

Santos' CCS scam

Santos is trying to access Australia's small amount of climate funding to subsidise increased fossil fuel extraction through a highly polluting activity known as enhanced oil recovery (EOR) - a process Santos has been using continuously since the mid-1980s.

Numerous company documents show that Santos' Moomba CCS project includes EOR and Enhanced Gas Recovery (EGR).

The Emissions Reduction Fund Carbon Capture and Storage (CCS) Method explicitly excludes projects that include EOR and EGR. It is therefore unclear why Moomba has been registered under the ERF.

Discussion paper

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Summary

The Federal Government recently made changes to Australia's Emissions Reduction Fund (ERF) legislation, enabling carbon capture and storage (CCS) projects to be registered as carbon credit projects. Oil and gas company Santos immediately announced it would register its Moomba CCS project, linked to the company's long-running operations in outback South Australia's Cooper Basin, under the CCS method.

The Minister for Industry, Energy and Emissions Reduction, Angus Taylor, made it clear publicly that he expected the Santos project be able to generate carbon credits (before the proposed method had even been finalised by the Clean Energy Regulator (CER), and long before the CER had made a decision on the eligibility of the Moomba project itself).

On 2 November 2021 at the COP26 UN Climate Change Conference, a Santos Moomba CCS model was put on display at the official Australian pavilion and Minister Taylor issued a media release announcing that the \$220 million Moomba CCS hub was the first project of its kind to be registered under the Government's ERF. The following day Minister Taylor and Santos CEO Kevin Gallagher held a joint press conference in front of the model announcing the project would be eligible for ERF funding.

Despite the abundant premature enthusiasm from both the government and Santos, it is not clear from publicly available documents that Santos' Moomba project complies with the eligibility requirements of the ERF CCS method.

Santos has stated repeatedly that CCS at Moomba is for enhanced oil recovery (EOR), a process that involves injecting carbon dioxide (CO₂) into depleted oil and gas fields to extract more oil and gas.

Santos company documents show that it has been using EOR since the 1980s, and specifically using CO₂ in the Cooper Basin since 2008. EOR is a "foundation" of the "Santos CCUS Vision" (where the 'U' stands for use). The company's publicly available presentations emphasise the role of EOR as the focus of the project, with storage for environmental purposes an afterthought.

Furthermore, the Moomba project documents on which South Australian Government approval is based also make clear that the project includes "enhanced hydrocarbon recovery" (storage of CO₂ for environmental purposes occurs only after EOR activities are completed).

However, while the Moomba CCS project has been approved by the South Australian Government with the understanding that it will include enhanced hydrocarbon recovery

activities, its subsequent registration under the ERF is on the basis that it *won't* include enhanced hydrocarbon recovery activities.

The CCS methodology determination that the CER used to assess the Moomba project unequivocally excludes enhanced hydrocarbon recovery (HER), including enhanced oil recovery or enhanced gas recovery (which is a similar process for extracting additional gas from depleted fields):

(3) To avoid doubt, ...the following is [not] a carbon capture and storage project:

(a) a project that involves or includes the injection of greenhouse gases into a storage site which has the effect of enhanced oil, gas or hydrocarbon recovery.

Excluding enhanced hydrocarbon recovery from the method is necessary because these projects are used to increase fossil fuel production, and therefore increase overall emissions, not reduce them. To be credited under an ERF method, a project must represent a real reduction in emissions.

In light of this explicit exclusion, it is not clear why Santos' Moomba project has been approved considering years of EOR operations and EOR planning for this project, as evidenced in Santos documents.

Santos has not explained how or if the Moomba project could be repurposed to exclude EOR. Instead, it has simply stopped talking about EOR. Public pronouncements now rarely mention it and references to "CCUS" have been replaced with "CCS".

Further, Minister Taylor claims to be unaware of any such plans by Santos.¹ The government and public officials more broadly are similarly cagey (or alarmingly unaware) of the presence of enhanced oil recovery generally in Australia, recently stating that "EOR is not currently undertaken in Australia" in commentary on changes to the National Greenhouse and Energy Reporting (NGER) scheme. NGERs was only recently expanded to account for fugitive emissions from EOR. If the government was unaware EOR was occurring, fugitive emissions may not have ever been measured or reported in Australia before now.

It is not clear how, nor has the Clean Energy Regulator given any justification, that the Santos Moomba project meets the eligibility criteria of the ERF CCS method. The inability or unwillingness by Santos, Minister Taylor and DISER to discuss either EOR or the Moomba project represents, at best, ignorance of the project and the relevant legislation. At worst, this could become yet another Australian climate policy scandal.

¹ Sky News (8 June 2020) Carbon capture technology 'strongly supported' globally: Energy Minister, https://www.skynews.com.au/details/_6257858576001?cspt=1623134317%7C2f6291fdca57ea6300e84bde62041cd1

The Australia Institute recommends that enhanced hydrocarbon recovery projects be explicitly prohibited from being able to register under any Emissions Reduction Fund method (including the forthcoming carbon capture, use and storage method) and therefore be ineligible for receiving ERF funds for increasing fossil fuel production. A simple and effective way to do this is to require the Chief Financial Officer of the proponent company to sign a *Statement of Activity Intent* certifying that the project does not and will not include or involve enhanced hydrocarbon recovery.

Furthermore, the Australia Institute recommends that enhanced hydrocarbon recovery projects be excluded from any current or future public CCS or CCUS funding, subsidies or grants.

RECOMMENDATIONS

- That the Chief Financial Officer, or another officer of the person who has the operational control over the facility, of the proponent company be required to sign *Statement of Activity Intent*, certifying that the project does not and will not include or involve enhanced hydrocarbon recovery. Giving false or misleading information or omitting material information should be a serious offence carrying penalties under the Criminal Code.
- The Australian Government has announced that it will be developing a carbon capture use and storage method under the Emissions Reduction Fund in 2022. The Australia Institute recommends that any enhanced hydrocarbon recovery project, or sub-projects therein, be explicitly ruled as ineligible to register under this method. Similarly, a *Statement of Activity Intent* should also be provided by project proponents registering under this method.
- Enhanced hydrocarbon recovery projects should be excluded from receiving any current or future public funding earmarked for carbon capture and/or storage and carbon capture, use and storage, such as the Carbon Capture, Use and Storage Development Fund, CCUS Hubs and Technologies program and Low Emissions Technology Commercialisation Fund.

Introduction

On 1 October 2021, Minister for Energy and Emissions Reduction Angus Taylor approved changes to Australia's Emissions Reduction Fund (ERF) legislation, the Federal Government's only fund dedicated to reducing greenhouse gas emissions, and announced a new carbon capture and storage (CCS) Emissions Reduction Fund (ERF) method.² The change meant CCS projects would be able to generate carbon credits that could be sold back to the government.³

Oil and gas company Santos immediately announced it would register its Moomba CCS project (linked to the company's long-running operations in outback South Australia, near the state's border with NSW and Queensland) under the newly created method.⁴

In June 2021, before the method had even been finalised, Minister Taylor made clear that he expected the Clean Energy Regulator (CER) to allow Santos to be registered under the scheme by the end of the year:

[The Moomba project] can be operating very soon. All they need to do is capture that CO₂ and put it back into the reservoir a few kilometres from here, which have held CO₂ for millions of years – so this is a very straightforward operation.

[Santos CEO] Kevin Gallagher is very confident about it. The economics work. They're very, very strong and that's why it's a very real project. It will need to be credited under our crediting mechanism – the ERF and we're well advanced and we expect to have that concluded by the end of this year and that will put the project to immediately proceed.⁵

The CER is the government body administering the ERF and is tasked with developing ERF methods, regulating ERF projects and issuing Australian Carbon Credit Units (ACCUs) to

² The Hon Angus Taylor MP (2021) *Media Release: New ERF method and 2022 priorities announced*, <https://www.minister.industry.gov.au/ministers/taylor/media-releases/new-erf-method-and-2022-priorities-announced>

³ Browne (2018) *Sunk costs: Carbon capture and storage will miss every target set for it*, <https://australiainstitute.org.au/report/sunk-costs-carbon-capture-and-storage-will-miss-every-target-set-for-it/>; Browne and Swann (2017) *Money for nothing*, <https://australiainstitute.org.au/report/money-for-nothing/>

⁴ Santos Ltd (2021) *Santos Welcomes CCS Method for Emissions Reduction Fund, Clearing the Way for Moomba CCS Project to apply for Registration*, <https://www.santos.com/news/santos-welcomes-ccs-method-for-emissions-reduction-fund-clearing-way-for-moomba-ccs-project-to-apply-for-registration/>

⁵ Sky News Business (8 June 2021) *Carbon capture technology 'strongly supported' globally: Energy Minister*, <https://www.skynews.com.au/business/carbon-capture-technology-strongly-supported-globally-energy-minister/video/6cdc92595b21158c2ce8a2a78fcf267d>

projects. The CER also buys back abatement generated by ERF projects. In this way public funding is given to private industry for reducing their emissions.

Comments like this from the Minister, preempting the decision to register the project, would undoubtedly place considerable pressure on the regulator to register the project.

The timing of the decision is revealing. The regulator's decision to register Santos under the methodology was made on 1 November 2021. The next day a branded model of the Santos Moomba CCS project controversially⁶ appeared at the Australian Government's official pavillion at the COP26 climate summit, providing a backdrop for Minister Taylor and Santos CEO Kevin Gallagher to announce the regulator's decision to register the project.⁷

Despite the project's registration, it is not clear from publicly available documents that Santos' Moomba project complies with the rules for generating ACCUs and therefore receiving funding from the ERF. To the Australia Institute's knowledge, there is no information in the public domain of how the decision was made. Santos has stated repeatedly that CCS at Moomba is for enhanced oil recovery (EOR), a process that involves injecting carbon dioxide (CO₂), into depleted oil and gas fields in order to extract more oil and gas than would be recoverable otherwise. EOR can increase the amount of oil recovered by up to 40 percent and extend the oil field's life by decades.⁸

The rules under which the CER assessed Santos' project specifically excludes EOR projects. This exclusion is necessary, because EOR projects are aimed at increasing fossil fuel production, and therefore increasing greenhouse emissions, not reducing them. To generate ACCUs, a project must represent a real reduction in emissions.

This report expands on these points and calls on the Clean Energy Regulator and the Minister for Energy and Emissions Reduction to provide a clear and robust justification as to how the Moomba CCS project meets the CCS method eligibility requirements. If the government is unable to do this, the only option that remains is to revoke Santos' registration.

⁶ Young (2021) *Australia criticised over prominence of fossil fuel company display at COP26 stall*, <https://www.sbs.com.au/news/australia-criticised-over-prominence-of-fossil-fuel-company-display-at-cop26-stall/7d385b4d-74d2-41e1-804d-69c7ebd6ddfb>

⁷ The Hon Angus Taylor MP & Minister for Industry, Energy and Emissions Reduction (2021) *Australia's first CCS hub to be operational by 2024*, <https://www.minister.industry.gov.au/ministers/taylor/media-releases/australias-first-ccs-hub-be-operational-2024>

⁸ United States Government, Office of Fossil Energy and Carbon management (2021) *Enhanced Oil Recovery*, <https://www.energy.gov/fecm/science-innovation/oil-gas-research/enhanced-oil-recovery>

Enhanced oil recovery at Moomba

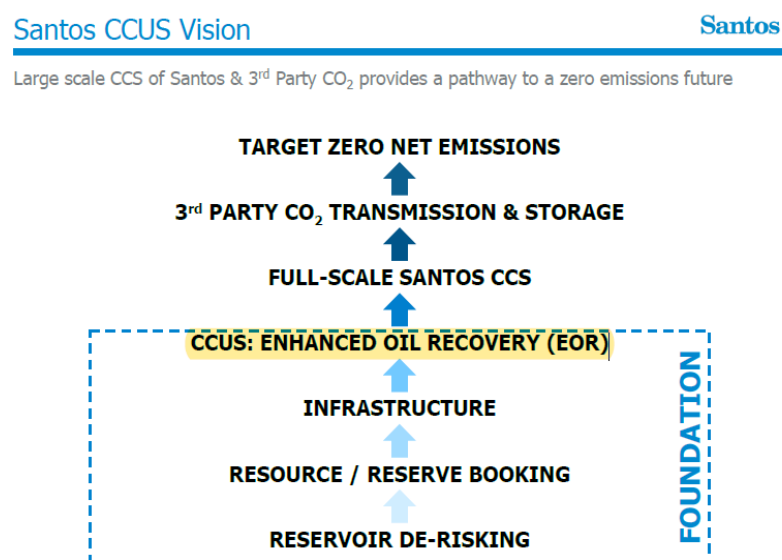
EOR IN SANTOS DOCUMENTS

In its 2019 Climate Report, Santos openly describes its Moomba CCS project as an EOR project:

Santos is actively pursuing a project to capture CO₂ emissions from the Moomba processing plant and inject it into Cooper Basin oil reservoirs **to enhance oil production from these reservoirs**. In September 2018, Santos announced a dedicated appraisal program to test the potential for CO₂ injection. The work we are doing on this project could result in the development of **Australia's first commercial-scale use of carbon capture, utilisation and storage for enhanced oil recovery** and contribute to a significant reduction in Santos' CO₂ emissions in the Cooper Basin [Emphasis added].⁹

This builds on Santos' wider "vision" for CCS plans in the Cooper Basin, of which EOR is a "foundation",¹⁰ as shown in Figure 1 below:

Figure 1: Santos presentation to South Australian Department for Energy and Mining



Source: Santos (2018) *Cooper/Eromanga Basins CCUS DEM 2018 Oil and Gas Roundtable*

⁹ Santos (2019) *Climate Change Report 2019*, P.23, <https://www.santos.com/wp-content/uploads/2020/02/2019-climate-change-report.pdf>

¹⁰ Santos Ltd (2018) *Santos Cooper/Eromanga Basins CCUS DEM 2018 Oil and Gas Roundtable*, p.1, https://energymining.sa.gov.au/__data/assets/pdf_file/0011/335864/Christian_Winterfield_-_Santos.pdf

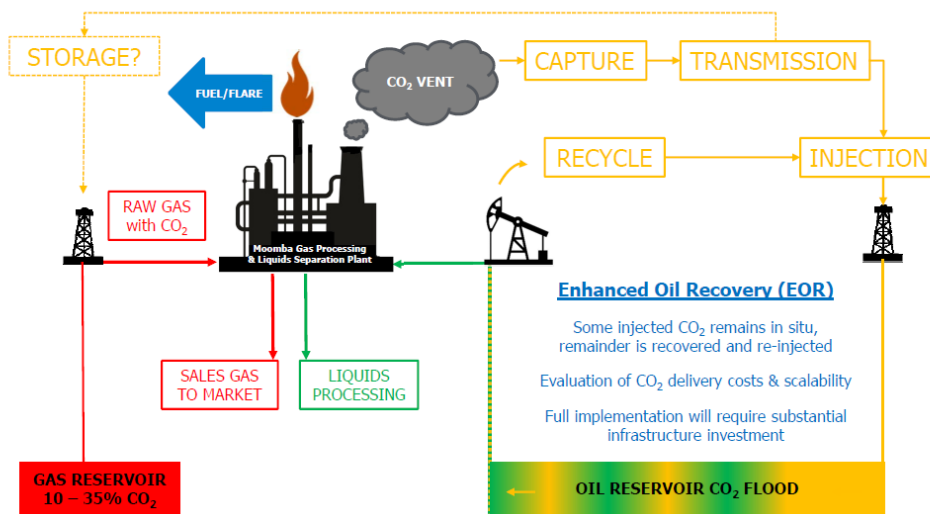
Santos' presentation to the SA Government's Department for Energy and Mining (DEM) in 2018 make it abundantly clear that "Santos' Cooper/Eromanga Basin asset is well positioned to develop CCS with EOR". EOR is a fundamental "target" of the Moomba project, in order to extract maximum production out of its "mature oil fields". The presentation's schematic diagram shown in Figure 2 emphasises EOR, while storage of CO₂ is included with a question mark.

Figure 2: Santos presentation to South Australia Department for Energy & Mining

Cooper Basin CCUS – simple schematic



Santos has a ready supply of reservoir CO₂ which is separated and vented at Moomba Gas Plant. The potential for this CO₂ to be used for a CCUS project is currently being evaluated.



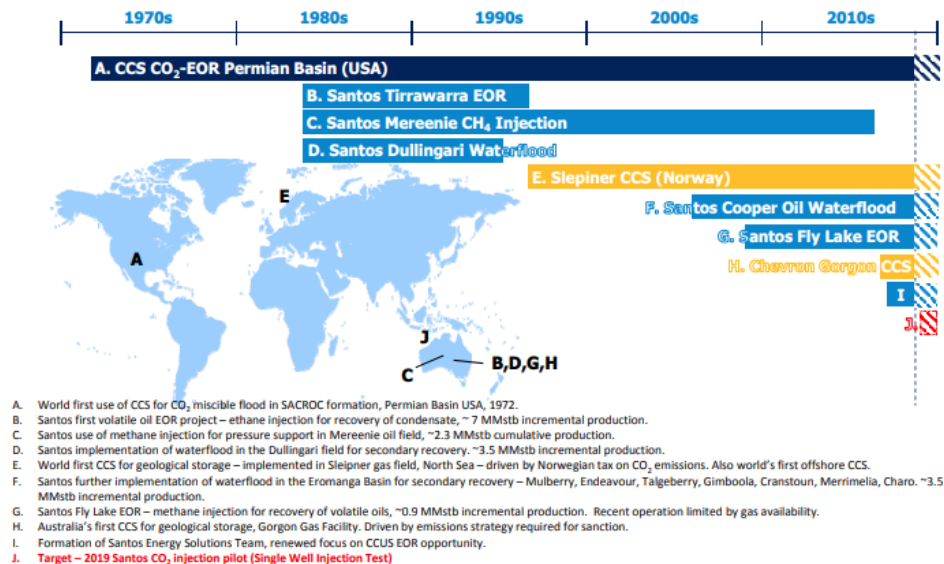
Source: Santos Ltd (2018) Santos Cooper/Eromanga Basins CCUS DEM 2018 Oil and Gas Roundtable,

Not only does Santos propose the EOR projects currently being prepared, but the same presentation also highlights that Santos has been operating enhanced recovery in the Cooper Basin continually since the mid-1980s. The light blue bars on the timeline in Figure 3 below show the duration of Santos EOR activities in various Cooper basin oil and gas reservoirs:

Figure 3: Santos presentation to South Australia Department for Energy & Mining

Carbon Capture, Utilisation and Storage History

Santos EOR History in relation to Australian and global milestones.



Source: Santos (2018) Cooper/Eromanga Basins CCUS, DEM 2018 Oil and Gas Roundtable

Figure 3 shows that Santos has been conducting EOR projects in Australia since the 1980s. These initial projects used ethane, methane or water for enhanced recovery. Use of carbon dioxide began in 2008:

Since 2008 Santos has injected >50kt of CO₂ into the Cooper Basin reservoirs at Fly Creek as part of a raw gas injection scheme for enhanced oil recovery.¹¹

The late 2010s saw the “formation of Santos Energy Solutions Team [with] renewed focus on CCUS EOR opportunity”, as shown in Figure 3 above (see footnote ‘i’).

The South Australian Government used Santos’ 2021 *Environment Impact Report: Carbon Storage* (EIR) as the basis for its decision to approve the Moomba Carbon Storage project. The South Australian Government approved the project that is described in that document in April 2021 without public consultation. The EIR is clear that the project includes

¹¹ Winterfield (2020) Santos Energy Solutions - Moomba CCS Project; 2020 Roundtable for oil and gas - 30 November 2020, https://www.petroleum.sa.gov.au/media/shared/pdf/petroleum/roundtable/roundtable_meetings/roundtable-meeting-2020/Winterfield-Christian-Moomba-CCS-Project-2020-Roundtable-for-Oil-and-Gas-Final.pdf

“enhanced hydrocarbon recovery”, which, as noted above, includes both enhanced oil recovery and enhanced gas recovery:

Carbon storage is the sequestration of CO₂ in geological formations and is the final stage in carbon capture and storage (CCS). This process will involve the capture of carbon emissions (CO₂) from industrial sources and injecting them into formations deep underground. Utilisation followed by storage has the additional step of using injected CO₂ for a specific beneficial purpose (such as enhanced hydrocarbon recovery) resulting in the subsidiary or consequential storage of this CO₂ in the geological formations.

...

This [Environmental Impact Report] (and the accompanying Statement of Environmental Objectives (SEO)) specifically cover operations for carbon storage which is defined as the storage of measurable quantities of CO₂ in subsurface geological formations. This also may include carbon storage following the cessation of EOR activities.¹²

This statement makes it clear that storage of CO₂ for environmental purposes occurs only after EOR activities are completed. Santos explains the enhanced hydrocarbon activities are already approved under previous South Australian Government approvals:

The following activities, including, but not limited to CO₂ capture, treatment, transmission and injection (including **utilisation for enhanced hydrocarbon recovery**), are addressed in the Santos Drilling, Completions and Well Operations (DCWO) EIR and SEO (Santos 2015a and 2015b) and the Production and Processing Operations (PPO) EIR and SEO (Santos 2017a and 2017b):¹³

The documents referred to are the Environmental Impact Report (EIR) and Statement of Environmental Objectives (SEO) that Santos was required to prepare for the South Australian Government when applying for approval of the Drilling, Completion and Well Operations (DCWO) activities, and Production and Processing Operations (PPO) referred to above. The activities in described in these documents have now been approved by the South Australian Government.

If Santos received approval from the South Australian Government on the of its enhanced hydrocarbon activities, the question could be asked whether this approval is still valid if Santos is suggesting it no longer intends to carry out EOR at Moomba.

¹² Santos (March 2021) South Australia – Moomba, Environmental Impact Report: Carbon Storage, p.1, <https://sarigbasis.pir.sa.gov.au/WebtopEw/ws/samref/sarig1/image/DDD/PGER003212021.pdf>

¹³ ibid

MOOMBA IS AN EOR PROJECT

The Moomba project described above has been approved by the South Australian Government with the understanding that it will include enhanced hydrocarbon recovery activities, *and* subsequently registered under the ERF with the understanding that it *won't* include enhanced hydrocarbon recovery activities.

Santos has publicly stated that it has been 'consulting' with DISER on the proposed CCS ERF method since March 2020.¹⁴

In October 2021, the company was finally able to announce commencement of registration under the ERF method it co-designed with the government. Santos makes no mention of removing or reducing EOR activities from the Moomba project. Doing so would undermine the "foundation" of the company's "vision" for CCS and be contrary to the project as approved by the SA Government.

Santos welcomes the Federal Government's release of the carbon capture and storage (CCS) method for the Emissions Reduction Fund and will today commence the process to apply to register our Moomba CCS Project with the Clean Energy Regulator and generate Australian Carbon Credit Units (ACCUs).

Santos' A\$210 million Moomba CCS Project will be one of the biggest in the world and will safely and permanently store 1.7 million tonnes of carbon dioxide per year in the same reservoirs that held oil and gas in place for tens of millions of years.¹⁵

The ERF method for CCS excludes "a project that involves or includes" any kind of enhanced hydrocarbon recovery. The Moomba CCS project clearly includes enhanced hydrocarbon recovery, so any activity that is part of this project should never have been eligible for to be registered under the ERF.

¹⁴ Santos (2020) Santos welcomes \$1.9 billion technology-neutral investment to reduce carbon emissions, <https://www.santos.com/news/santos-welcomes-1-9-billion-technology-neutral-investment-to-reduce-carbon-emissions/>

¹⁵ Santos Ltd (2021) Santos Welcomes CCS Method for Emissions Reduction Fund, Clearing the Way for Moomba CCS Project to apply for Registration, <https://www.santos.com/news/santos-welcomes-ccs-method-for-emissions-reduction-fund-clearing-way-for-moomba-ccs-project-to-apply-for-registration/>

Relevant legislation

The ERF is governed by the *Carbon Credits (Carbon Farming Initiative) Act 2011*.¹⁶ The *Offsets Integrity Standards* under Section 133 of the of the Act are designed to ensure that ERF methods “represent real emissions reductions that may be counted towards meeting Australia’s international emissions reduction obligations”. They require that abatement from methods be genuinely additional, measurable, and verifiable and that calculation is conservative.¹⁷

Approved methods for generating ACCUs are developed by the Clean Energy Regulator (CER) in consultation or “co-design” with industry, and then reviewed by the Emissions Reduction Assurance Committee (ERAC). The method must be approved by the Minister for Energy and Emissions Reduction following advice from the ERAC.

As mentioned above, Minister Taylor recently approved the CCS method, adding it to over 30 other ERF methods, mostly in vegetation and waste management. The final CCS method is close to the draft method, which was open for consultation until July 27, 2021. The Australia Institute was critical of the draft method citing reasons including the integrity of the process, inadequate coverage of the risk of long-term leakage and not requiring any long-term monitoring.¹⁸

The Australia Institute supported the exclusion of enhanced hydrocarbon recovery (including enhanced oil recovery or enhanced gas recovery) in the draft method. This exclusion remains in Section 7(3)(a) of the final methodology determination:

(3) To avoid doubt, ...the following is [not] a carbon capture and storage project:

(a) a project that involves or includes the injection of greenhouse gases into a storage site which has the effect of enhanced oil, gas or hydrocarbon recovery.¹⁹

¹⁶ Parliament of Australia, Federal Register of Legislation (2020) *Carbon Credits (Carbon Farming Initiative) Act 2011*, <https://www.legislation.gov.au/Details/C2020C00281>

¹⁷ Australian Government, Clean Energy Regulator (2021) *Emissions Reduction Assurance Committee Information Paper: Committee considerations for interpreting the Emissions Reduction Fund’s offsets integrity standards*, <http://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Information%20Paper%20on%20the%20Offsets%20Integrity%20Standards.pdf>

¹⁸ Ogge (2021) *Regulatory carbon capture Submission on the proposed methodology determination for Carbon Capture and Storage*, <https://consult.industry.gov.au/carbon-capture-and-storage-method/submissions/list>

¹⁹ Parliament of Australia, Federal Register of Legislation (2021) *Carbon Credits (Carbon Farming Initiative—Carbon Capture and Storage) Methodology Determination 2021*, <https://www.legislation.gov.au/Details/F2021L01379>

This stipulation is included in the methodology because allowing projects using EOR and EGR would mean the method would not meet the Offsets Integrity Standards, described above: the abatement could not be considered genuine and additional. While CCS for EOR projects may sequester some CO₂, emissions over the life of the project are increased.

It is important to note that the methodology excludes not only overt EOR projects, but also projects *that include* EOR/EGR. With this in mind, it remains entirely unclear how the Moomba CCS project has met the eligibility requirements of the CCS method. Even if the Moomba CCS project itself is not EOR or EGR, it appears to be part of a bigger development that is.

Attempting to present one activity in isolation from the overall project that clearly includes EOR and EGR is disingenuous. Neither the CER or Minister Taylor have provided any evidence or justification of how the Moomba project meets the CCS method eligibility requirements.

Statement of Activity Intent

A simple way to ensure that enhanced hydrocarbon projects do not receive ERF funding is to require a *Statement of Activity Intent*, similar to that required under the ERF Facilities Method.²⁰

Under the Facilities Method, the Chief Financial Officer (CFO) of the company applying for ERF registration is required to sign a statement certifying that the project:

would not be (or would not have been) implemented at the facility during the crediting period for the project in the absence of a declaration of the project as an eligible offsets project.²¹

This statement helps ensure emissions reductions are genuinely additional by guarding against companies attempting to receive credits for emissions reductions that would have happened anyway. Giving false or misleading information or omitting material information is a serious offence and carries penalties under the Criminal Code.

A similar statement should be required for the CCS method requiring the company's CFO or similar representative to certify that the project will not at any time include or involve any type of enhanced hydrocarbon recovery.

This would not add any cost or administrative burden to the proponents. It would simply safeguard against companies falsely registering projects that were intended to include or involve enhanced hydrocarbon recovery at some point in the future, and avoid the risk of public funds being spent on ERF projects that produce far more emissions than they store.

²⁰ Australian Government, Clean Energy Regulator (2021) *Facilities method*, <http://www.cleanenergyregulator.gov.au/ERF/Choosing-a-project-type/Opportunities-for-industry/facility-methods/facilities-method>

²¹ Australian Government, Clean Energy Regulator (2015) *Statement of Activity Intent under Carbon Credits (Carbon Farming Initiative – Facilities) Methodology Determination 2015*, <http://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/ERF%20Facilities%20Method%20-%20Statement%20of%20Activity%20Intent.pdf>

Lifecycle emissions of EOR

Although some of the CO₂ injected for EOR may remain underground, overall, the practice leads to a net increase in emissions due to the emissions from combustion of the additional fuel extracted.

The most detailed study of the ability to store carbon geologically for a significant period, which also involved EOR, was the IEAGHG Weyburn CO₂ Monitoring and Storage Project in Canada. This \$80 million project is the worlds “largest, full scale, in-field [CCS] Measurement, Monitoring and Verification study with EOR.”²² The project was an International Energy Agency (IEA) project, sponsored by the Canadian and US Governments, the European Community and several oil and gas multinationals including BP, Total, Shell and Chevron, with research provided by range of US, Canadian and European universities and research institutions.²³ The then US Secretary of Energy said of the project:

The Weyburn-Midale Project will provide policymakers, the energy industry, and the general public with reliable information about industrial carbon sequestration and enhanced oil recovery.²⁴

The project involved injecting CO₂ into the Weyburn and Midale oil fields near Midale in Saskatchewan for EOR, with monitoring to determine how much CO₂ could be stored. Rather than theoretical assumptions, the project actually measured the amount of CO₂ injected and the amount of oil produced as a result of EOR.²⁵

Figure 4 below shows operating statistics from the project, which included the amount of CO₂ injected over a ten-year period, and the amount of additional (incremental) oil produced. It also includes projections of the total amount of CO₂ that was expected to be stored over the 30-year life of the two projects (that began five years apart), and the “projected total incremental oil recovery due to CO₂,” which is the amount of additional oil that expected to be produced as a result the EOR activities.

These projections are highlighted with the red boxes in Figure 3 below. This demonstrates how much additional oil is produced per tonne of CO₂ stored, and is important because if

²² Petroleum Technology Research Centre (PTRC) (n.d.) *The World's Largest CO₂ Storage Research Project with EOR*, <https://www.cslforum.org/cslf/sites/default/files/documents/IEAGHGWeyburnProjectPoster0307.pdf>

²³ IEA Greenhouse Gas R&D Program (Unknown) *IEA GHG Weyburn CO₂ Monitoring & Storage Project*, https://ieaghg.org/docs/general_publications/weyburn.pdf

²⁴ Petroleum Technology Research Centre (PTRC) (n.d.) *The World's Largest CO₂ Storage Research Project with EOR*

²⁵ McGlade (2019) *Can CO₂-EOR really provide carbon-negative oil?*, <https://www.iea.org/commentaries/can-co2-eor-really-provide-carbon-negative-oil>

EOR results in more emissions from the extra oil it produces in relation to the emissions it stores, then it is increasing rather than reducing emissions.

Figure 4 shows that combined, the Weyburn and Midale fields would store 34.5 million tonnes of CO₂ over the 30-year project life and produce 215 million barrels of additional oil through EOR from the CO₂ injection.²⁶

Figure 4: Weyburn and Midale CO₂-EOR Operating Statistics

	Weyburn (EnCana)	Midale (Apache)
Start of CO₂ injection / duration	2000 / 30 years	2005 / 30 years
Injection pressure	10 - 11 MPa (1450 - 1600 psi)	
Daily injection rate of fresh CO₂	6,500 t/d (125 MMscf/d)	1,250 t/d (25 MMscf/d)
Recycle rate of CO₂ & produced gas	6,500 t/d (125 MMscf/d)	400 t/d (8 MMscf/d)
Total daily CO₂ injection rate	13,000 t/d (250 MMscf/d)	1,650 t/d (33 MMscf/d)
Annual amount of fresh CO₂ injected	2.4 million tonnes	0.46 million tonnes
Total amount of fresh CO₂ injected to date	16.1 million tonnes (June 2010)	2.11 million tonnes (June 2010)
Incremental / total oil production	18,000 / 28,000 b/d	2,600 / 5,700 b/d
Projected total incremental oil recovery due to CO₂	155 million barrels	60 million barrels (17% OOIP)
CO₂ utilization factor	3 - 4 Mcf/b	2.3 Mcf/b
Projected amount of CO₂ stored at project completion	30+ million tonnes* (gross) 26+ million tonnes (net)	10+ million tonnes* (gross) 8.5+ million tonnes (net)
Total capital cost of EOR project	CAD\$1.3 billion	CAD\$475 million

June 2010

Source: Whittaker (2015) *CO₂EOR and Carbon Storage, with Case Example Form Weyburn Field*, https://ieaghg.org/docs/General_Docs/Summer_School_2015/03_IEAGHG_School_Whittaker_EORSECURED.pdf

The US EPA calculate CO₂ emissions from combustion of oil at 420 kg/ barrel,²⁷ however the lifecycle emissions from oil also include emissions produced in production, transport and processing. The total lifecycle emissions per barrel of oil have been estimated at around 500

²⁶ Whittaker (2015) *CO₂EOR and Carbon Storage, with Case Example Form Weyburn Field*, https://ieaghg.org/docs/General_Docs/Summer_School_2015/03_IEAGHG_School_Whittaker_EORSECURED.pdf

²⁷ United States Environmental Protection Agency (2020) *Greenhouse Gases Equivalencies Calculator - Calculations and References*, <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>

kg.²⁸ This means there would be approximately ***three tonnes of CO₂ emissions produced from the oil for every tonne of CO₂ stored.***

²⁸ Azzolina et al (2016) *How green is my oil? A detailed look at greenhouse gas accounting for CO₂-enhanced oil recovery (CO₂-EOR) sites*, <https://www.sciencedirect.com/science/article/pii/S1750583616302985#bib0140>

Awareness of EOR at Moomba

MINISTER TAYLOR AND SANTOS

Public documentation has clearly demonstrated that Santos' Moomba CCS project is based around EOR. Basic due diligence by the Clean Energy Regulator prior to registering Moomba under the ERF would have revealed this.

Minister Taylor was asked directly in a Sky News interview at the Santos Moomba site whether the project would include EOR:

Journalist: Do you seek guarantees that it won't be used for [enhanced recovery]?

Minister Taylor: Well, there's no plan to do that here...²⁹

Minister Taylor's apparent unawareness of Santos' long-stated and approved plans for EOR could be partly due to the company's change in messaging. Santos has avoided mentioning EOR in recent public pronouncements on the Moomba CCS project. Public comment by the company now mainly refers to CCS, not CCUS, which would include 'use' of CO₂ for EOR.³⁰ Presentations about the project formerly centred on CCUS, even including it in the title, but presentations from late 2020 refer only to CCS.³¹

This change in messaging is so far unexplained. Santos has offered no public discussion of if and how the Moomba project is significantly different enough from initial plans that it is now eligible to be registered under the ERF.

²⁹ Sky News (8 June 2020) Carbon capture technology 'strongly supported' globally: Energy Minister, https://www.skynews.com.au/details/_6257858576001?cspt=1623134317%7C2f6291fdca57ea6300e84bde62041cd1

³⁰ Santos Ltd (2021) *Santos welcomes CCS and hydrogen focus*, <https://www.santos.com/wp-content/uploads/2021/04/210421-Release-Santos-welcomes-CCS-and-hydrogen-focus.pdf>, Santos Ltd (2021) *Moomba CCS Project boosted by \$15 Million Carbon Capture Use and Storage Fund*, <https://www.santos.com/news/moomba-ccs-project-boosted-by-a15-million-grant-from-carbon-capture-use-and-storage-development-fund/>

³¹ Compare 2018 and 2020 presentations: Santos Ltd (2018) *Santos Cooper/Eromanga Basins CCUS DEM 2018 Oil and Gas Roundtable*, https://energymining.sa.gov.au/__data/assets/pdf_file/0011/335864/Christian_Winterfield_-_Santos.pdf; Winterfield (2020) *Santos Energy Solutions - Moomba CCS Project; 2020 Roundtable for oil and gas - 30 November 2020*, https://www.petroleum.sa.gov.au/media/shared/pdf/petroleum/roundtable/roundtable_meetings/roundtable-meeting-2020/Winterfield-Christian-Moomba-CCS-Project-2020-Roundtable-for-Oil-and-Gas-Final.pdf

In June 2021 Minister Taylor announced that the Santos would be given a grant of \$15 million “towards the low-cost capture and storage of CO₂ emitted from Santos’s Moomba LNG operations” from the government’s Carbon Capture Use and Storage Development Fund.³² It is difficult to see how a grant explicitly awarded to Santos for carbon ‘use’ could not be interpreted as for EOR. If Santos is not planning on EOR then this grant has been incorrectly awarded.

NATIONAL GREENHOUSE & ENERGY REPORTING SCHEME

Santos’ EOR operations and plans also seem to have gone unnoticed by the Federal Government’s Department of Industry, Science, Energy and Resources (DISER). Whether this is wilful ignorance or a lack of due diligence by public officials is unclear.

In May 2021 the Government introduced amendments to the National Greenhouse and Energy Reporting (NGER) scheme, which expanded on the method for measuring fugitive emissions from carbon capture and storage to also including measuring fugitive emissions (unintentional emissions releases during extraction and production) from EOR. NGERs is a national framework for reporting company information about greenhouse gas emissions, energy production and consumption.

In commentary on the proposed changes, DISER asserts that EOR does not occur in Australia:

While EOR is not currently undertaken in Australia, recent interest in the technology suggests it would be beneficial to establish the data collection arrangements necessary to reflect the activity in the national inventory should it occur in the future.³³ [Emphasis added]

...

The method is designed to allow for the reporting of transfers of CO₂ from capturing facilities to EOR sites, and to report losses during the transport and injection phases.

³² Santos Ltd (2021) *Moomba CCS Project boosted by \$15 Million Carbon Capture Use and Storage Fund*, <https://www.santos.com/news/moomba-ccs-project-boosted-by-a15-million-grant-from-carbon-capture-use-and-storage-development-fund/>

³³ Australian Government, Department of Industry, Science, Energy and Resources (2021) *National Greenhouse and Energy Reporting Scheme – 2021 Amendments Departmental commentary*, p.6, https://consult.industry.gov.au/climate-change/2021-nger/supporting_documents/2021%20NGER%20amendments%20Departmental%20commentary.pdf

Yet as noted in this paper, Santos has been operating EOR in Australia since the mid-1980s, and CO₂ injection since 2008. Given there has previously been no method for accounting for fugitive emissions from EOR, and the Commonwealth Government does not appear to have even been aware it has been occurring, this suggests that fugitive emissions from EOR may not have been measured or reported for over thirty years.

This is particularly concerning given two of the projects, Fly Lake and Mereenie, involve direct injection of methane, which have a global warming impact of around thirty times CO₂ over a 100-year period and around eighty times CO₂ over a 20-year period. As such, even a relatively small amount of methane escaping to the atmosphere could have a large climate impact. Methane emissions from the oil and gas industry were 23 million tonnes last year.³⁴ Methane emissions from the gas production have long been thought to be underestimated in Australia,³⁵ and recent field measurement have found emissions in the coal seam gas sector are two to three times higher per unit of gas than has previously been estimated.³⁶

EOR is far more complex than ordinary gas extraction, with many more opportunities for leakage. Additional gas is injected at high pressure into reservoirs that may have pathways for the gas to escape, either via natural pathways or via the 400 abandoned wells in the Cooper Basin.³⁷ Much of the gas returns to the surface and is then reinjected. Every part of the gas production process results in methane emissions without EOR. Further injection and extraction will result in more methane emissions. The question is just how much, and the answer is we have absolutely no idea.

EOR activities using methane without any accounting for emissions or oversight by the government could be very serious, and the Australia Institute recommends that they be investigated by the government as a matter of urgency.

³⁴ Australian Government, Department of Industry, Science, Energy and Resources (2021) *National Greenhouse Gas Inventory Quarterly Update: March 2021*, <https://www.industry.gov.au/data-and-publications/national-greenhouse-gas-inventory-quarterly-update-march-2021>

³⁵ Lafluer et al (2016) *A review of current and future methane emissions from Australian unconventional oil and gas production*, <https://www.climatecollege.unimelb.edu.au/review-current-and-future-methane-emissions-australian-unconventional-oil-and-gas-production>

³⁶ McCutcheon (2021) *Methane emissions higher than previous estimates in Queensland's Surat Basin CSG region*, <https://www.abc.net.au/news/2021-09-28/methane-emissions-higher-than-estimates-in-coal-seam-gas-region/100497292>

³⁷ Government of South Australia (2021) *PEPS SA, South Australia Data Exports, General Well Location and Details*, <https://peps.sa.gov.au/home>

Conclusion

A significant amount of publicly available evidence suggests that Santos' Moomba CCS project includes both EOR and EGR. Multiple company documents show Santos has not only been injecting CO₂ underground for EOR for decades, but that the Moomba CCS was originally envisaged as EOR, is approved as EOR, and that EOR is a foundation of Santos "CCUS vision."

The Clean Energy Regulator has correctly understood that if the CCS method were to allow projects that include EOR and EGR, the method would not meet the integrity standards of *Carbon Credits (Carbon Farming Initiative) Act 2011*, and so have expressly excluded these activities. This decision was endorsed by the ERAC and approved by the Minister.

It is the view of the Australia Institute that the Santos' Moomba CCS project does not meet the eligibility criteria of the CCS method, as it has been framed as an EOR project ever since its inception. It was approved by the South Australian Government on the basis that it was an EOR project (which possibly raises the question of whether the state approval is now valid). Santos has failed to provide evidence that the Moomba CCS project is in any way different from its original design (i.e. how it is now *not* CCUS). Neither the Clean Energy Regulator nor Minister Taylor have provided justification or evidence to demonstrate exactly how the Moomba project is eligible to be registered under the ERF's CCS method.

It remains unclear as to whether Minister Taylor's Department of Industry, Science, Energy and Resources (DISER) or the Clean Energy Regulator carried out any due diligence in relation to the history or nature of the Moomba project before registering it under the ERF. It also remains alarmingly unclear just how much understanding the Australian Government has of the presence and history of EOR in Australia. The inability or unwillingness by Santos, Minister Taylor and DISER to discuss either EOR or the Moomba project represents, at best, ignorance of the project and the relevant legislation. At worst, this could become yet another Australian climate policy scandal.

RECOMMENDATIONS

- That the Chief Financial Officer, or another officer of the person who has the operational control over the facility, of the proponent company be required to sign *Statement of Activity Intent*, certifying that the project does not and will not include or involve enhanced hydrocarbon recovery. Giving false or misleading information or omitting material information should be a serious offence carrying penalties under the Criminal Code.

- The Australian Government has announced that it will be developing a carbon capture use and storage method under the Emissions Reduction Fund in 2022. The Australia Institute recommends that any enhanced hydrocarbon recovery project, or sub-projects therein, be explicitly ruled as ineligible to register under this method. Similarly, a *Statement of Activity Intent* should also be provided by project proponents registering under this method.
- Enhanced hydrocarbon recovery projects should be excluded from receiving any current or future public funding earmarked for carbon capture and/or storage and carbon capture, use and storage, such as the Carbon Capture, Use and Storage Development Fund, CCUS Hubs and Technologies program and Low Emissions Technology Commercialisation Fund.