EMBER

Submission to the NSW Parliament inquiry into Net Zero

This report includes an analysis of the impact of coal mining on achieving the NSW legislated targets, and key policy recommendations that should be incorporated into a further evaluation of how to achieve an equitable reduction in coal mining emissions

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About Ember

Ember is an independent, not-for-profit energy think tank that aims to accelerate the clean energy transition with data and policy. It gathers, curates and analyses data on the global power sector and its impact on the climate, using cutting edge technologies and making data and research as open as possible. It uses data-driven insights to shift the conversation towards high impact policies and empower other advocates to do the same. Founded in the UK in 2020, its team of energy sector analysts are based in Australia, the EU, Asia and the UK.

Acknowledgement of Country

Ember acknowledges the Traditional Custodians of the many nations across Australia and their enduring connection to Country and the lands, seas and skies. We pay our respects to Elders past and present and extend that respect to all Indigenous Peoples today.

Executive Summary

Following significant investment in decarbonising the energy system across NSW, the coal mining sector now represents the biggest potential risk to achieving the state's legislated emission reduction goals. There are considerable opportunities to tackle the sector's current and future emissions growth, but this would require a new, proactive regulatory framework that would include efforts to:

1. *Ensure onsite mitigation is prioritised where technically feasible*
2. *Limit the expansion and extension of the coal mining sector*
3. *Ensure that emissions measurement and verification is in line with emerging best practice*
4. *Proactively initiate a phased approach to coal production restrictions in a manner that enables appropriate Just Transitions for affected workers.*

In order to facilitate this approach, Ember recommends that the NSW government request a specific, dedicated report from the Net Zero Commission on the risks that existing coal mine emissions, and ongoing expansions and extensions, may pose to NSW climate targets, to be completed by June 2025:

a. The report should NSW should include cost benefit analysis of additional regulatory measures to ensure that onsite mitigation is undertaken across coal mines in line with the state's emissions reduction requirements
b. It should also include advice on a coal sectoral target to drive emissions reduction in the coal sector.
c. It should also assess the potential risks associated with improved emissions measurement and monitoring that could significantly increase reported emissions across open cut coal mines in NSW
d. It should also include an exploration on the opportunity and value of adding additional MRV capacity to enable the NSW government to cross-check the emissions of coal mines across NSW and ensure that emissions reductions are in line with their stated targets.

Background

Ember welcomes the opportunity to make a submission to the NSW Parliament inquiry into Net Zero, especially in regards to the impact of coal mining emissions on the state's ability to achieve ambitious emissions reduction goals. The NSW Net Zero Commission's 2024 Annual Report highlights that the outsized Scope 1 impact of the coal mining sector's emissions represent an economy-wide emissions risk.

According to the Commission, we are now approximately half way towards achieving the state's 2030 targets, but the "increased emissions in the resources sector" poses a considerable impediment to their achievement. As a result, the Annual report warns that emissions from the coal mining sector "may require other sectors to make greater emissions reductions".

Considering that the coal mining sector contributes approximately 3.3% to the state economy's gross value added (GVA), and direct coal royalties have averaged around 2.4% of the government revenue over the last decade, Ember believes the oversized impact and potential economy-wide strain of the state's emissions are in need of urgent reconsideration.

Of the estimated 13.8 million tonnes of CO2-e that the resources sector released in 2022, the Commission noted that "ninety-nine per cent" of it came from coal mining - and that's before any of that coal was even burned.

Once it was, the global climate footprint of the state's coal was just shy of 450 million tonnes of CO2-e. To put that in context, that's a bigger global climate impact from our coal than the total greenhouse emissions of France.

For those scope 1 emissions released at coal mines in NSW, fugitive methane emissions vastly outsize even the emissions of our gigantic mining trucks. These greenhouse gases are released by the very act of digging into coal seams, releasing methane that has been embedded within the coal strata.

Currently the NSW government estimates that this might release the equivalent of about 360 thousand tonnes of methane each year. This then converts to 10 million tonnes of carbon dioxide equivalent when you consider its warming over the next century. However, there is also considerable evidence that this could be an understatement.

A diverse array of peer-reviewed satellite estimates have now identified considerably higher emissions from a range of underground and open cut coal mines across the state. According to a recent study from energy insights firm Reputex, company-led emissions reporting shifts on open cut coal mines over the last decade have consistently decreased

reported emissions by 65 – 70% after switching to site-specific estimates. This has potentially led to an unverified reporting reduction of 10.6 Mt CO2-e nation-wide, which is at odds with a significant body of satellite evidence. They note that this represents not only an emissions underreporting risk, but significant short term price risks for Australia's carbon credit market, as satellite evidence becomes increasingly hard to deny.

This reinforces the challenge and opportunity for the NSW government to proactively address coal mining emissions, before the challenges simply become too great. In this submission, we will outline how existing financial and regulatory incentive schemes have so far been unable to incentivise emissions mitigation in the coal mining sector, through a series of case studies on some of the state's highest emitting facilities. However, we also outline the considerable opportunities that the state has to implement a diverse array of industry-appropriate regulations that will enable material abatement, in parallel to existing federal regulations such as the Coal Mine Waste Gas (CMWG) method, and the Safeguard Mechanism.

Existing Regulatory Mechanisms

There are 42 active coal mines in NSW. Of these, 26 coal mines currently report to the Safeguard Mechanism under the Clean Energy Regulator. This represents one of the two existing regulatory frameworks that would act to incentivise emissions reductions in the sector. The other existing regulatory framework is the coal mine waste gas (CMWG) method, which is primarily focussed on displacing electricity demand from coal mines (scope 2) utilising wasted coal mine methane gas.

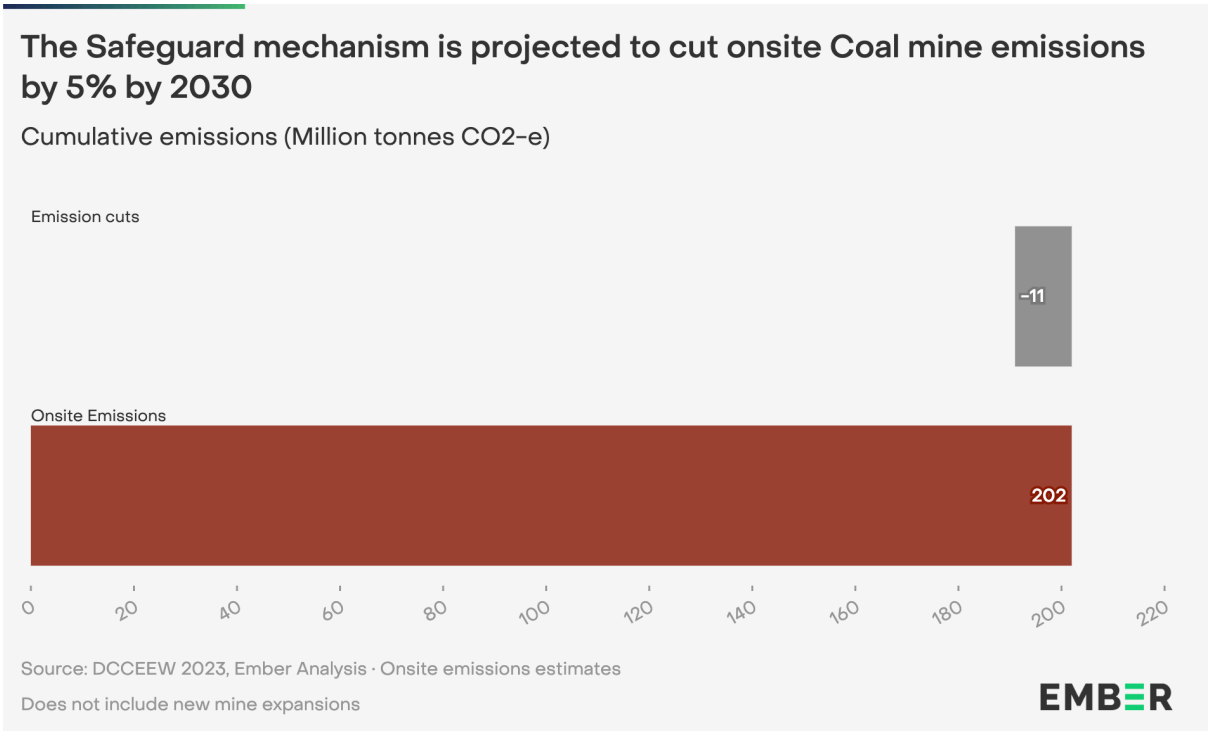
The Safeguard Mechanism

The reformed Safeguard Mechanism in Australia is designed to drive significant reductions in greenhouse gas emissions from the country's largest emitters, including coal mines. Under the revised framework, emissions baselines are established for high-emitting sectors, requiring operators to either reduce emissions to meet these baselines or purchase carbon credits to offset any excess emissions.

This provides a high array of flexibility for coal mines in meeting their emissions obligations, and if not partnered with regulatory reforms to prioritise onsite mitigation in line with the

objects of the Act, unlimited access to offsets may inadvertently reduce the incentives for mines to invest in onsite emissions mitigation technologies. This will considerably impact the ability of the Safeguard Mechanism to drive critical emissions reduction cuts on coal mines within NSW.

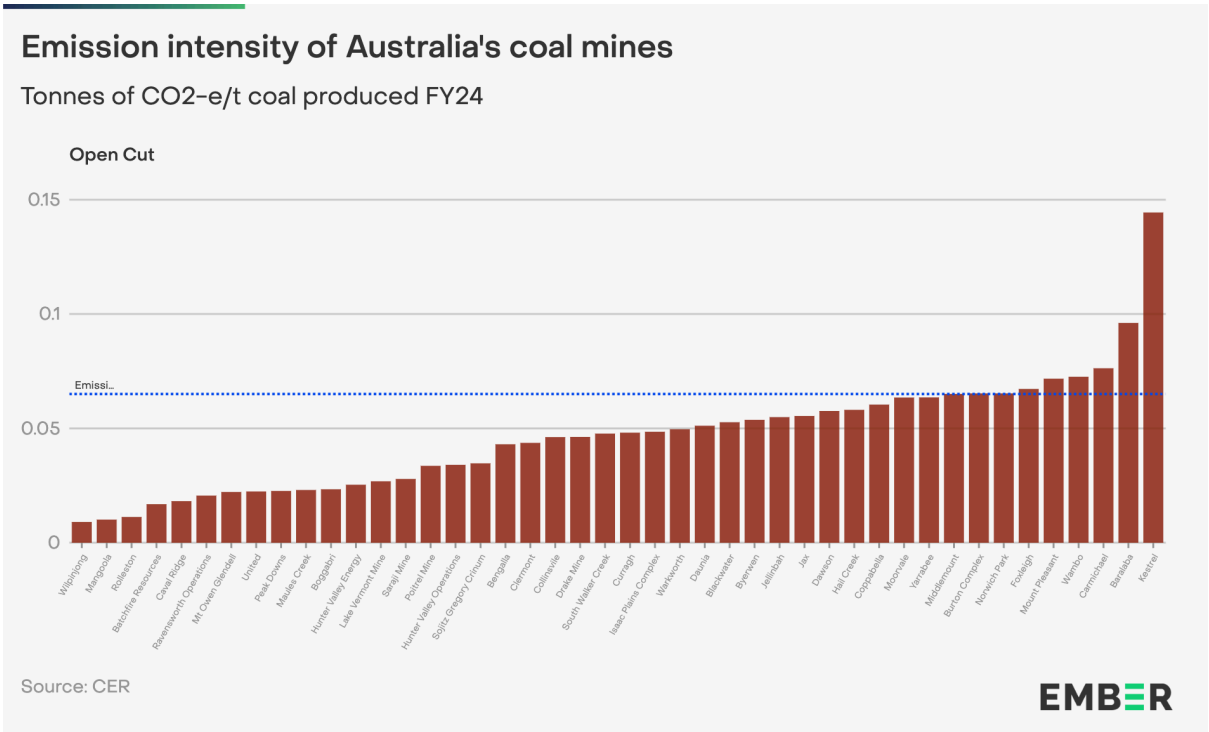
As a result, the Department of Climate Change, Energy, the Environment and Water estimated that the Safeguard Mechanism would only reduce cumulative onsite CO2-e emissions from the coal sector across Australia by 5% between now and 2030.



Another key limitation of the Safeguard mechanism, is its ability to incentivise mitigation across open cut coal mines. Due to its design of dynamically adjusted emissions baselines that progressively incorporate the sectoral average emissions intensity each year, it will have a much greater impact on facilities that fall above, rather than below the emissions intensity average. This will lead to significant reduction requirements on high emitting underground mines towards 2030, but may perversely reward lower emitting open cut mines per tonne of coal produced.

Our analysis of emissions intensity reporting for 2023-2024 indicates that the vast majority of open cut coal mines have reported emissions intensities well below the sectoral average.

Unless this is addressed in the planned Safeguard Mechanism review in 2026-2027, this will effectively mean that their Safeguard Mechanism obligations will progressively reward their production towards 2030. However, under existing regulatory incentives, the Safeguard Mechanism does not provide the adequate regulatory mechanism to reduce fugitive methane emissions, and that there will be an important role for state-led supplementary incentives and regulations focussed on requiring for direct onsite mitigation, on both underground and open cut coal mines.



The Coal Mine Waste Gas Method (CMWG)

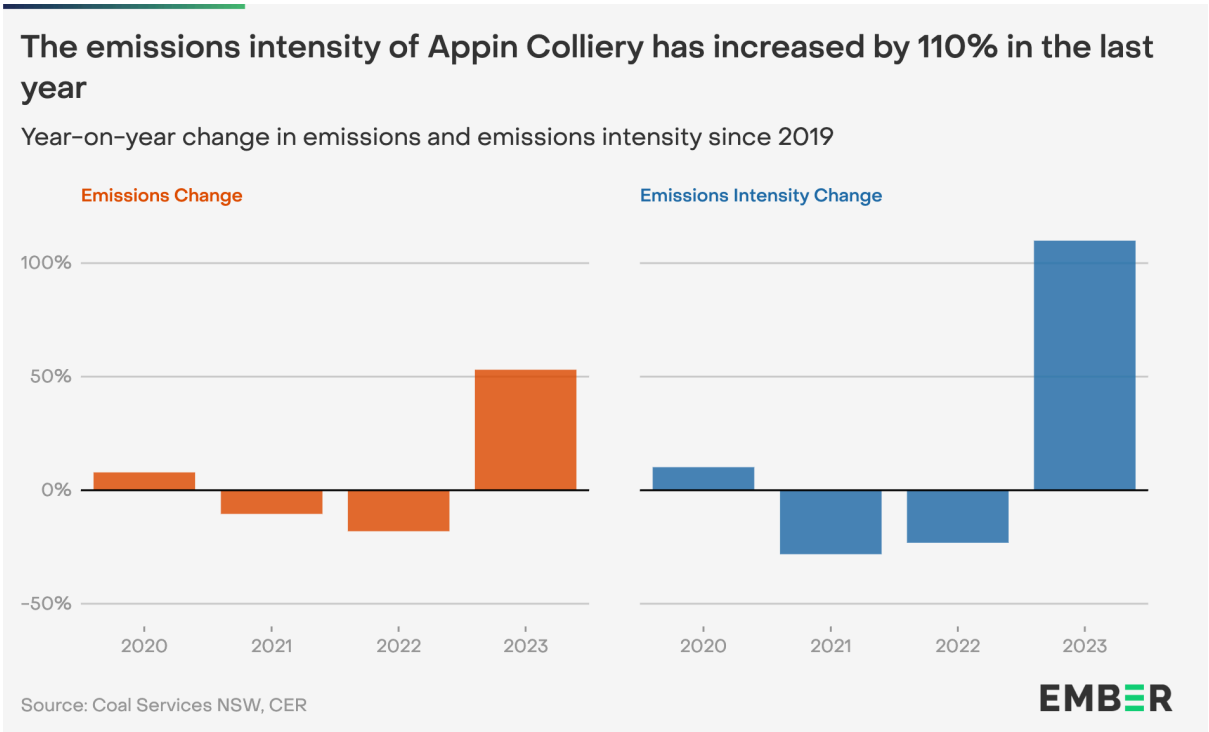
The CMWG is currently under review, but has played a significant role in incentivising mitigation of the coal sector's methane emissions since its inception in 2015. There are currently 15 registered projects nationally that have led to the mitigation of 2.78 million tonnes of CO2-e. The majority of these projects however are based in Queensland (10 projects) with a primary focus on electricity displacement utilizing fugitive methane gas at metallurgical coal mines that would otherwise be vented into the atmosphere or flared.

There are three electricity displacement and two flaring projects registered in New South Wales. This is a particularly valuable contribution to coal mine mitigation in the state, where a number of financing mechanisms such as the Coal Innovation fund and the Net Zero Industry and Innovation Program have had relatively little impact on progressing material abatement at coal mines beyond initial feasibility assessments. In this way, the CMWG method plays a complimentary role in addressing Scope 2 emissions associated with coal mining, alongside upfront funding and incentive mechanisms focussed on reducing direct, or Scope 1 emissions. This has however has had a far greater impact in QLD, where 10 of the 15 projects are currently registered.

Existing funding incentives are not driving reductions

In their pre-budget submission made this year, the Low Emissions Technology Australia (LETA) group advocated for greater focus and financial support for ventilation air methane mitigation. They noted that additional "financial incentives or subsidies could be offered to offset the initial costs of implementing these emissions reduction technologies, making them more accessible to mining operations."

In NSW however, financial incentives have not necessarily been the biggest inhibiting factor in expanding VAM mitigation. Coal Innovation NSW awarded a $15 million grant to establish a pilot VAM abatement project at what was South32's Illawarra mine (now Stanmore). The new owners have yet to confirm if this project will continue. When initiated, the project was intended to "help to encourage greater investment in, and uptake of, VAM abatement technologies to significantly reduce fugitive methane emissions from coal mining operations in NSW".



However, the currently proposed pilot initiative at Appin colliery comes off the back of a 5 year feasibility study funded by the Coal innovation fund, which has yet to result in tangible emissions reductions or broader industry take-up in NSW. While there are hopes that the program will mature to full implementation this year, the Appin coal mine continues to have the highest emissions intensity of any coal mine in Australia (0.639 t CO2-e/ROMt). As a pilot project, it is questionable whether or not the planned initiative will have a material impact in reducing onsite emissions.

Similarly, the NSW Net Zero Industry and Innovation Program has sought to incentivise mitigation financing across coal mines since 2021, and has yet to fund a single abatement project in the state. This is regardless of the 10 year successful track record that saw 2 million tonnes of CO2-e reduced from the Illawarra's West Cliff Mine.

It is also in contrast to three new funding announcements for coal abatement projects in QLD last year alone, under the Powering the Regions Fund, and the recently introduced Low Emissions Investment Partnership.

Feasible Mitigation is not being taken up

Tahmoor Colliery is a super-emitting underground coal mine located in Bargo. The mine has produced an average of 2.4 million tonnes of ROM coal over the last five years, but released close to 1 million tonnes of CO2-e in 2023 (992,938 t/CO2-e).

In the last financial year, the mine recorded an emissions intensity of 0.5454 t CO2-e/ROMt. This gives Tahmoor Colliery the **third highest emissions intensity of any mine in the country according to the CER, and is more than 8 times greater than the emissions intensity average** across the coal sector.

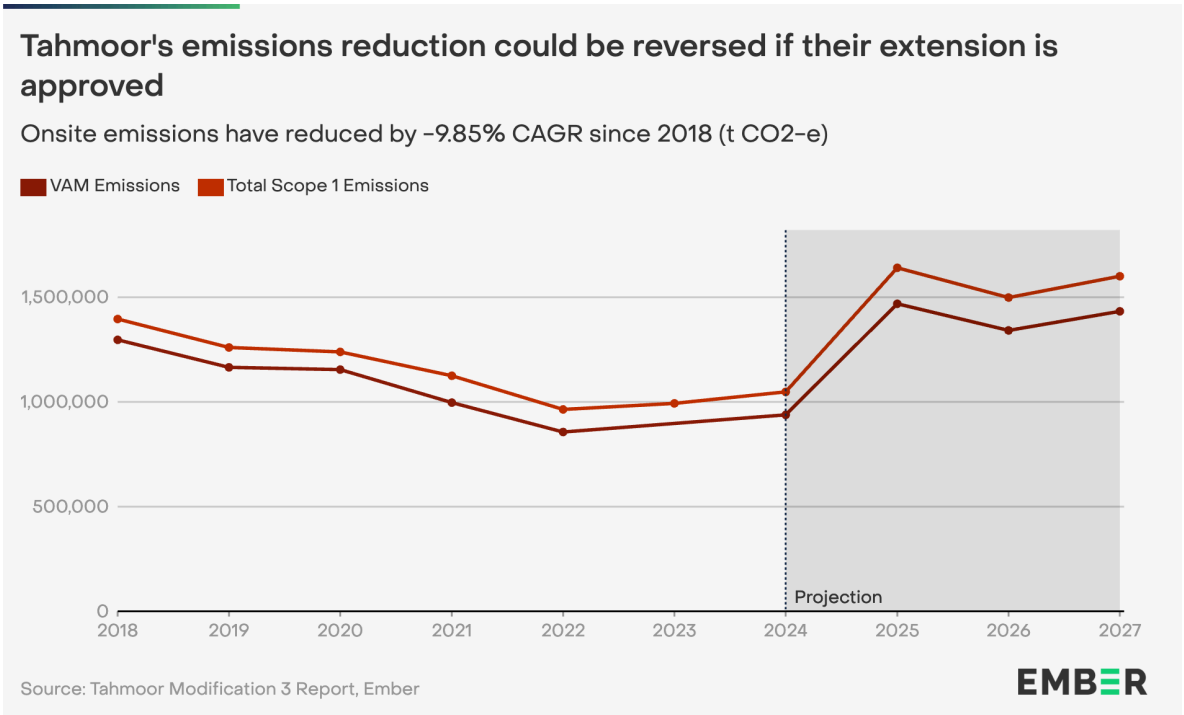
Currently, SIMEC has applied to modify and extend the existing mine. According to the company's own modelling, they expect that this will increase annual onsite emissions by 12% between now and FY2030 and potentially as high as 45% by FY2033, reaching 1.44 million tonnes of CO2-e. This increase in emissions is particularly problematic given the broader challenges that the NSW government faces in balancing sectoral emissions, which currently relies on company-led feasibility assessments of mitigation opportunities. In response to ongoing inquiries about mitigation opportunities, SIMEC has noted that "the Safeguard Mechanism will be the driving factor for implementing emission reductions at Tahmoor."

However, under the Safeguard Mechanism, Tahmoor's current emissions baseline is set at over 2 million tonnes of CO2-e, more than double its emissions in FY2023. This inflated baseline indicates that the Safeguard mechanism will not in fact drive emissions reductions in the short term.

SIMEC does additionally highlight that the Safeguard Mechanism not only "*does not require details of how emissions will be reduced, or include any assessment or authorisation of activities*", but notes there are no restrictions on how offsets may be incorporated in future emission reduction plans, nor limitations on if those offsets need to be contained within NSW.

Tahmoor's Extended Emissions Risk

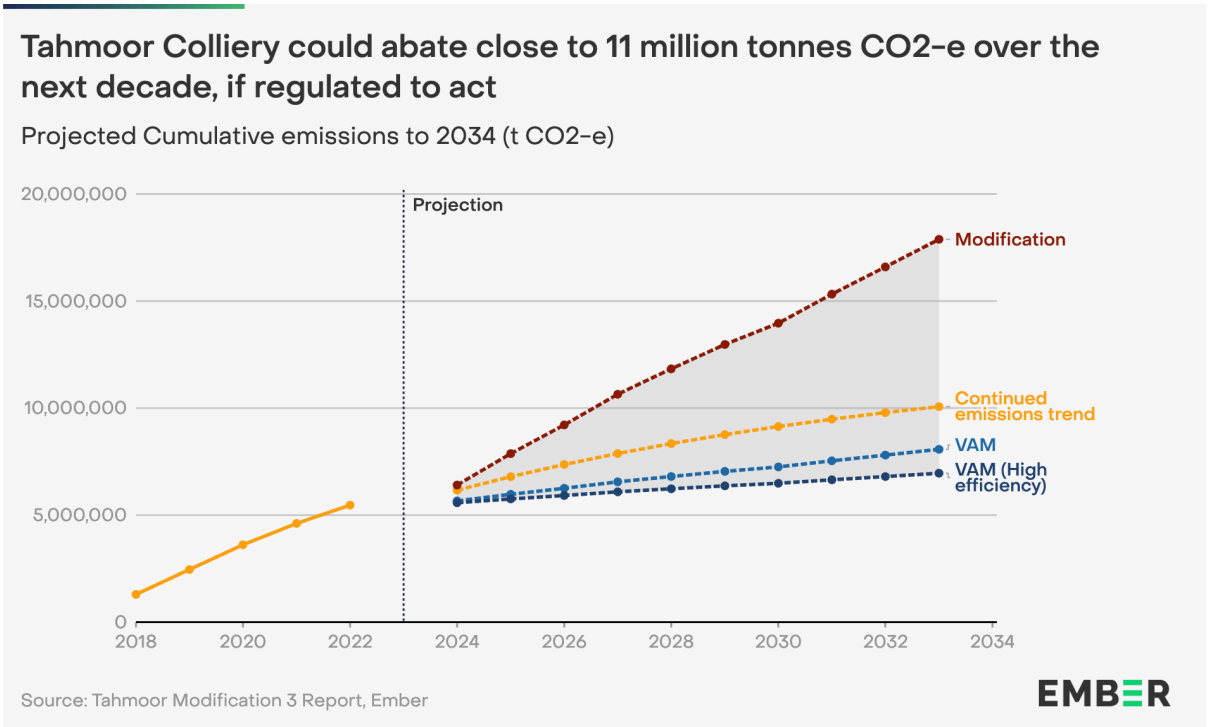
Over the past 5 years, Tahmoor's VAM emissions have actually declined, as efficiency improvements and mining location has changed, resulting in a 5-year compound annual growth rate (CAGR) emissions reduction of -9.85%. However, under the proposed Modification plans, emissions at Tahmoor could rapidly reverse this trend, and increase by 57% in the next year if granted.



The Modification proposal would also have a material impact on the future cumulative emissions at Tahmoor Colliery, which is projected to release a further 11.5 million tonnes of CO2-e by 2033 from its ventilation shaft alone. If granted without clear requirements for a highly efficient onsite VAM mitigation system, Tahmoor's methane emissions will significantly increase in the short term, and represent a significant risk to the NSW Net Zero targets in the short term.

Tahmoor's Mitigation Opportunity

Tahmoor Colliery has highlighted in their Modification 3 report, as well as in a more recent letter issued on 19 December 2024, that there are significant mitigation measures that are technically feasible onsite.



In their Modification report, SIMEC noted that:

"*The US-EPA (2019) identifies that regenerative thermal oxidation (RTO) is the only commercially operational technology capable of using VAM as a primary fuel at CH4 concentrations below 1.5%. Historical monitoring records of mine ventilation emissions recorded by Tahmoor Coal show that CH4 content of VAM from the mine has been <0.5% since 2020. As operations have moved from Tahmoor North into Tahmoor South, the VAM concentration has decreased to the range of 0.16 to 0.35%. Forecast modelling indicates that the CH4 concentration will be around this range as the mine progresses further to the south-west.*"

This indicates that Tahmoor Colliery has not only been a viable location for commercial VAM mitigation using commercially available technology. These technical opportunities have

recently been outlined in the UNECE Best Practice Guide for VAM which highlight the value and successful abatement potential of Regenerative Thermal Oxidisers on underground coal mines with methane concentrations of 0.2% or above.

Regenerative Thermal Oxidiser (RTO) technology has been very widely used for pollution control in industry since 1971, and at coal mines for VAM since 1994. The technology is proven in VAM mitigation in around 20 projects worldwide, and there are at least 40 technology manufacturers globally.

The technology has been applied twice in New South Wales, once at Appin Mine as a demonstration operating in a stable manner down to 0.19% CH4 concentration. It was also the technology utilised in the 10 year successful track record of mitigation at Illawarra's West Cliff Mine that saw 2 million tonnes of CO2-e abated.

In the case of Tahmoor Colliery, VAM has been considered technically feasible onsite since at least 2021, as noted in a statement by Marcus Ray, NSW Deputy Secretary, Planning and Assessment. It was again considered feasible in a letter sent on 19 December 2024, in which Tahmoor's consultants EMM, noted that VAM mitigation could be expected to achieve "at least a 79% reduction in fugitive methane emissions from the mine". Building on this conservative estimate, Ember considers the technical abatement potential of a well designed and safely operating RTO system to be between 79% and 89% of all VAM emissions. This could have the potential to reduce between 9-11 million tonnes of CO2-e between 2025 and 2033.

This however, would require state-led regulatory pressure. Under the current Safeguard Mechanism, there is no requirement or short term expectation that a coal mine would introduce onsite mitigation, considering the operational ease of accessing the offset market. Onsite mitigation is further undermined by limited long term clarity of the Safeguard Mechanism's regulatory requirements, especially post-2030.

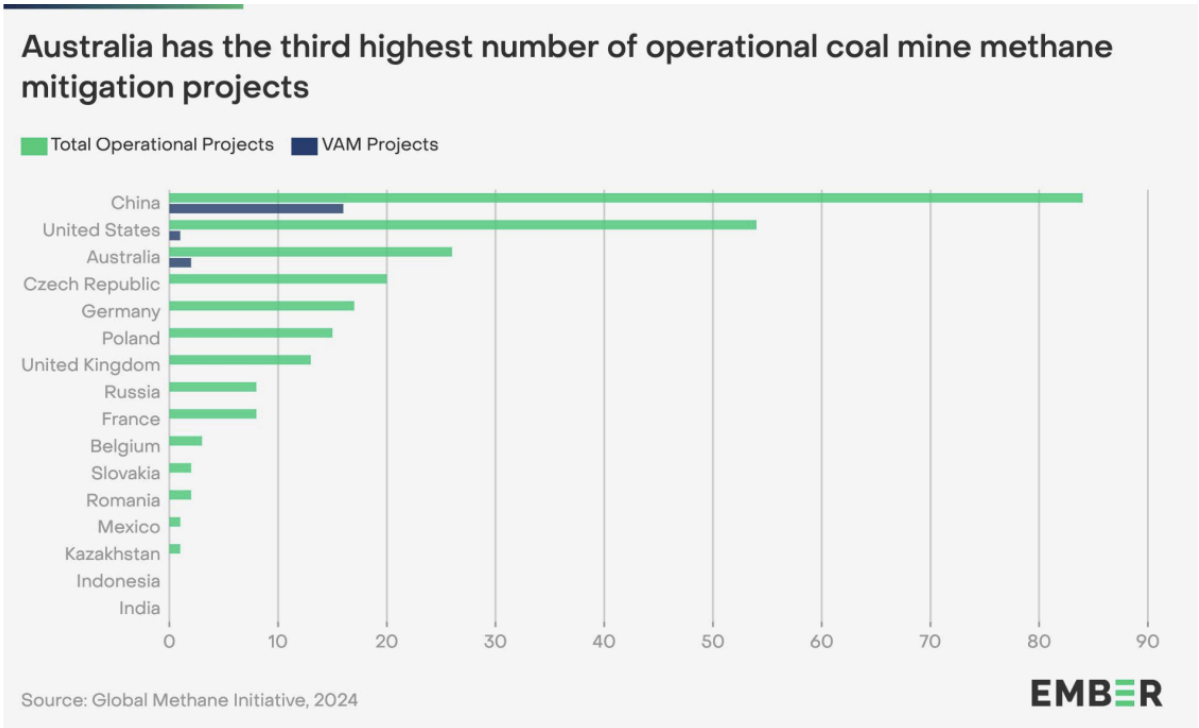
Considering the limited implementation of onsite VAM mitigation and the unique labour and regulatory context in Australia, it is challenging to estimate upfront costs. The recently released UNECE guide on VAM mitigation has estimated build and installation costs at $AU 23 million. This is based on existing projects across China and the USA with 500,000 m3. In Australia, current commercial estimates for a full scale system range from $AU 50 - $100 million, due to significantly increased labour costs, insurance premiums, risk mitigation requirements and an average gas volume of 2,000,000 m3. This cost assumes a single primary ventilation shaft per mine, which is the norm across Australia.

Due to the volume of methane mitigation, a system of this scale would still be able to achieve estimated abatement at or below the current ACCU spot price of $AU 35. Additionally, the current cost premium is expected to decrease as the pioneering or first mover costs decrease as more active projects enter the market. However the current lack of long term regulatory clarity undermines the confidence needed to make significant upfront investments, even if this leads to a cost competitive abatement value comparative to the offset market.

This commercial viability however, could be materially improved through additional state-led regulatory incentives and requirements, ensuring that onsite mitigation is prioritised in line with the state's legislated emission reduction targets. It would also significantly shift the commercial viability of this mitigation option, and would align with a key objective of the reformed Safeguard Mechanism, that has yet to be appropriately reinforced.

Onsite Mitigation Opportunities

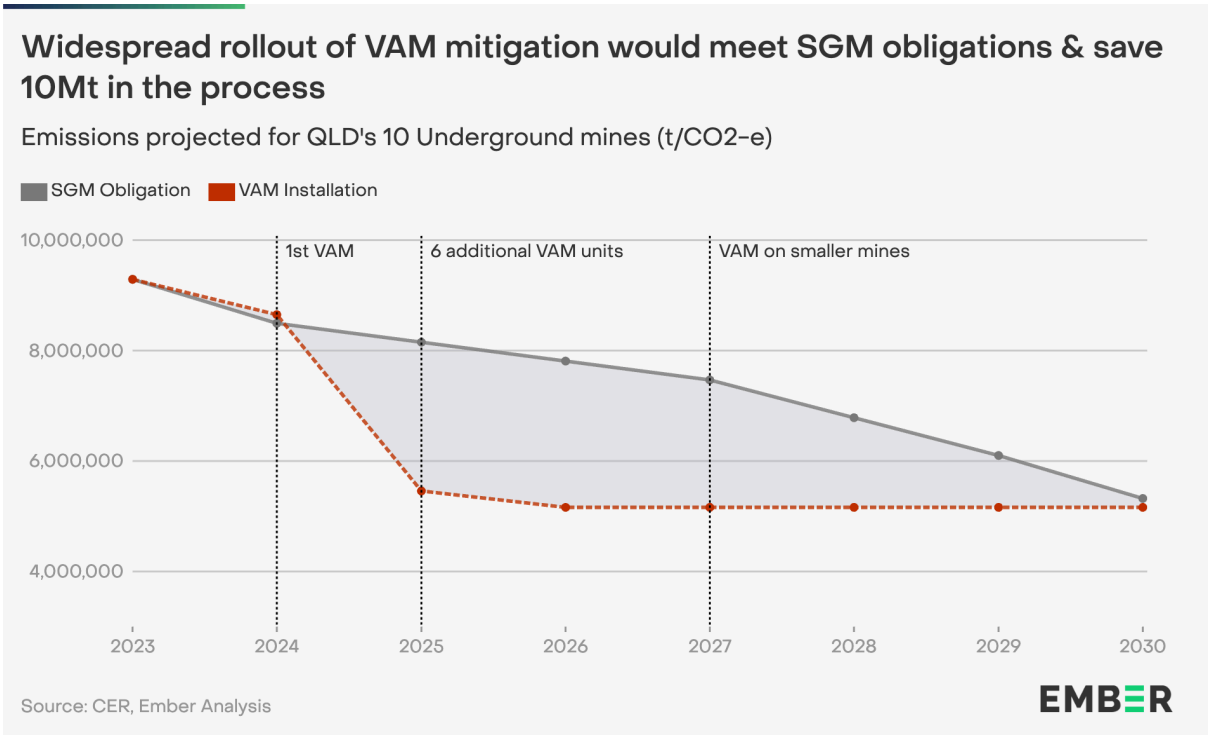
Australia now has 26 operational coal mine methane projects. These are largely flaring projects utilising pre-mine drainage, which are now legally required across the EU. There are currently two operational VAM mitigation units, but both remain in pilot stage. While this represents an important contribution to the total number of mitigation projects around the world, the vast majority of Australia's coal mine mitigation projects have yet to scale up their emissions reduction impact, and contribute only marginal mitigation gains. Not only has this been hindered by the coal industry's lack of mitigation ambition, but finance and regulatory settings have failed to incentivise large scale abatement in the last decade.



There are a number of mitigation opportunities that the coal sector could take up if given the regulatory framework that clearly and appropriately incentivised their uptake within NSW. According to the latest CER emissions intensity reporting, NSW is home to the three highest emissions intensity coal mines in Australia, and six of the top 10. All of these mines are underground mines, with considerable potential to abate ventilated air methane, which typically represents over 80 per cent of underground coal mine scope 1 emissions.

As mentioned previously, current uptake of VAM mitigation is limited, and the Safeguard Mechanism is not currently appropriate in itself, to incentivise onsite abatement across the coal sector. This represents a considerable opportunity for NSW, to address its coal mine emissions challenge across its 11 major emitting underground coal mines. If efficiently designed, appropriate regulatory incentives could also cut emissions in the short term, as the estimated implementation time for a VAM mitigation project is within 18 months.

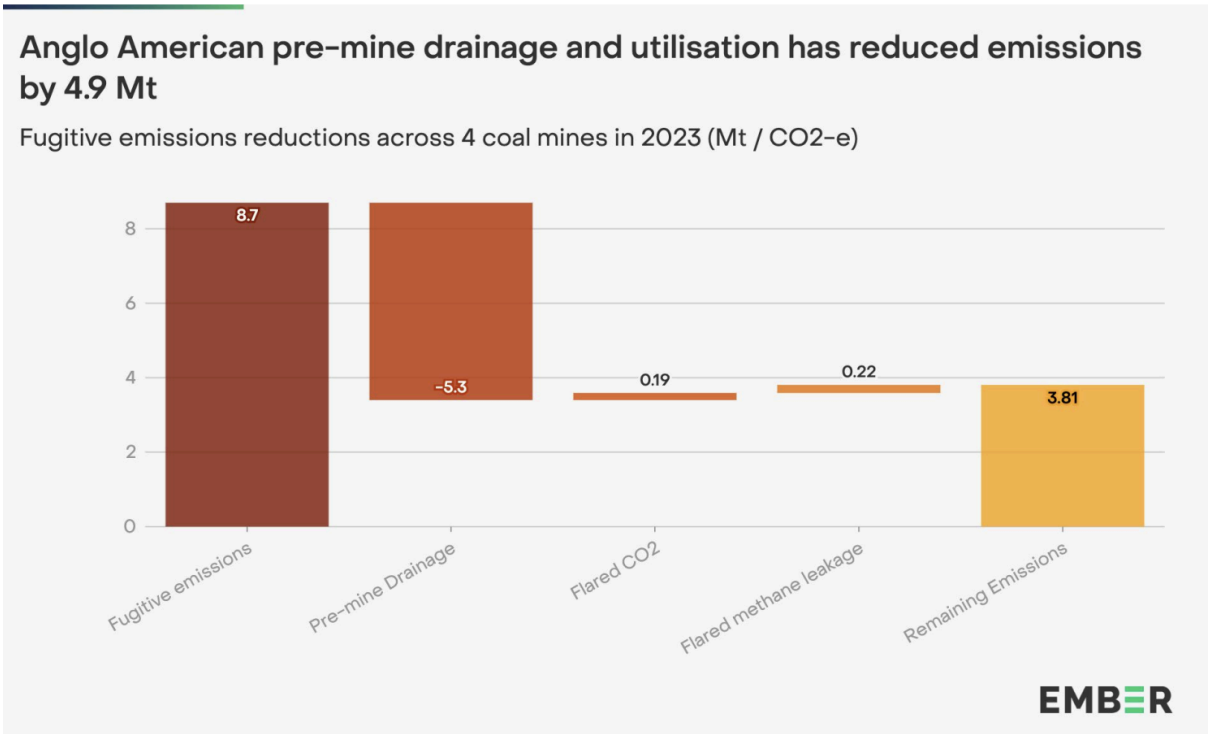
In a relevant comparative analysis, Ember estimates that through the targeted combination of VAM mitigation projects applied on the top 12 highest emitting mines in Queensland, that an additional 10 million tonnes of CO2-e could be reduced, above and beyond existing Safeguard mitigation requirements. This we believe would be similarly impactful across NSW.



While these VAM opportunities would incur a considerable upfront installation cost, they would likely achieve cost competitive mitigation over time. Existing commercial operators have estimated their ability to achieve material emissions abatement of up to 88% of VAM emissions at close to AUD$30-$35 t/CO2-e.

This is inline with what has been a cost competitive mitigation ecosystem when coal miners have proactively invested in onsite abatement. Between 2023 and 2024, Anglo American reported that they had invested in "excess of USD $100 million per annum, in methane capture infrastructure". As a result, the company has reported capturing and mitigating up to 60% of its potential methane emissions in FY2024.

This was largely in the form of pre-mine drainage and utilisation infrastructure, although the company had also reported conducting extensive trials to explore the opportunities of abating their remaining fugitive emissions, by installing emissions mitigation technology on the mine's ventilation shafts. According to their own reporting, existing investments had realised emissions abatement at approximately $32 per tonne of CO2-e.



Summary:

- Coal mining emissions represent a significant risk to the NSW legislated emissions reduction targets, creating an economy-wide strain in the short term and long term
- Existing regulatory frameworks such as the Safeguard Mechanism and the Coal Mine Waste Gas method have created a valuable platform for sectoral regulation, but will have a limited impact on onsite emissions cuts within NSW
- Onsite emissions cuts are technically and commercially feasible, but require the appropriate regulatory framework to ensure they are prioritised against offset opportunities, requiring no operational changes.
- This emissions risk is exacerbated by new coal mining extensions and expansions, highlighted by the example of the Tahmoor Modification, which pose a considerable challenge to achieving the state's short term goals, and risk locking in that challenge for the long term.

Recommendations

1. The NSW government should immediately pause all approvals processes for new coal extensions and expansions
    a. This is particularly critical considering the upcoming NGERs review of company-led emissions reporting on open cut mines (Method 2) which now incorporates 75% of open cut emissions across NSW.

2. The NSW government should request a specific, dedicated report from the Net Zero Commission on the risks that existing coal mine emissions, and ongoing expansions and extensions, may pose to NSW climate targets, to be completed by June 2025:

    b. The report should NSW should include cost benefit analysis of additional regulatory measures to ensure that onsite mitigation is undertaken across coal mines in line with the state's emissions reduction requirements
    c. It should also include advice on a coal sectoral target to drive emissions reduction in the coal sector.

d. It should also assess the potential risks associated with improved emissions measurement and monitoring that could significantly increase reported emissions across open cut coal mines in NSW
e. It should also include an exploration on the opportunity and value of adding additional MRV capacity to enable the NSW government to cross-check the emissions of coal mines across NSW and ensure that emissions reductions are in line with their stated targets.

3. The Net Zero Commission should be asked to provide specific advice and make recommendations on all proposed major coal mine expansions, as per s15 (3) of the New South Wales Climate Change and Net Zero Emissions Framework Authority