this application is submitted. The form would benefit from clearly outlining how it would interact with the requirements of the OPGGSA and/or other state-based acts (i.e. pipeline licences, EPs etc).

Question 4: What further information, if any, would help improve the application form and clarify the proposed requirements?

Australian Energy Producers proposes the following be considered to improve the application form

Where referring to upper and lower levels, the application form should clearly state whether they relate to air or water | Tick boxes relating to upper and lower levels must explicitly state if it is referring to ‘air’ or ‘seawater’ to avoid confusion.

The form should only consider IAS that are included in the NAL | Australian Energy Producer recommends only focusing on items in the NAL that pose a health risk to humans or marine environments, rather than have applicants justify everything in the stream. Also, it should avoid requiring the applicant to provide additional details about the IAS, as these should have already been considered when the NAL levels were created.

The form should include provisions to add new emitters to a CCS hub | New emitters may sign up to a CCS hub during its lifetime and therefore a process is required for the retrospective addition of emitters to the sea dumping permit.