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22 August 2025

To: Parliament of NSW Joint Standing Committee on Net Zero Future
Re: NSW Parliamentary Inquiry into Fossil Fuels

Thank you for the opportunity for IEEFA to provide comments on the NSW Parliamentary Inquiry into Fossil Fuels being conducted by the NSW Joint Standing Committee on Net Zero Future.

IEEFA is an independent energy finance think tank that examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy.

In summary:

A. Consequences for NSW climate targets

- If fossil fuel methane emissions remain at 2022 levels, they would equal 69% of NSW's 2035 target emissions; adjusted for underreporting, this rises to 78%.
- Methane is not projected to fall nationally, unlike carbon dioxide (CO_2), undermining NSW's legislated targets.

B. Methane reporting and measurement

- (i) Underreporting risk is significant: open-cut coalmines may emit two to three more times more methane than reported. Open-cut coalmines switching to Method 2 could worsen underestimation.
- (ii) A twenty-year global warming potential better reflects methane's short-term warming impact and strengthens abatement incentives.
- (iii) Verification: United Nations Environment Programme flyovers found emissions three to eight times higher than reported at one mine and offer a complementary technology to combine with satellite and remote sensing technology for methane emission verification purposes.

C. Emission modelling

- NSW modelling could account for potential methane emissions underreporting by modelling scenarios **30-100% higher** than reported emissions in the open-cut coal sector.

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D. Abatement feasibility

- **Coal**:
  - **Reducing production** is an effective way to reduce methane emissions in the resources sector.
  - **Pre-drainage trials** at open-cut mines show technical and commercial feasibility.
  - **Ventilation air methane (VAM) abatement** is mature technology, widely used overseas.
  - **Post-closure methane capture** is proven in the US and Germany.
- **Oil & Gas**:
  - Existing technologies could abate up to **90% of emissions**, often at **negative cost**.
  - Options include leak detection/repair, replacing high-loss equipment, vapour recovery, and electrification.

F. Policy recommendations

- Make **methane abatement plans mandatory** for new or expanded fossil fuel projects at the approvals stage.
- Consider implementing a NSW **state-based methane/transition fund tax or emissions scheme**. Revenue could support further abatement and decarbonisation efforts.
- International examples (such as Germany) show carbon pricing effectively drives methane abatement.

Kind regards,

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Inquiry overview

IEEFA understands that the Inquiry intends to investigate and report on the scale and nature of current and likely future direct greenhouse gas emissions from fossil fuel projects and related infrastructure in New South Wales (NSW), and in particular:

a. the relevance and consequences of fossil fuel greenhouse gas emissions for achieving NSW's emissions reductions targets and complying with the guiding principles and purposes of the Climate Change (Net Zero Future) Act 2023

b. quantification and measurement of coalmine and gas industry methane and related greenhouse gas emissions in NSW including fugitive emissions, in particular:

    i) the accuracy of emissions reporting from coalmines and gas fields

    ii) the relevance of using a twenty-year versus one-hundred-year global warming potential to assess short-term climate impact

    iii) current measurement, reporting and verification methods and whether they reflect best practice

c. the transparency, timeliness and integrity of NSW's emission modelling and how this modelling is used to inform NSW's planning decisions

d. the implementation and feasibility of greenhouse gas abatement, including ventilation air methane (VAM) abatement for coalmining

e. economic costs associated with greenhouse gas emissions including indirect costs from climate change related impacts and opportunity costs for other sectors

f. any other related matters.

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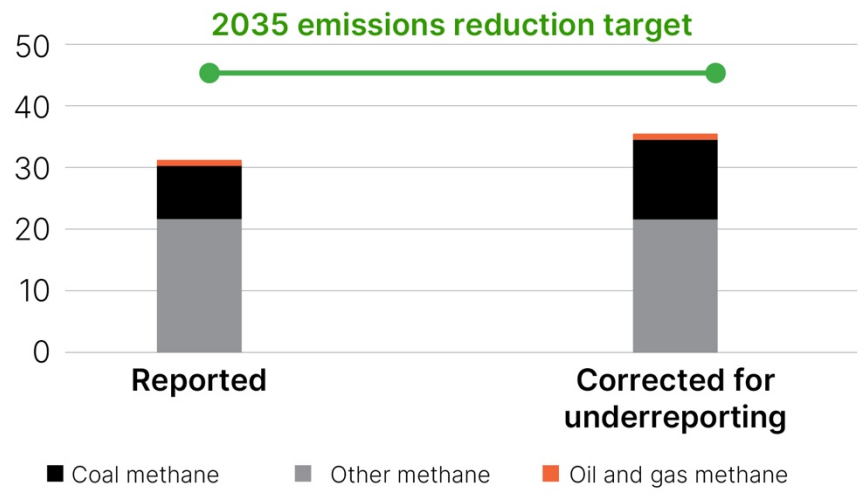
A. Consequences of fossil fuel greenhouse gas emissions for achieving NSW emissions reductions targets

NSW has legislated even stronger interim targets than the federal government, with a 50% cut on 2005 levels by 2030 and a 70% reduction by 2035, before reaching net zero by 2050. Figure 1 shows that if NSW's annual fossil fuel methane emissions stayed at 2022 levels in 2035, they would account for 69% of targeted 2035 emissions in NSW. If fossil fuel methane emissions were adjusted by IEEFA's assumptions of underreporting, this would represent 78% of NSW's targeted 2035 emissions, making the state's target even more difficult to achieve. Nationally, methane emissions are not forecast to decrease by 2035, while CO_2 emissions are forecast to nearly halve, according to projections from the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Figure 1. Methane emissions vs NSW reduction targets*, MtCO2e*



Sources: Australian, NSW and Qld governments, CCA, IEEFA analysis.
Note: $MtCO_2e$ = million tonnes of carbon dioxide-equivalent (CO_2e).

B (i) methane emissions could be significantly higher than currently reported by coal and gas producers

According to multiple sources – including the International Energy Agency (IEA), Climate TRACE, OpenMethane, Global Energy Monitor and Ember – methane emissions from Australia's fossil fuel sectors could be significantly underreported, particularly from open-cut coalmines.

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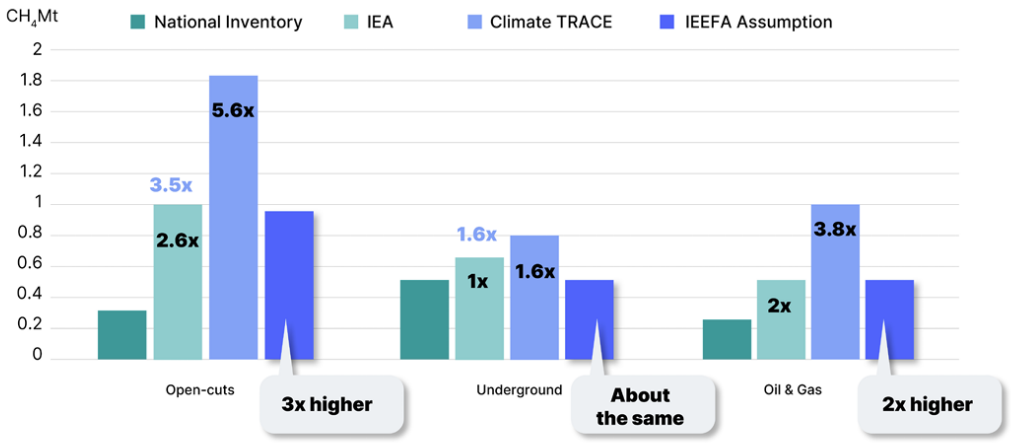
Figure 2. Estimates of methane emissions underreporting from Australian coalmining and oil & gas



Sources: DCCEEW; IEA; Climate TRACE; IEEFA.
Note: The IEA does not report on underground and open-cut mine methane estimates separately; IEEFA considered a range of underreporting factors based on underground emissions varying between reported levels and Climate TRACE levels.

Coal

A growing body of evidence has found that reported methane estimates from open-cut coalmines in Australia could be more than twice as high as currently reported. The DCCEEW has stated that the uncertainty in methane emissions reporting by open-cut mines is at least 30%. Additionally, analysis from the Superpower Institute suggests methane emissions from the fossil fuel sector could be twice as high as what is reported; and data from the IEA suggests open-cut coalmine emissions could be three times higher on average than currently reported.

Recently, all open-cut coalmines in NSW moved from using Method 1 to Method 2 under the National Greenhouse and Energy Reporting (NGER) scheme to estimate methane emissions from coalmining. After switching to using Method 2, total reported Scope 1 emissions from Maule's Creek decreased by 60%. There is potential that total Scope 1 emissions would have decreased during this period due to decreased production or mining less gassy seams or decreasing carbon dioxide (CO_2) emissions. However, when examining data from other large NSW open-cut coalmines, the reported methane emissions per unit of coal produced were 80% lower under Method 2 estimations compared with Method 1 default factors, based on the FY2023-24 Safeguard Facility data. This means that the decrease in reported emissions would not be driven by a decrease in production.

The Australian Climate Change Authority reviewed the Methods in the NGER scheme and recommended, "as a matter of urgency" a review of Method 2 with respect to sampling requirements and standards. Additionally, research from the University of Wollongong has found the Method 2 approach to determining "low-gas zones" is flawed. This is due to the standards containing an artificially high gas detection threshold and an associated low amount of gas assumed for the low-gas zone, effectively underreporting gas considerably. This is most

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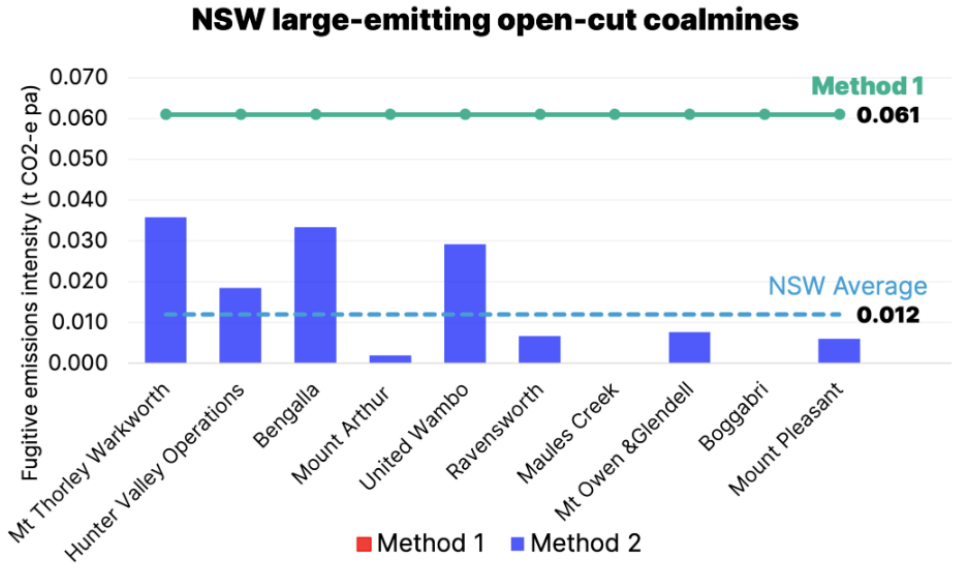
pronounced when high levels of methane are found in the gas (due to gas density differences). The study recommended lowering the threshold gas factor used in Method 2 by an order of magnitude.

Figure 3. Method 2 actual reported methane emissions intensity vs Method 1 standards



Sources: Australian Clean Energy Regulator, Safeguard Mechanism Data 2023-24; IEEFA

Gas

In the oil, gas and liquefied natural gas (LNG) sectors, fugitive methane emissions can arise throughout the supply chain. This can include emissions stemming from flaring or venting activities. According to Wood Mackenzie, it may also include "routine methane losses from innumerable small, undetected or unreported leaks across the … gas value chain". About two thirds of fugitive methane emissions are generated in gas production, and about one third is generated in the transmission, distribution and storage of gas. Gas exploration and decommissioning activities can also generate fugitive methane emissions.

International evidence suggests that methane emissions are prevalent throughout the gas and LNG production and supply process. For example, it is estimated that upstream and midstream fugitive methane emissions could equal up to 2.8% of US gas production, and losses during LNG liquefaction could amount to 3.5 grams of methane per kilogram of LNG. Transporting LNG contributes further to methane emissions, both through LNG boil-off and incomplete combustion in LNG tankers powered by gas engines.

B (ii) the relevance of using a twenty-year versus one-hundred-year global warming potential to assess short term climate impact

A twenty-year global warming potential would better reflect methane's short-term warming impact, therefore strengthening methane abatement incentives. When converting to carbon

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dioxide equivalence under the Australian Carbon Credit Unit (ACCU) and Safeguard Mechanism Credit (SMC) schemes, the higher the warming potential of methane that is set, the greater the incentive for companies to take onsite abatement action for methane emissions to generate carbon credits. Conversely, this could also provide an incentive to invest in methane abatement over CO_2 abatement activities.

B (iii) current measurement, reporting and verification methods and whether they reflect best practice

A recent United Nations Environment Programme (UNEP) study highlights the potential to utilise plane flyovers to measure methane. The study involved two planes taking aerial measurements over the Hail Creek mine. It found methane levels were likely somewhere between three and eight times above the annual emissions reported by the mine. This is the first study to successfully verify reported emissions from an open-cut coalmine in Australia using this method. The UNEP study highlights that it is possible for scientific researchers or companies like Glencore to pay for plane flyovers to get better information about the scope of their methane emissions, particularly from open-cut coalmines.

While this is an emerging space, it is also rapidly evolving. An open-source database OpenMethane is continuously improving public access to satellite and remote sensing methane emission observations as they become available.

C. the transparency, timeliness and integrity of New South Wales' emission modelling and how this modelling is used to inform New South Wales' planning decisions

Recommendation: Model scenarios that adjust reported fossil fuel methane emission upwards by 30-100% to project potential greenhouse gas emissions.

Australia's total fossil fuel methane emissions are underreported. While there is still uncertainty about the exact amount of this underreporting, there is mounting evidence that methane emissions from coalmines and oil & gas facilities are higher than the estimates used in Safeguard Mechanism reporting.

If this is not addressed, all other processes cannot work appropriately: companies cannot accurately assess the business case for methane emissions reduction; and new projects' cost/benefits cannot be accurately assessed. Moreover, the Safeguard Mechanism cannot effectively drive methane emissions down – either due to the omission of emissions-intensive facilities, or through "watered-down" financial incentives for companies to act given they are only penalised for a fraction of their emissions.

NSW should account for this uncertainty by modelling scenarios 30-100% higher than reported fossil fuel emissions and emissions reduction projections. The DCCEEW has asserted there is at least 30% uncertainty in the methane emissions reported by open-cut coalmines in Australia's

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national greenhouse gas accounts. Research by the Superpower Institute has found methane emissions could be twice as high as reported in Australia's national accounts, based on satellite data. In addition, recent United Nations research has found some coalmines in Queensland could be emitting three to eight times more methane than self-reported, based on methane data collected from plane flyovers.

D. Feasibility of current abatement options

Beyond onsite activities to reduce emissions the most effective way to reduce methane emissions in the resources sector is to reduce production. The NSW Government Response to the Net Zero Annual Report recognises, "There are pressures for increased emissions associated with new coalmining projects, with a sizeable pipeline of projects already submitted for consideration and determination through the planning process. If NSW is to meet its emissions reductions targets, other sectors would need to meet the shortfall to counter emissions increases associated with extended or expanded coal projects."

While NSW is not a significant gas producer, that could change if the Narrabri gas project were developed and the Port Kembla LNG import terminal goes ahead. Either of these two projects would change the emissions profile of the state's gas sector given their associated methane emissions, which in turn places additional pressure on NSW's greenhouse gas reduction ambitions. Hence, gas demand measures must be a priority to reduce the need for these gas projects; hopefully this will be reflected in the NSW gas decarbonisation roadmap.

Coal

The United Nations Economic Commission for Europe (UNECE) found that ultimately the largest reduction of lifecycle coalmine methane emissions can only be achieved by closing mines. The IEA estimates that by 2035 global coal production will fall by about 30% or 50% in scenarios aligned with 2.4°C and 1.7°C of global warming respectively.

Open-cut coalmine – Pre-drainage

Overall, Rystad Energy estimates that drainage and gas utilisation in open-cut mines cost about AU$15 per tonne of carbon dioxide-equivalent (tCO_2e) on average, net of methane sales revenues and/or utilisation benefits. Some coalminers in Australia are showing that action to abate methane emissions from their coalmines is possible. Coronado Resources has established a methane pre-drainage trial system at its Curragh open-cut mine, using captured methane to displace some diesel used in its truck fleet. Additionally, Stanmore Resources received government funding to capture methane for at least 15 years to power a new 20-megawatt gas-fired power station to be completed by 2027. The power station is expected to entirely offset Stanmore's South Walker Creek mine's electricity requirements. These examples suggest that methane abatement at open-cut coalmines is feasible, and under certain conditions can be financially viable.

Additionally, an Australian Coal Association Research Program (ACARP) study found that the net present value was positive for open-cut pre-drainage when there was a CO_2 penalty on fugitive

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emissions of more than approximately AU$20/tCO$_2$e. The same ACARP study found that enhanced-pre drainage was more economic than normal drainage for open-cut mines and concluded that "there is good evidence for technical and business case feasibility for enhanced drainage as a means of reducing the gas content in coal seams prior to mining."

Glencore previously stated that "pre-drainage is not currently economically viable for a multi-seam open-cut mining operation such as HVO", but last year it revised its position in response to submissions on the HVO Continuation Project environmental impact statement. Glencore has since committed to undertake a pre-drainage trial and to consider pre-drainage later in the mine's life.

There are examples of other miners trialling methane-drainage at open-cut mines, and multiple research studies have found that it can present a net economic benefit. Analysis by Rystad Energy showed a marginal net benefit of around AU$15/tCO$_2$e on average when drained methane is utilised or sold.

However, even if more open-cut coalmines conduct pre-drainage, a range of studies show that only 50-80% of methane can be captured and abated via this method, under best-case scenarios. This means the remaining options for open-cut miners to achieve net zero CO$_2$e emissions by 2050 would be to purchase carbon credits or reduce coal production.

Underground coalmine – VAM abatement

Established technologies allow low-concentration VAM to be either combusted or used for heat or power generation. Regenerative thermal oxidisers (RTOs) are one form of VAM abatement, and are a mature, safe technology that can combust methane at low concentrations. RTOs have been demonstrated and implemented in coalmines in China and the US since the early 2000s. Australian governments are funding Australia's first full-scale RTO project at the Kestrel underground metallurgical coalmine in the Bowen Basin in Queensland.

New technologies are also being developed that allow VAM to be concentrated, or abated at even lower concentrations, which would further increase the amount of VAM that can be abated, and enable it to be utilised instead of combusted.

China is a global leader in VAM abatement with 13 operational VAM projects, and it proposes to make it mandatory for underground coalmines to "process coal mine gas with a concentration of 8% or less and ventilation air methane using flameless oxidation technology to produce heat for power generation".

Underground coalmine – Enhanced pre- and post-drainage

The methane capture and recovery technologies discussed above can continue even after mining ceases. Examples of this exist in other countries. In 2015, the US captured and utilised about 5.3 billion cubic feet of methane (about 5.6 petajoules) from 40 abandoned coalmines. In Germany, more than 100 cogeneration plants were installed on coalmines during mining, and many are still operating, fuelled by the abandoned mine methane. However, the continued

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operation of these plants depends on the coal-seam gas reservoir, its rate of decline, and ongoing mine dewatering activities.

Underground coalmines – Leak detection and repair

Simple improvements to existing technology and plugging leaks can reduce emissions from an underground coalmine. Refining gas drainage borehole and placement design, optimising suction and purity control, and enhancing water management in pipelines at underground coalmines can help reduce methane gas leaking into the atmosphere. These upgrades can be made in a relatively short timeframe – within a year – at a low net cost.

Oil & Gas

Methane abatement in the oil & gas sectors relates to ending the use of flaring and venting, and identifying and addressing methane leaks from oil, gas and LNG equipment. In practice, a range of existing technologies can readily be utilised to abate methane emissions from oil & gas, including:

- Leak detection and repair regimes to identify and address methane leaks from oil, gas and LNG equipment, such as pumps and compressors.
- Replacing high-loss equipment (that emits methane) with upgraded equipment, including electric equipment (that does not vent methane) and air compressor systems (rather than gas-driven pneumatic systems).
- Recovery of methane vapour that might otherwise be vented, such as from storage tanks (and methane that has 'boiled off' during the transport of LNG).
- Deploying electricity-powered equipment.

The oil & gas industry body Australian Energy Producers (AEP – formerly the Australian Petroleum Production and Exploration Association) noted the availability of suitable technologies to abate methane emissions, and highlighted a number of case studies that clearly demonstrate the potential for Australia's oil & gas sectors to reduce their methane emissions. Rystad has similarly noted this potential, suggesting that the adoption of existing technologies would facilitate a 90% reduction in Australia's oil & gas methane emissions.

These technologies are in many cases also cost-effective, due primarily to the value associated with selling the additional methane captured. Oil & gas producers may also benefit if measures to lower their methane emissions also reduce their regulatory costs (noting that methane emissions contribute towards reportable emissions under Australia's Safeguard Mechanism).

In a global context, the IEA estimates about two thirds of oil & gas methane emissions could be abated at zero cost (assuming average gas prices in line with those between 2017 and 2021). The remaining interventions are likely to cost less than US$20/t$CO_2$e.

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This is similar to estimates for Australia. For example, Rystad estimates that more than half of Australia's oil & gas fugitive methane emissions could be abated at a negative cost (assuming the methane that is captured is sold at 2021 average Western Australia LNG netback prices). Rystad further estimates that up to 90% of methane emissions could be abated at a maximum cost of less than about AU$250/tonne of methane, which equates to a cost of about AU$4.50 per gigajoule. This is much lower than the typical cost of gas in Australia. In addition, this is equivalent to about AU$8.40/$tCO_2e$ (assuming a global warming potential of 29.8), which will be cost-effective if oil & gas producers are required to offset the emissions through the surrender of carbon credits – in Australia, ACCUs are trading about AU$39/$tCO_2e$. While some measures are relatively more expensive, implementing all existing and available options for methane abatement in the oil & gas sectors is likely to have an effective negative cost overall.

The costs could be even lower when accounting for the likely scale of underreporting. Many of the interventions to reduce methane emissions in oil & gas production rely on equipment upgrades, with the costs the same regardless of how much additional methane is captured. In practical terms, this means that, to the extent that methane abatement captures more methane than anticipated (due to the underreporting of fugitive methane emissions), the costs may be even lower per unit of methane than estimated by Rystad Energy.

F. Any additional comments

Recommendation: NSW government approvals for any new fossil fuel projects or expansions should require companies to submit comprehensive methane plans.

Early planning is key to effective methane abatement, especially in open-cut coalmines, where the most effective methane reduction actions need to occur before mining starts. Approvals for any new projects, expansions or extensions should be conditional on companies submitting comprehensive methane abatement plans. This should include the rehabilitation cost estimates and proposals that miners submit as part of their environmental impact statement given the residual methane risk.

Additionally, to grant NSW more control over achieving its net-zero targets and incentivising fossil fuel companies to decrease greenhouse gas emissions, NSW could:

Implement a methane/transition fund tax in NSW.

A NSW methane/transition fund tax could provide a lever to address methane emissions without relying on the federal Safeguard Mechanism. This may be less resource-intensive and easier to introduce than a separate, state-based version of the Safeguard Mechanism. Revenue from a methane tax could be fully or partially reinvested to support methane reduction.

A methane or transition fund tax would increase company management attention and provide a more effective financial incentive for methane abatement. The key difference from the Safeguard Mechanism is that a methane tax would cover all methane emissions in NSW, whereas the Safeguard Mechanism only provides a financial incentive to reduce emissions below the baseline for Safeguard facilities in NSW.

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Examples from other countries show that a price on carbon can drive emissions reduction action. In Germany, carbon pricing has incentivised the development of at least 39 coalmine methane abatement projects since the early 2000s.

OR

Introduce an emissions reduction scheme in parallel to the Safeguard Mechanism to apply to all facilities in high-emitting industries in the NSW.

NSW could consider establishing a specific emissions reduction scheme in parallel to the Safeguard Mechanism to apply to all facilities in high-emitting industries. This would give it more control over requiring emission reductions from high-emitting industries. In addition, NSW would not need to wait for the Clean Energy Regulator and DCCEEW to fix existing issues in the Safeguard Mechanism or the NGER, ACCU and SMC schemes. These issues and opportunities are outlined in recent IEEFA analysis.

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About IEEFA

IEEFA is an independent energy finance think tank that examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy.

About the Author

Anne-Louise Knight

Anne-Louise Knight is IEEFA's Lead Research Analyst for Australian Coal. Her work examines the financial viability of coalmining projects in Australia and the demand outlooks in Australia's thermal and coking coal export markets. Anne-Louise has over seven years of experience working in Australian government agencies, most recently as a senior economist with the Australian Trade and Investment Commission. She holds a Master's in Economics, a Master's in Environmental Management and Development from the Australian National University, for which she was awarded the Tiri Tiri Prize, and a Bachelor's of International Studies from the University of New South Wales.