Prioritising methane abatement makes economic sense

Governments must urgently address the lack of financial incentives to reduce emissions from coal, oil and gas

Amandine Denis-Ryan, CEO IEEFA Australia

11th December 2024

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Evidence-based

Our analyses are thoroughly researched, fact-based, and data driven

Independent

As a non-profit think tank, our work is free from political influence, corporate and sectoral interests.

Energy focused

Our mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. We cover domestic and export energy markets.

Financial analysis

We focus on the financial issues associated with the energy transition, looking at market trends, financial risks and opportunities.

Global

We have teams in North America, Europe, Asia and Australia.

Contents

A large problem for Australia

Methane makes an oversized contribution to warming

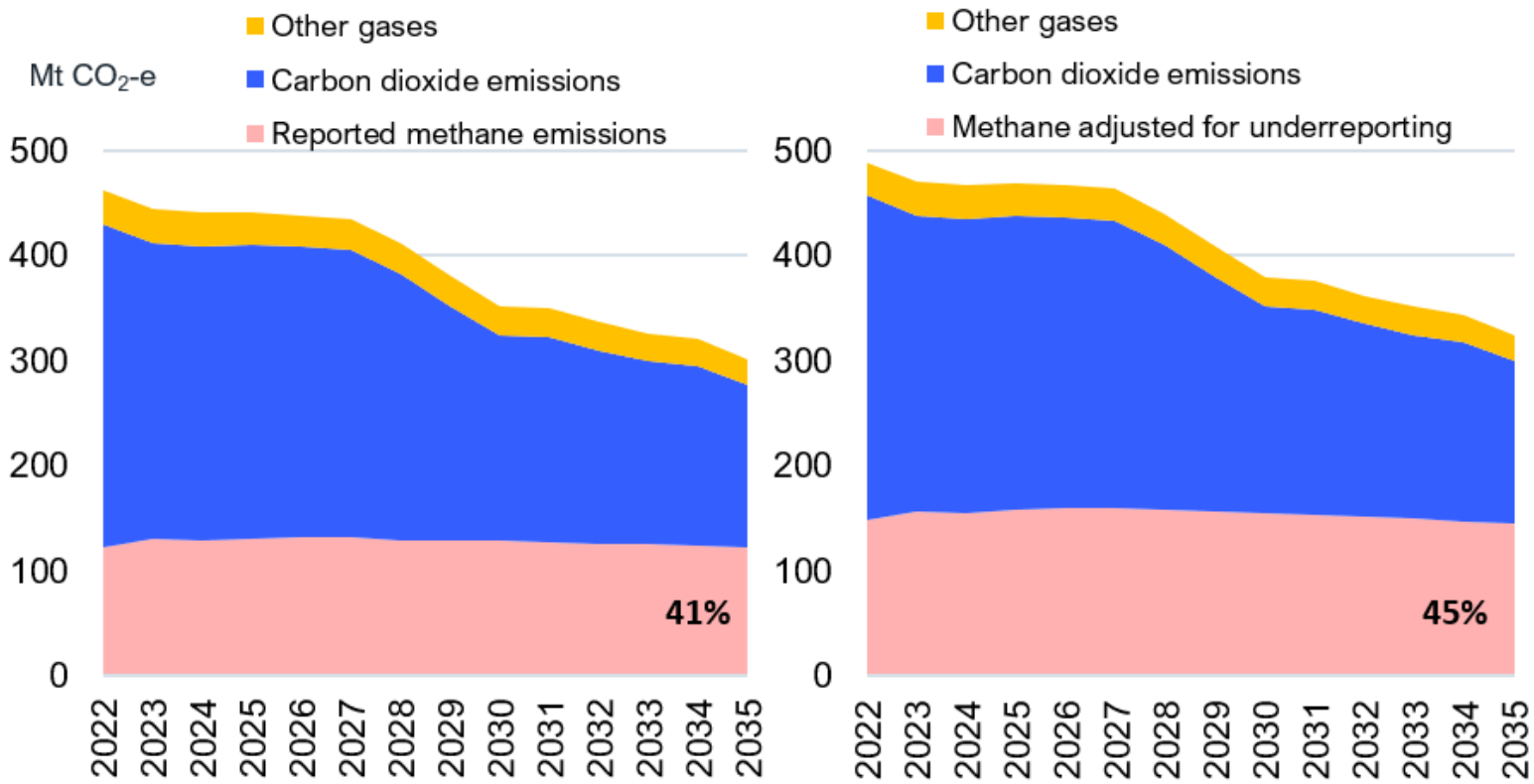
- Methane accounts for about 30% of global temperature increases
- *IEA*: Fossil fuel methane needs to reduce by 75% by 2030 for 1.5°C
- *UNEP*: Addressing methane emissions is the most cost-effective greenhouse gas reduction strategy

Methane is a short-lived greenhouse gas with a high warming potential - ~30x more potent than CO_2 over a 100-year time horizon

Source: IEA, UNEP, IPCC

Methane stays flat to 2035 while CO_2 halves

Figure 3: Australian government emissions projections

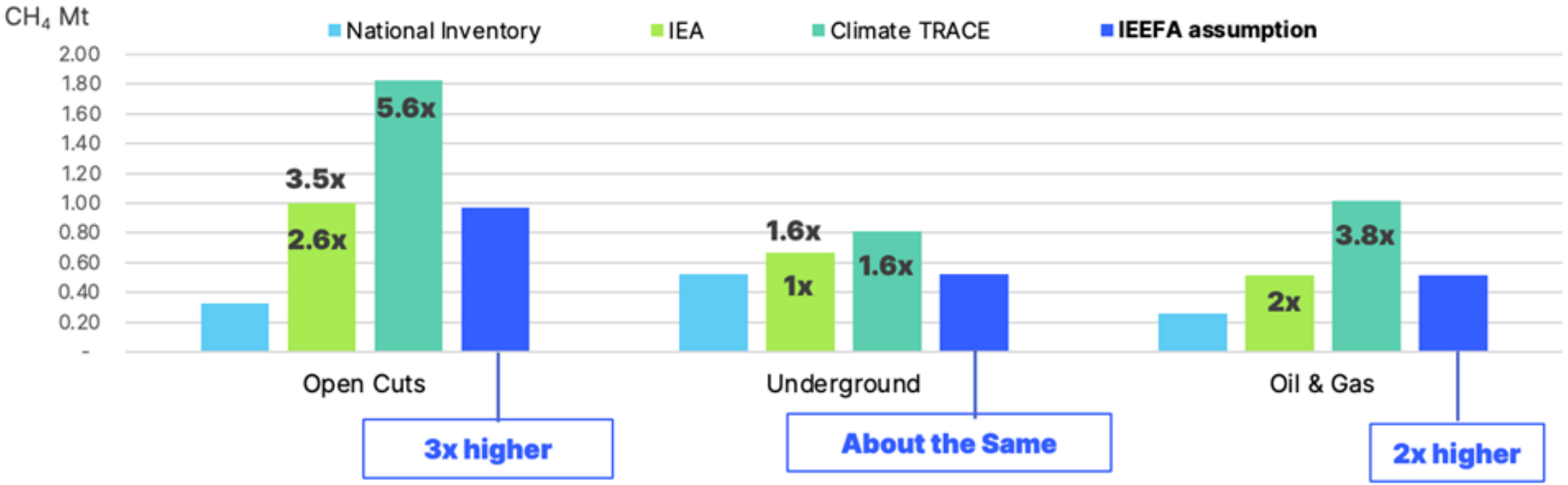


Source: DCCEEW.[23] Note: November 2023 projections adjusted with IEEFA assumptions of underreporting (right).

This is at odds with Australia's commitment to contribute to global efforts to reduce methane emissions by at least 30% between 2020 and 2030

Suspicions of material underreporting

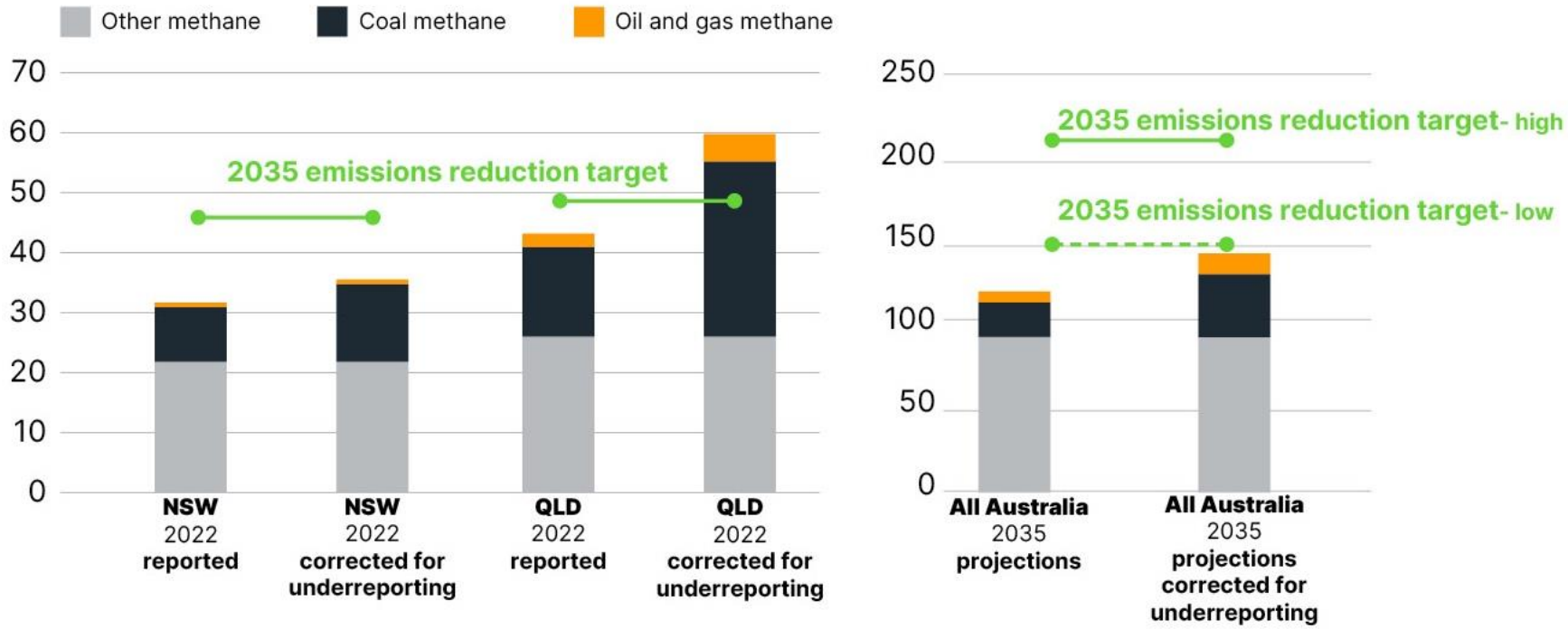
Estimates of methane emissions underreporting, $MtCH_4$



Source: IEEFA analysis based on Australian government, IEA, ClimateTRACE
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.

Methane emissions put state and federal targets at risk

Methane emissions compared to NSW and QLD 2035 emissions reduction targets (left) and potential 2035 emissions reduction range for Australia (right), $MtCO_2e$

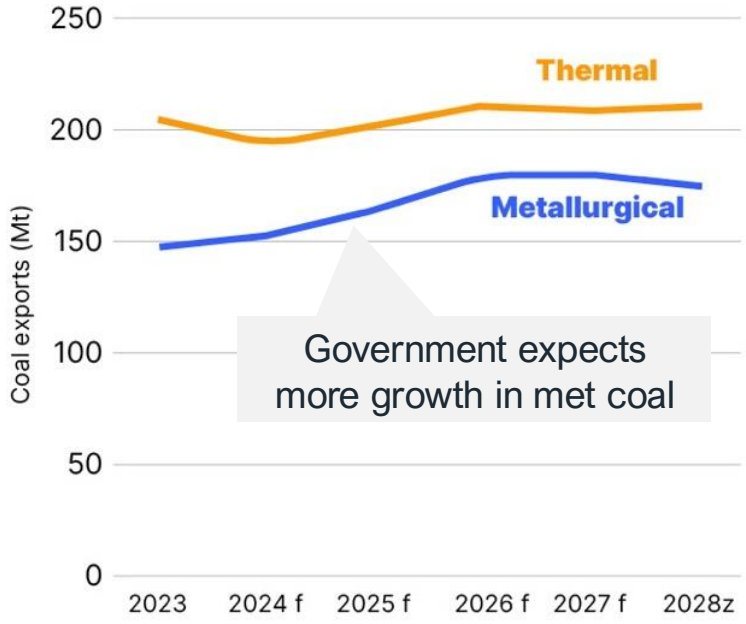


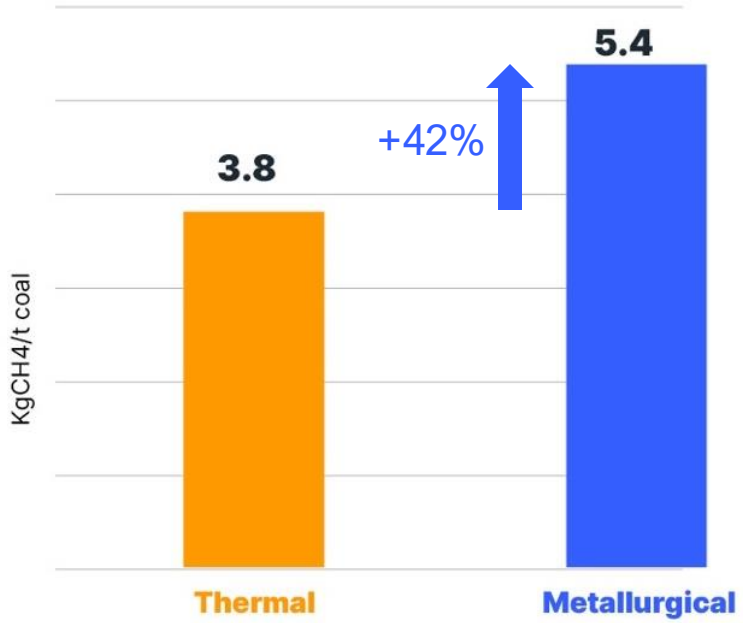
Source: IEEFA analysis based on Australian government, NSW government, QLD government, CCA

Fugitive methane emissions could rise

Metallurgical coal is more emissions intensive

Australian coal export volumes (left), and methane intensity (right)

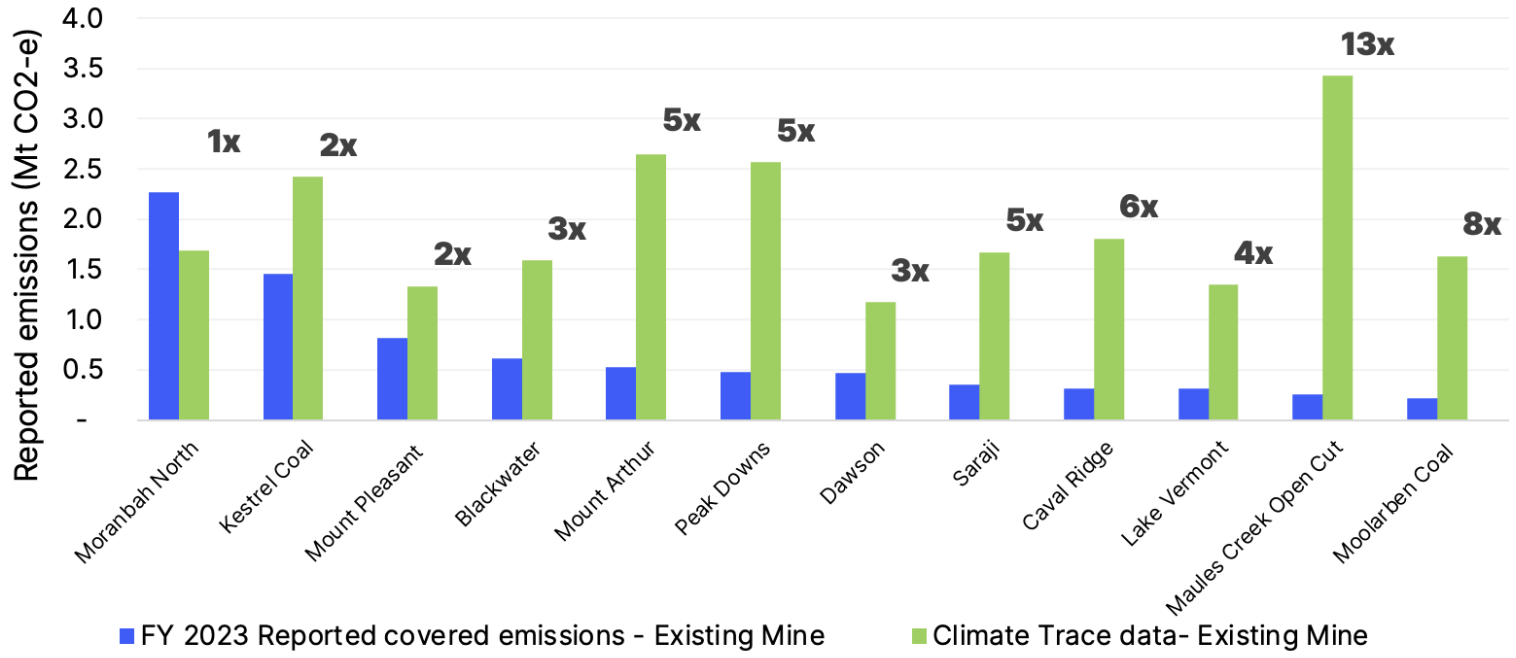




Source: Australian government forecasts and projections, IEA, IEEFA

High uncertainty of methane from coal expansions

Potential underreporting from coalmines with expansion plans



Source: Clean Energy Regulator, Safeguard Mechanism, facility data 2022-23; Climate Trace
Notes: Climate TRACE data refers to methane emissions quantity in 2023 reported in CO_2e, Safeguard Facility data reflects total greenhouse gas emission data not just methane emissions data, reported for FY2022-23.

Shift to Method 2 could worsen underreporting

Method 2 still has high risk of underreporting:

- Different areas can have different gas concentrations
- Could underestimate methane after mining has started
- There is no third-party or external review process

Methods 1-3 are estimates only. Need independent verification using top-down measures (eg satellite)

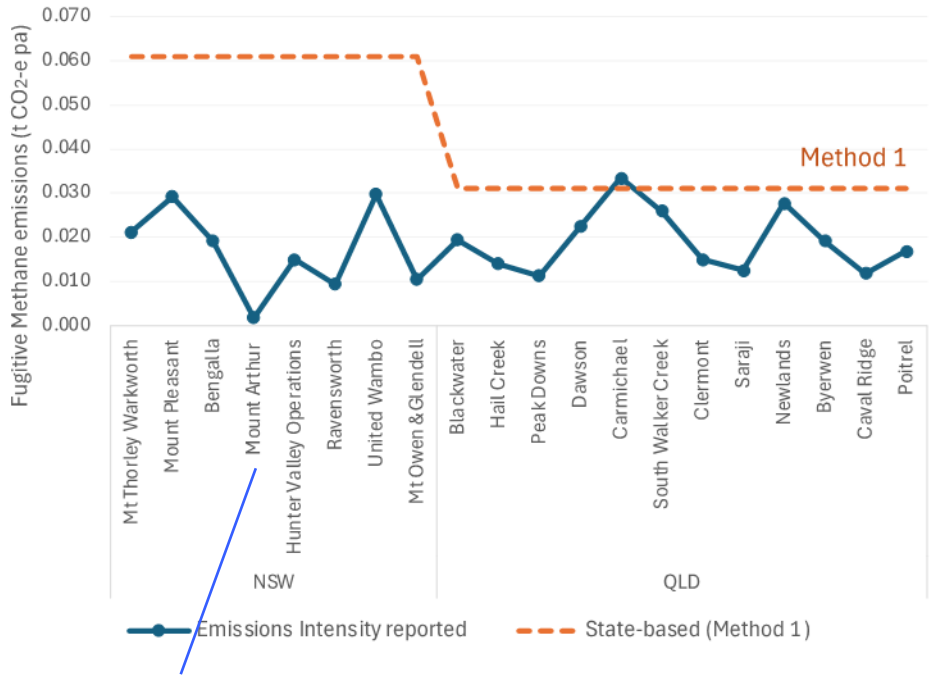
Methods to estimate methane emissions from coal mines

Method 1 uses a set emissions factor per state

Method 2 uses gas sampling from the coal seam, self-assessed

Method 3 uses gas sampling, complying with industry standards

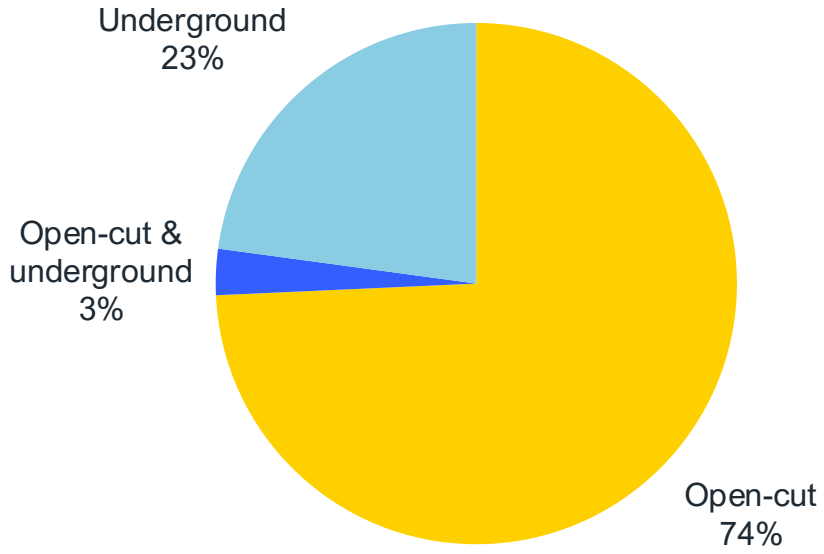
Discrepancy between reported emissions intensity (mostly under Method 2) and state-wide default emissions intensity factors (Method 1), top 20 open cut emitters



When Mount Arthur moved from Method 1 to Method 2, its reported emissions intensity fell by a factor of 32

Open cut mines could lock in high emissions

Proposed new mines or mine expansions undergoing EPBC approval



Risk factors

- The bigger a surface mine gets – the deeper it digs – the more methane it releases
- Depth limits were recently increased from 60m to 120m
- It is harder to abate methane from open-cut mines
- Underreporting is likely much higher for open-cut mines

Source: Australian government, IEEFA, University of Wollongong

Post-operating emissions could be underestimated

- Methane continues to be emitted when mining stops, potentially quite steadily and for an extended time
- Abandoned mines were estimated to emit <1MtCO_2e in 2019, but there is a high risk of underreporting
- Glencore's Ravensworth was estimated to release >1MtCO_2e when it was in care and maintenance from 2014 to 2020 – and not subject to reporting emissions
- **Estimates for EU**: ~5.6 MtCO_2e per year
- **Estimates for US**: 12.5% of the country's coal methane

In 2015, the US captured and utilised about ~5.6PJ of methane from 40 abandoned coalmines.

These projects are seen as a way to "stimulate economic development in communities affected by coalmine closures".

Source: US EPA, Ember, GEM, Berkeley Lab, ACF

Shift in ownership of coal mines could slow abatement

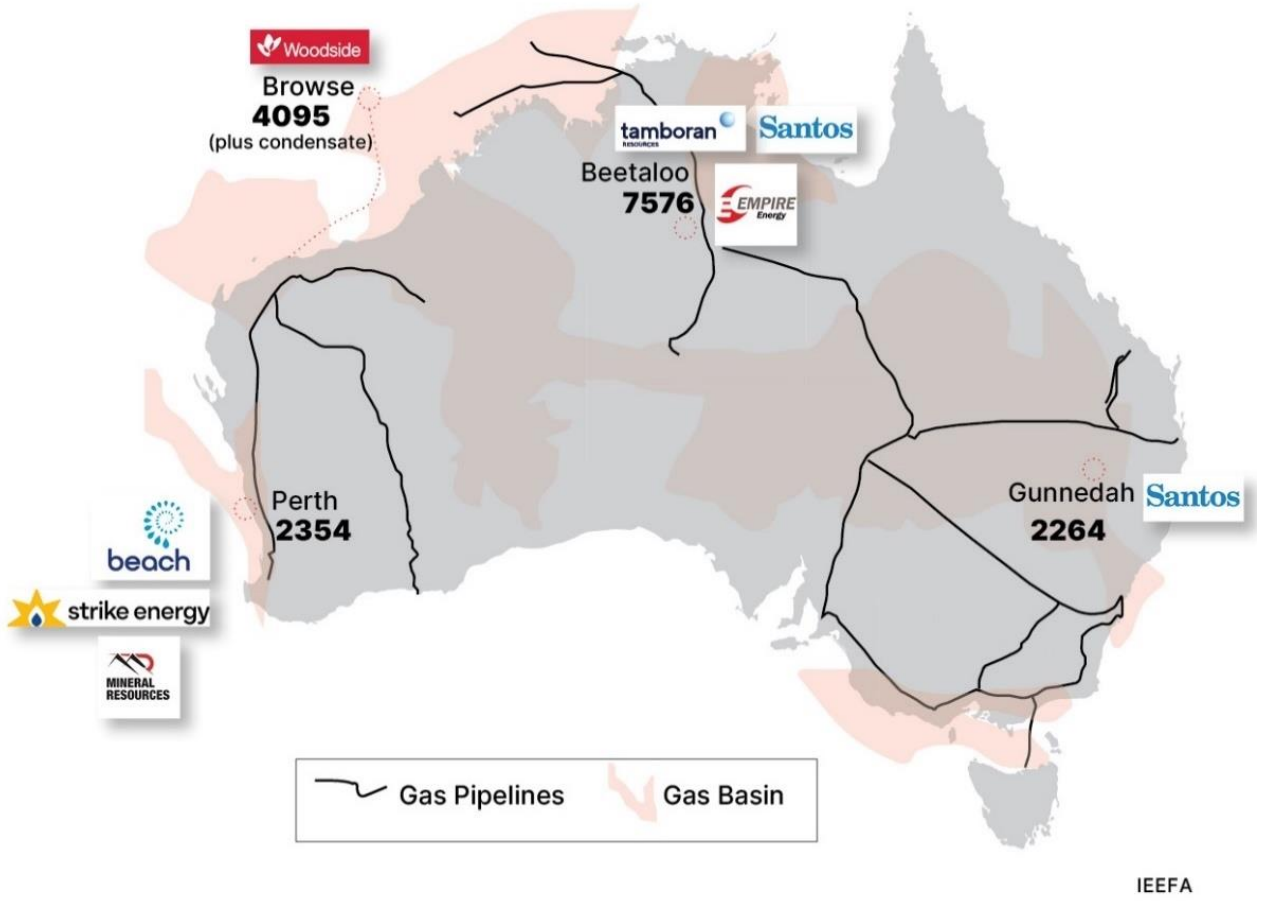
- Large diversified miners are selling their coal portfolios, often to **smaller, pure-play coal miners**
- This shift is also often associated with a shift to a higher share of **private ownership & finance**
- There is a risk that these shifts could lead to **decreased ambition on fugitive methane** abatement

Illustration: AngloAmerican portfolio

- **Anglo-American** (diversified miner) recently sold its met coal mines to **Peabody** (pure-play coal miner)
- **Anglo-American** had a target of carbon neutral operations by 2040, and was investigating VAM oxidising systems to abate the remaining methane from its underground mines
- **Peabody** has lower emissions reduction targets than Anglo-American and it is unclear whether they will continue those efforts

Source: IEEFA, Coalmine M&A, financing and unintended consequences and Anglo sale puts Queensland coal mine emissions in the spotlight – and in Wall Street's hands

Proposed gas developments could add to emissions

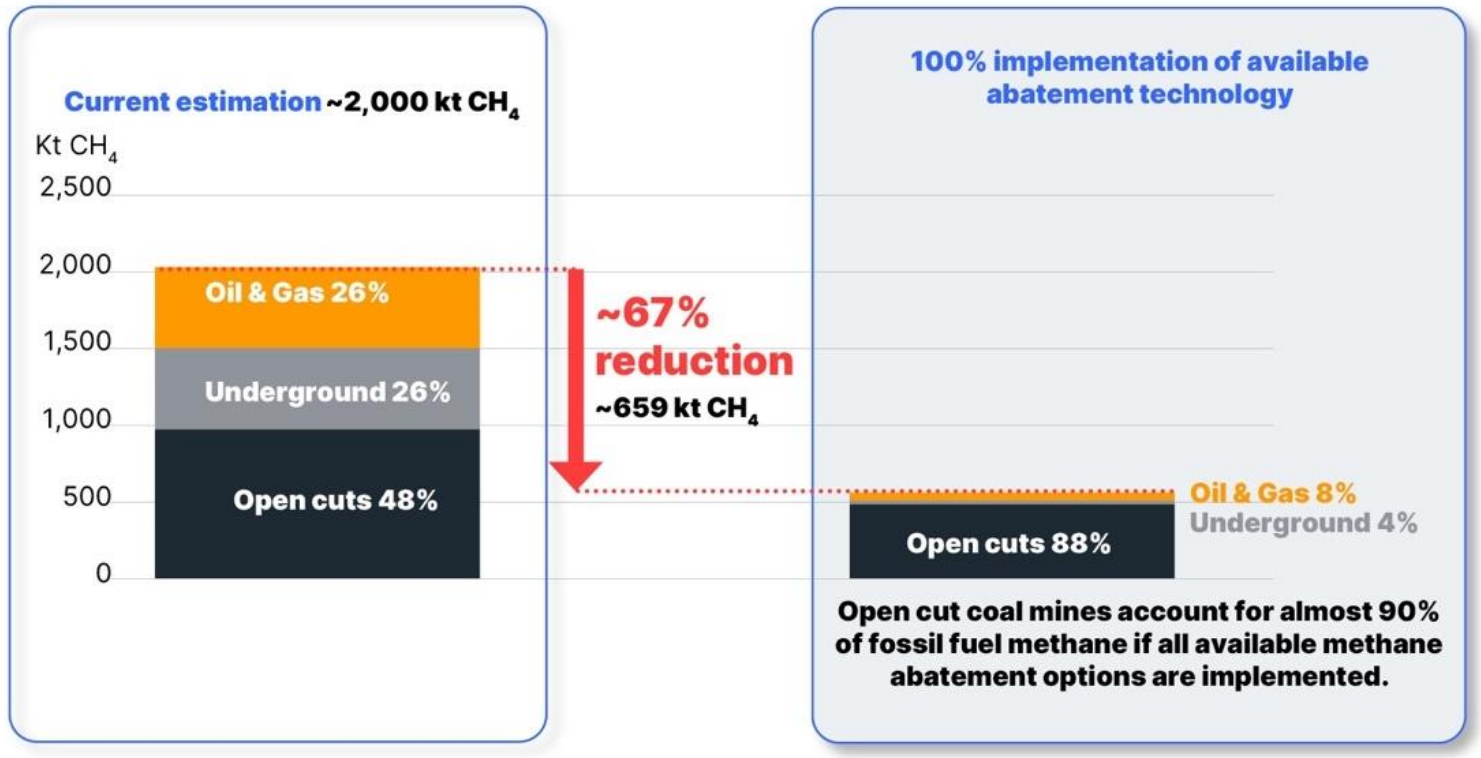


Source: Australian government, company reports

The economic case for methane abatement

Existing technologies could slash fugitive emissions

Fossil fuel fugitive methane emissions abatement potential, $MtCH_4$



Source: IEEFA analysis based on Australian government, Rystad.

Underground coal mines: ~95% abatement possible

Enhance pre-drainage

- Underground mines already conduct pre-drainage, but the **amount drained can increase**.
- **Leak detection and repair** and rerouting can prevent methane leakage from equipment.
- Most methane captured is flared to turn it into CO_2 and reduce its warming potential. **Utilising methane** instead could displace other gas use.

Abate Ventilation Air Methane (VAM)

- VAM is currently released in the atmosphere, making up 70%-80% of Scope 1 emissions.
- VAM can instead be combusted or used for heat or power generation through the implementation of **regenerative thermal oxidisers (RTOs)** or other new technologies.

Capture post-closure

- The technologies discussed above can **continue even after mining ceases**.
- Beware: Filling coalmines with water does not entirely stop methane emissions from the site and produces a range of additional risks and costs.

Source: IEEFA analysis based on broad range of sources

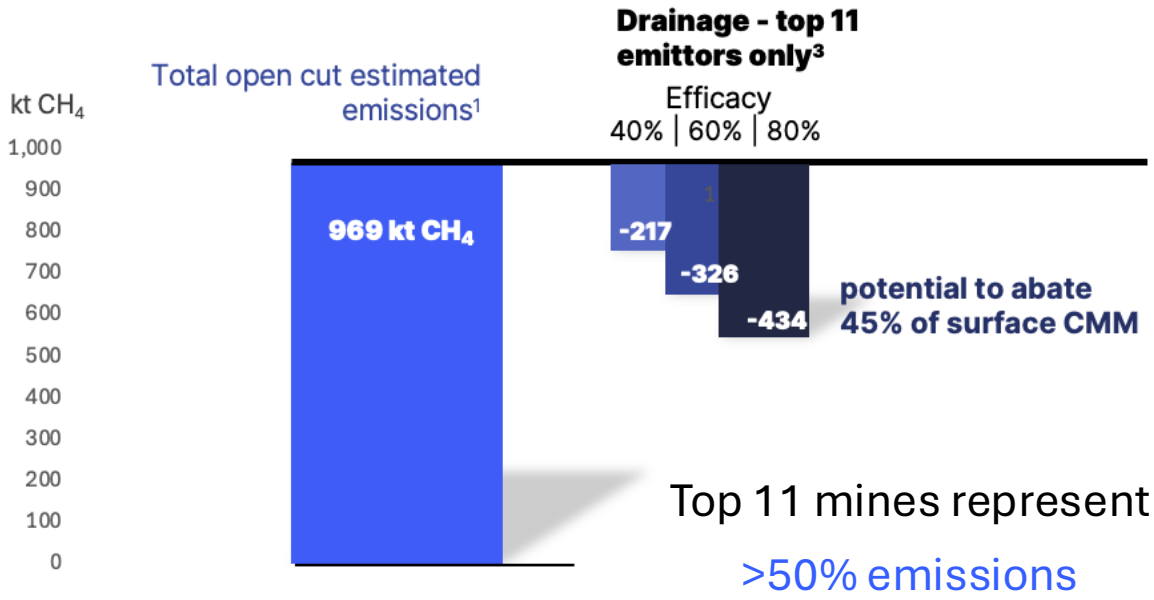
Open-cut coal mines: ~40% abatement possible

- Pre-drainage could capture 20%-80% methane
- No pre-drainage now, feasibility studies only
- Cost ~$15/t$CO_2$e, but may delay operations

Emerging examples in QLD, supported by government funding:

- Coronado Resources: Trialling methane pre-drainage and using it to displace diesel in trucks.
- Stanmore Resources: Capturing methane to power a new 20MW gas-fired power station for the mine.

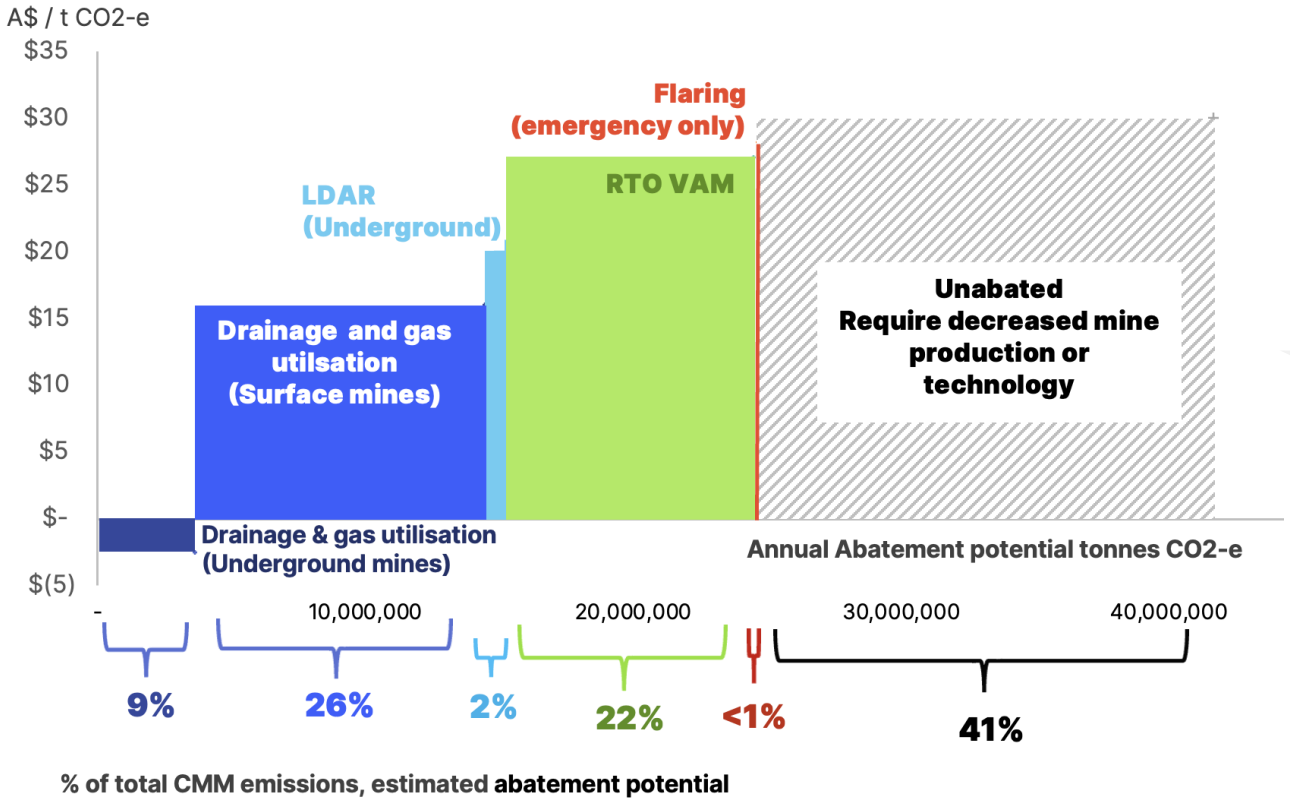
Prioritising top emitters makes sense



Source: IEEFA analysis based on Australian government, ClimateTRACE

Coal: ~60% reduction is achievable at <$30/tCO2e

Methane marginal abatement cost curve (MACC), Australian coalmine sector



Total net cost:

$1/t saleable coal

<0.5% recent revenue

Source: IEEFA analysis based on Rystad

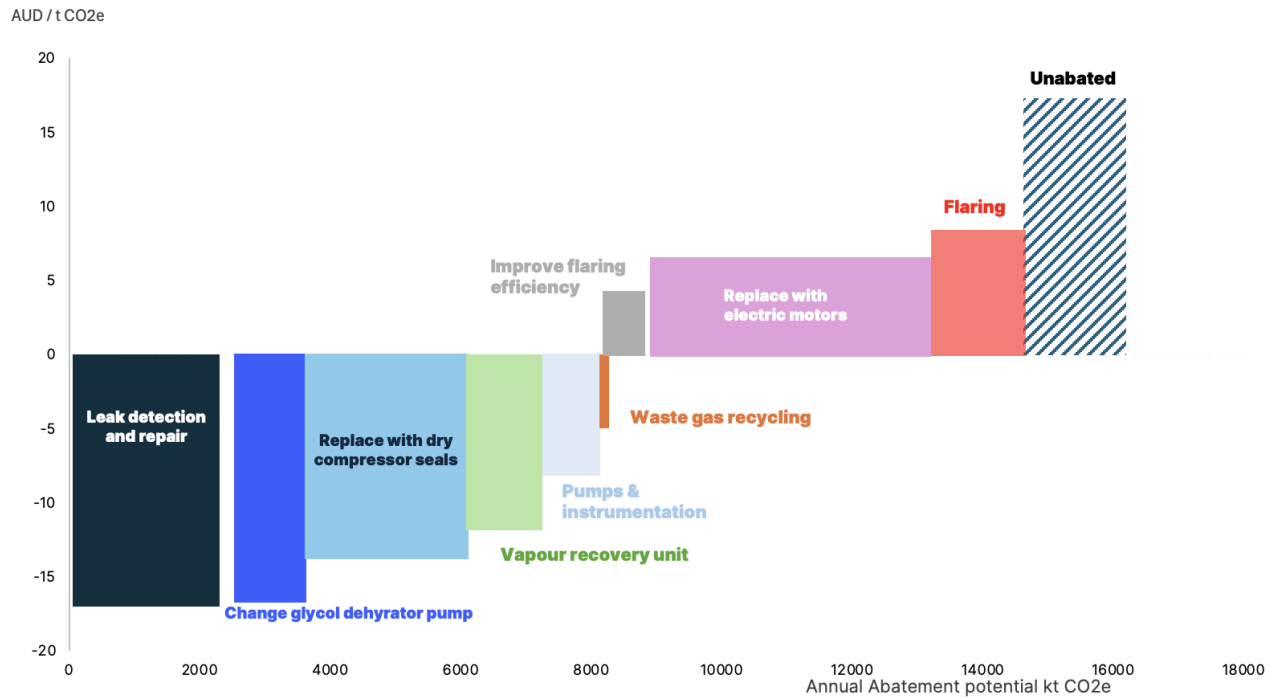
Gas: ~90% abatement achievable with best practices

- **Leak detection and repair regimes** to identify and address methane leaks
- **Replacing high-loss equipment** (that emits methane) with upgraded equipment, including electric equipment and air compressor systems (that do not vent methane)
- **Recovery of methane vapour** that might otherwise be vented, such as from storage tanks
- **Deploying electricity-powered equipment**

Source: Wood Mackenzie

Gas: ~90% reduction is achievable at net cost benefit

Methane marginal abatement cost curve (MACC), Australian gas sector



Total net cost:

negative

Source: IEEFA analysis based on Rystad

The lost methane has a high financial value

Lost value from estimated fugitive methane emissions (2021 prices)

Oil and gas sector	Potential methane capture (PJ)	Domestic market forgone revenue (A$M)	LNG markets forgone revenue (A$M, 2024)
Total potential to capture methane	26.90	308	378
Coalmining sector	**Potential methane capture/use (PJ)**	**Equivalent value (A$M)**	
Underground mines			
Drainage & LDAR	8.9	115	
VAM abatement	18.9	245	
Open-cut mine drainage	21.6	282	
Coalmines total	*48.8*	*643*	
Oil and gas + coal total	*75.7*	*951*	

Total equivalent value:
$951 million / year

>2x the gas anticipated to be required for the NEM in 2025

Source: IEEFA analysis

Costs could be lower if underreporting is confirmed

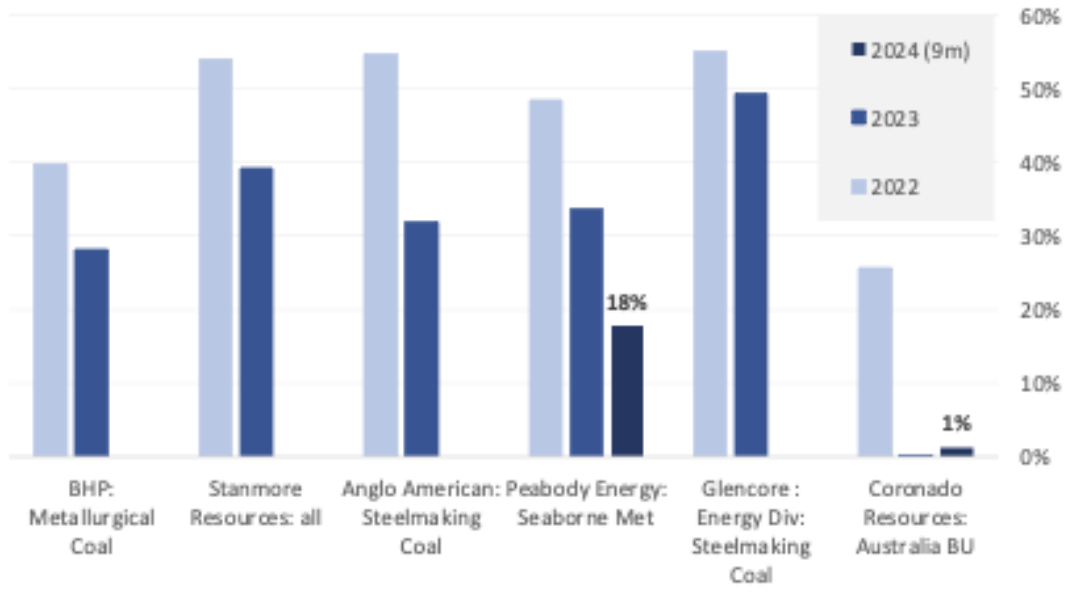
Same capital costs + Higher value of recovered methane = Lower net costs

Source: IEEFA analysis

New coal developments should be scrutinised

- Coal mining costs have risen by >40% on average
- High-cost and low-price mines could be unprofitable and deliver no tax/royalties
- This is particularly true for pulverised coal injection (PCI) coal, the first met coal grade expected to decline
- E.g. IEEFA estimated Baralaba South project net present value could be -$2bn (0.43 benefit/cost ratio)

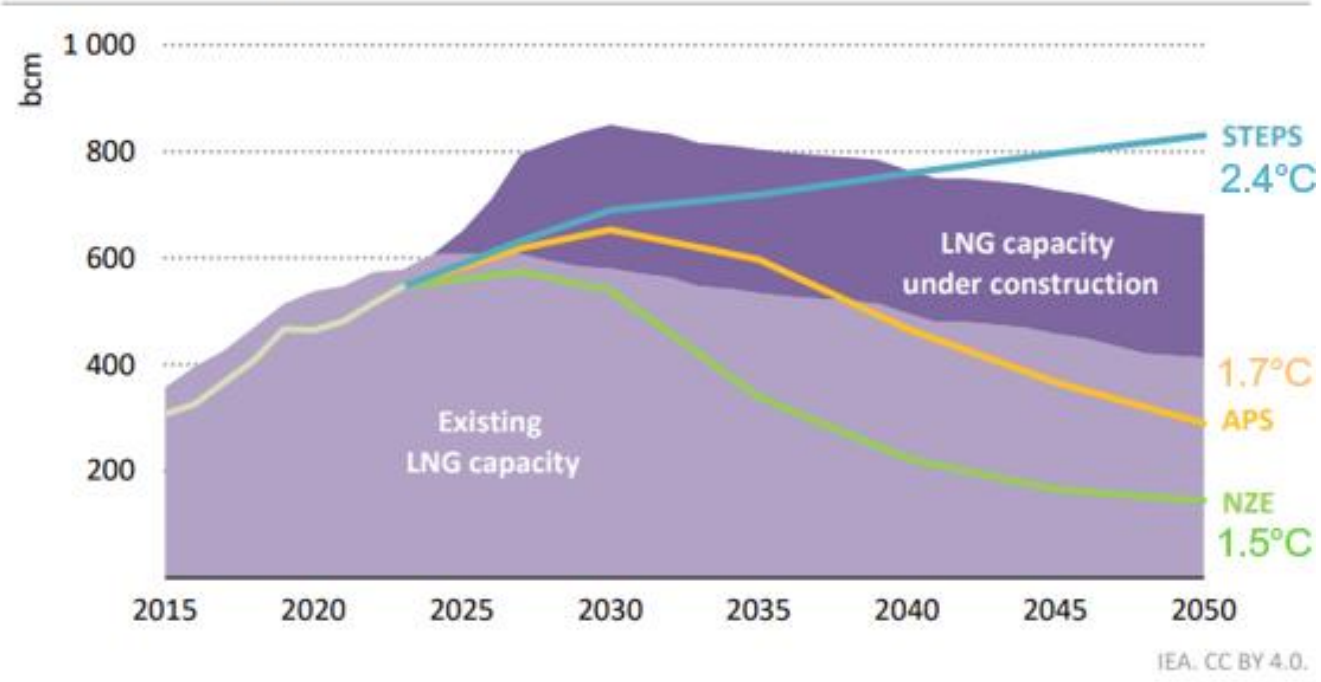
Met Coal miner EBITDA margins, %



Source: IEEFA, New coalmines could deliver zero royalties and a methane headache for Queensland; unpublished IEEFA analysis based on recent company results; Submission: Baralaba South Project – Environmental Impact Statement

New LNG projects could deliver lose-lose situation

Figure 4.7 ▷ LNG trade by scenario relative to existing and under construction export capacity to 2050



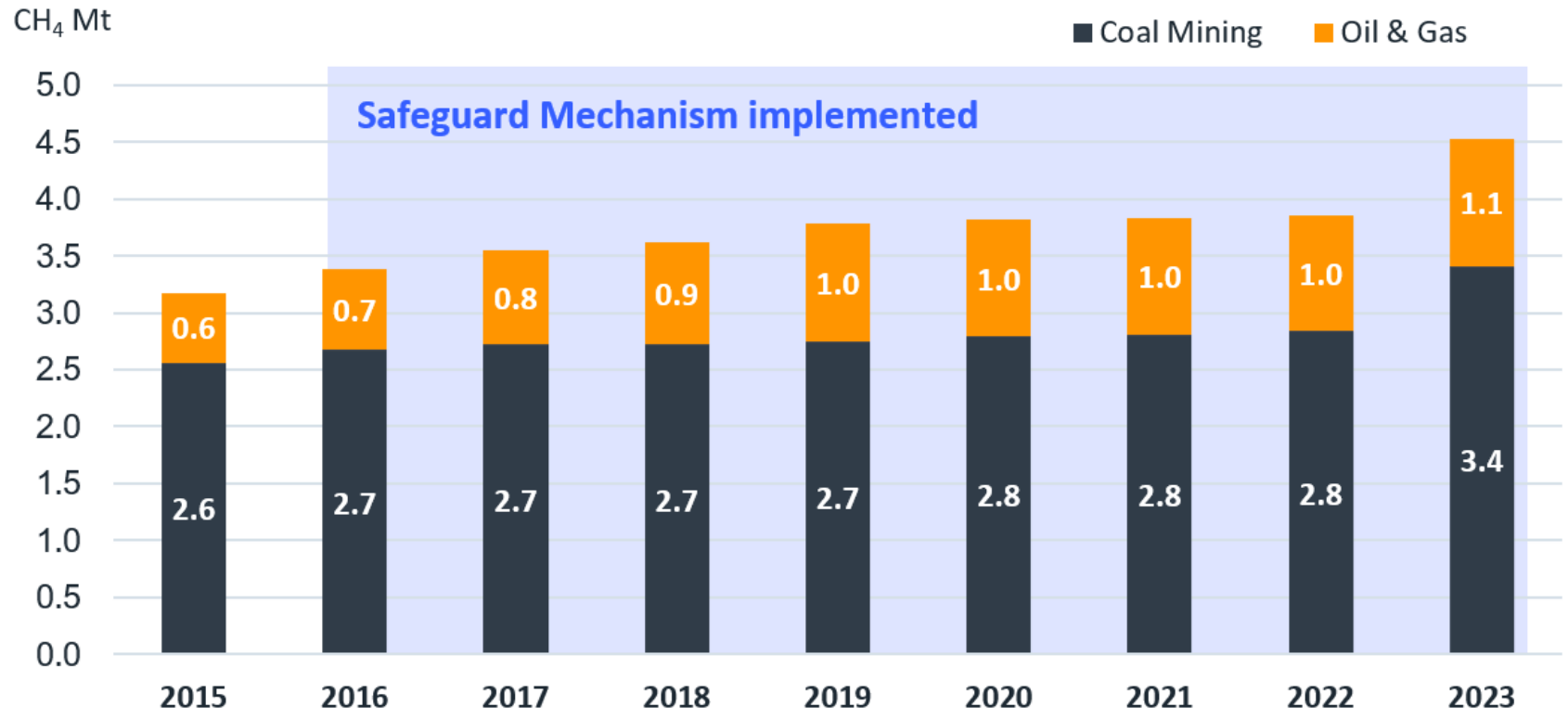
- Prices needed to generate large volumes of demand in developing economies: US$3-5/Mbtu
- Cost recovery for new export projects globally: US$8/Mbtu
- Absorbing new supply would require slower energy transition – less RE & EE – than in STEPS

Source: IEA, World Energy Outlook 2024

Recommendations for government

Methane emissions may have risen under Safeguard

Australian coalmine and gas methane emissions, 2015-2023



Source: ClimateTRACE, IEEFA

The Safeguard Mechanism is not effective for methane

Ineffective baselines

- Baselines have increased by 0.3 $MtCO_2e$ for coal mines, while they decreased by almost 7 $MtCO_2e$ for sectors excl. coal and gas.
- Six of the 10 coal mines have no requirement to reduce their emissions.
- Not representative of actual reductions required due to underreporting.

Insufficient coverage

- Based on ClimateTRACE data, up to 23 coalmines should have reported under the Safeguard Mechanism in FY2022-23 but did not.

Low incentive to act

- Measurement methods can remove incentive to act, underestimate emissions.
- Unlimited carbon offsets lower priority for capital deployment.

Source: IEEFA analysis based on Australian government, ClimateTRACE, Energy & Resource Insights

Australia is lagging behind other countries on methane

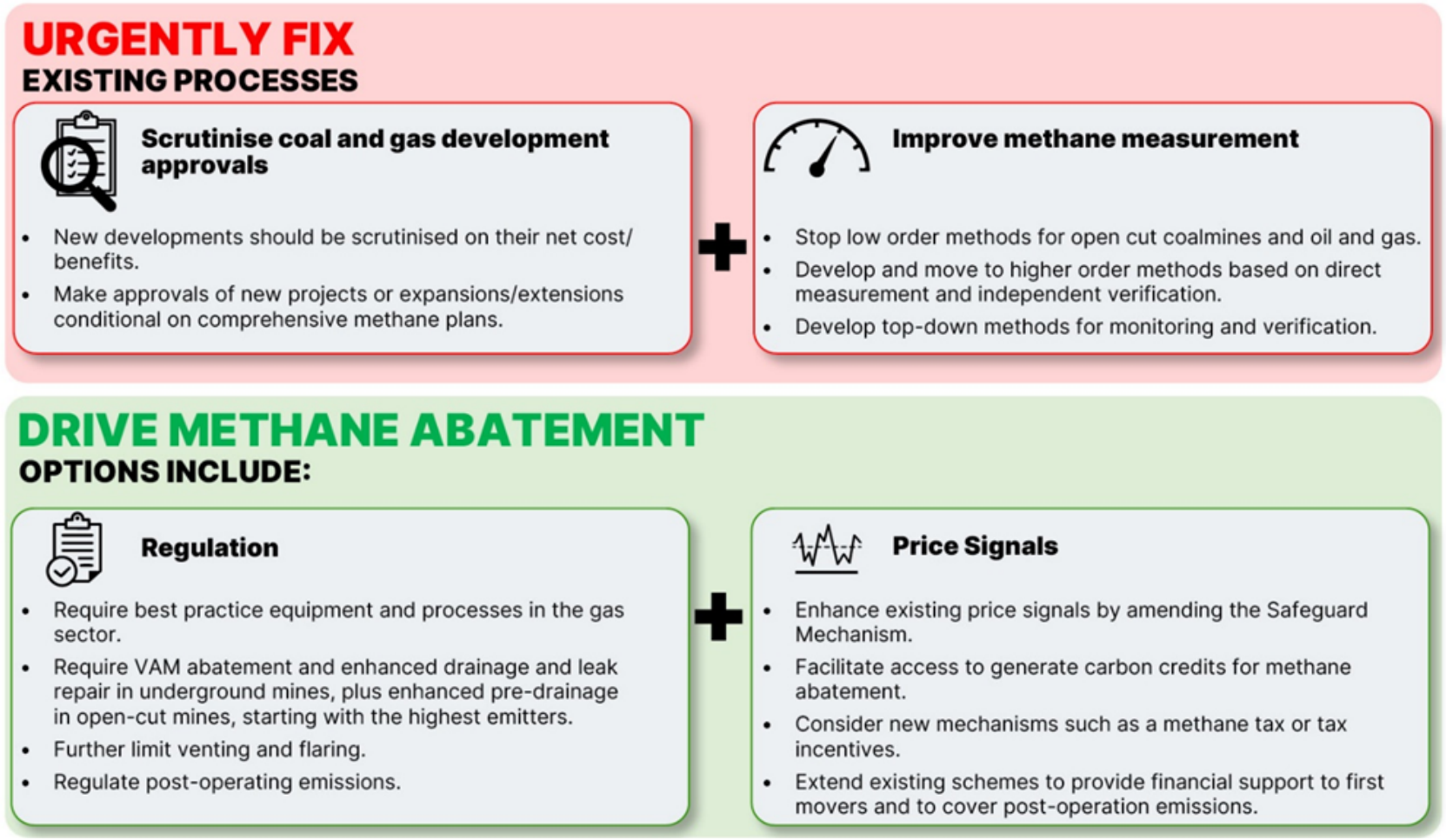
- Methane tax of ~A$46/tCO2e in 2024, increasing to A$76/tCO2e by 2026.
- North Dakota has banned methane venting, and Texas has restricted it.
- Carbon markets and tax incentives driving abandoned coal mine abatement.
- New rule proposed to require advanced leak detection in gas pipelines.

- Carbon price driving coal mine methane abatement, especially in Germany.
- Approvals accounting for climate impact.

- Carbon markets revenue driving VAM abatement implementation.
- Proposing to to make VAM capture and utilisation mandatory.

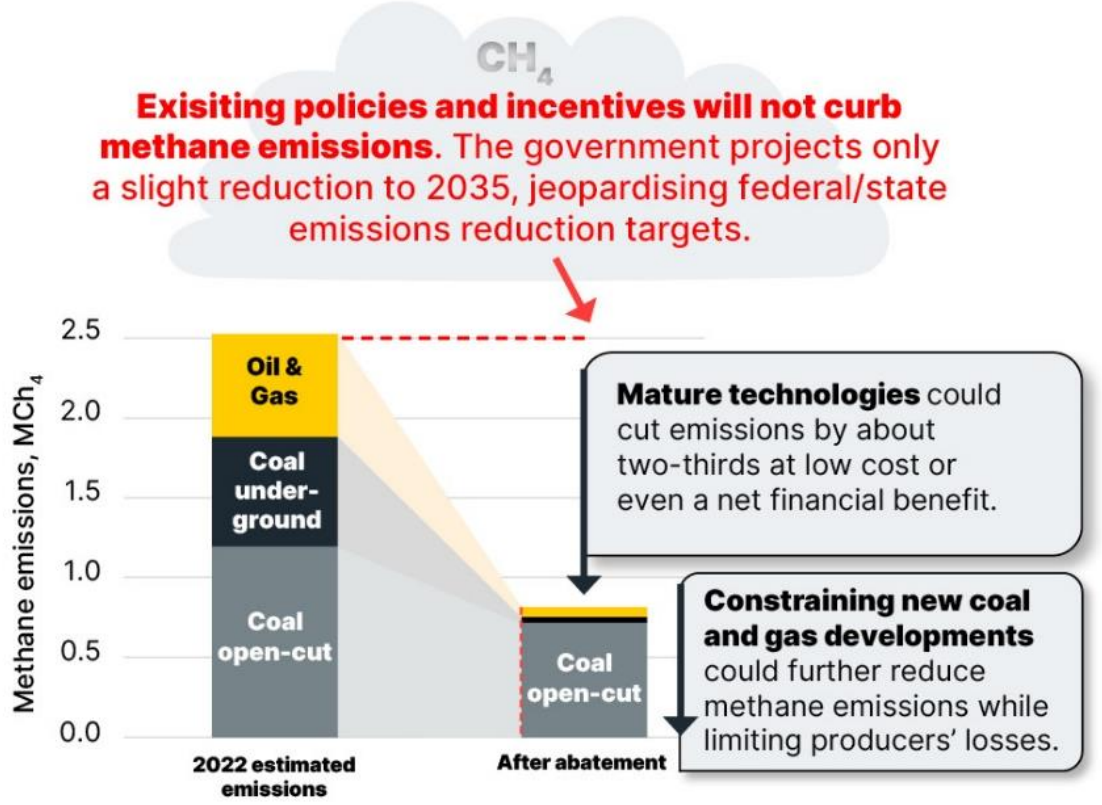
Source: Government information

Urgent government action is warranted



Source: IEEFA analysis based on Australian government, IEA, ClimateTRACE

Prioritising methane abatement makes economic sense for Australia



The gas sector could reduce **90%** of its methane emissions at a net financial benefit by selling the captured methane.

Low-cost technologies could almost eradicate methane from **underground coalmines**.

Open-cut mines can reduce methane by 20%-80% using pre-drainage. The 11 most emissions-intensive mines could address half the sector's emissions.

The net cost is estimated at about **$1/t coal** – 0.5% of recent revenue levels.

$ IEEFA calculates the lost value of fugitive emissions to be around **~$933**

Urgent government action is needed to:

1. **Prevent the methane problem worsening**
2. **Shift the cost-benefit for reducing emissions**
3. **Regulate emissions reduction/ utilisation targets**

Source: IEEFA Calculations. Note: Fugitive methane emissions are natural gas escaping into the atmosphere.

IEEFA

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