An aerial photograph of a frozen lake, likely in a northern region, showing a vast expanse of ice with numerous circular, white, bubble-like formations scattered across the surface. The water between the ice is a deep blue color. The overall scene is serene and visually striking.

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

Snapshot of IEEFA



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.

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2. Fugitive methane emissions could rise
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4. Recommendations for government

A large problem for Australia

Methane makes an oversized contribution to warming

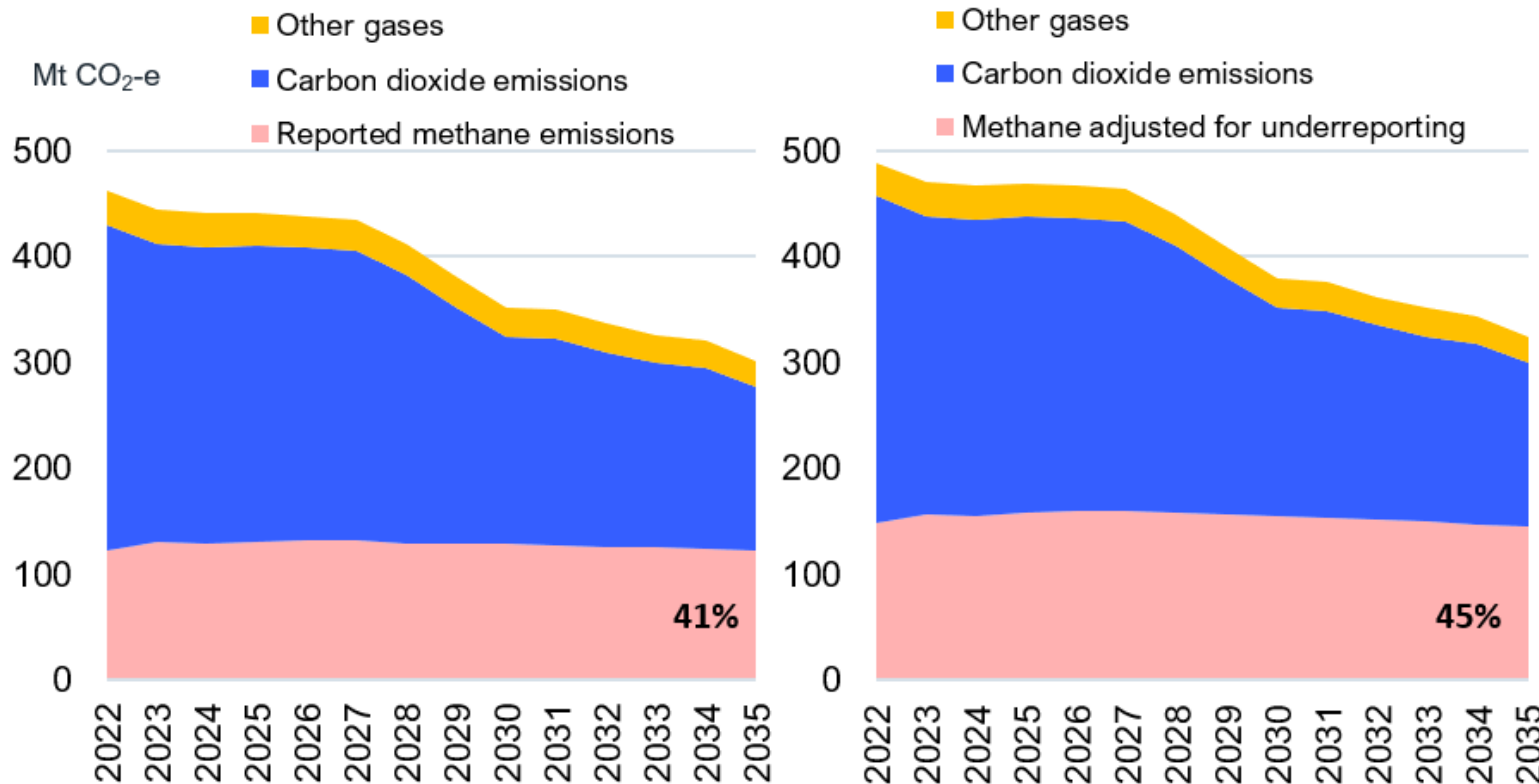
- Methane accounts for about **30%** of global temperature increases
- *IEA*: Fossil fuel methane needs to **reduce by 75%** by 2030 for 1.5°C
- *UNEP*: Addressing methane emissions is the **most cost-effective** greenhouse gas reduction strategy

Methane is a short-lived greenhouse gas with a high warming potential - **~30x more potent than CO₂** over a 100-year time horizon

Source: IEA, UNEP, IPCC

Methane stays flat to 2035 while CO₂ halves

Figure 3: Australian government emissions projections

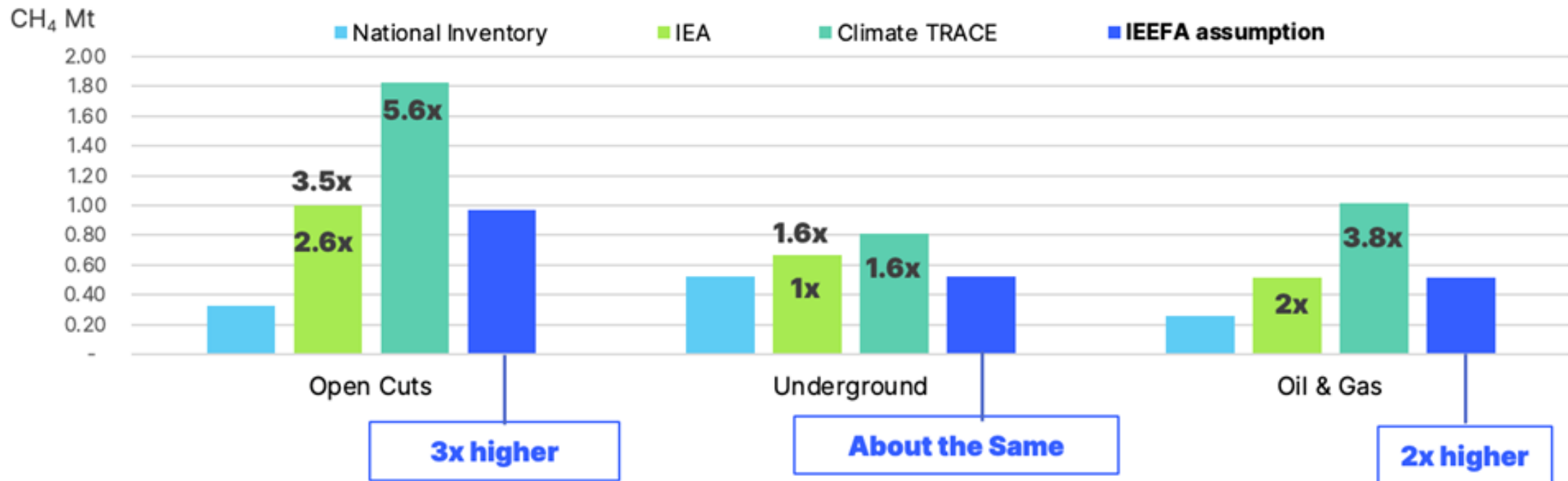


This is at odds with Australia's commitment to contribute to global efforts to reduce methane emissions by **at least 30%** between 2020 and 2030

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

Suspicious of material underreporting

Estimates of methane emissions underreporting, MtCH₄

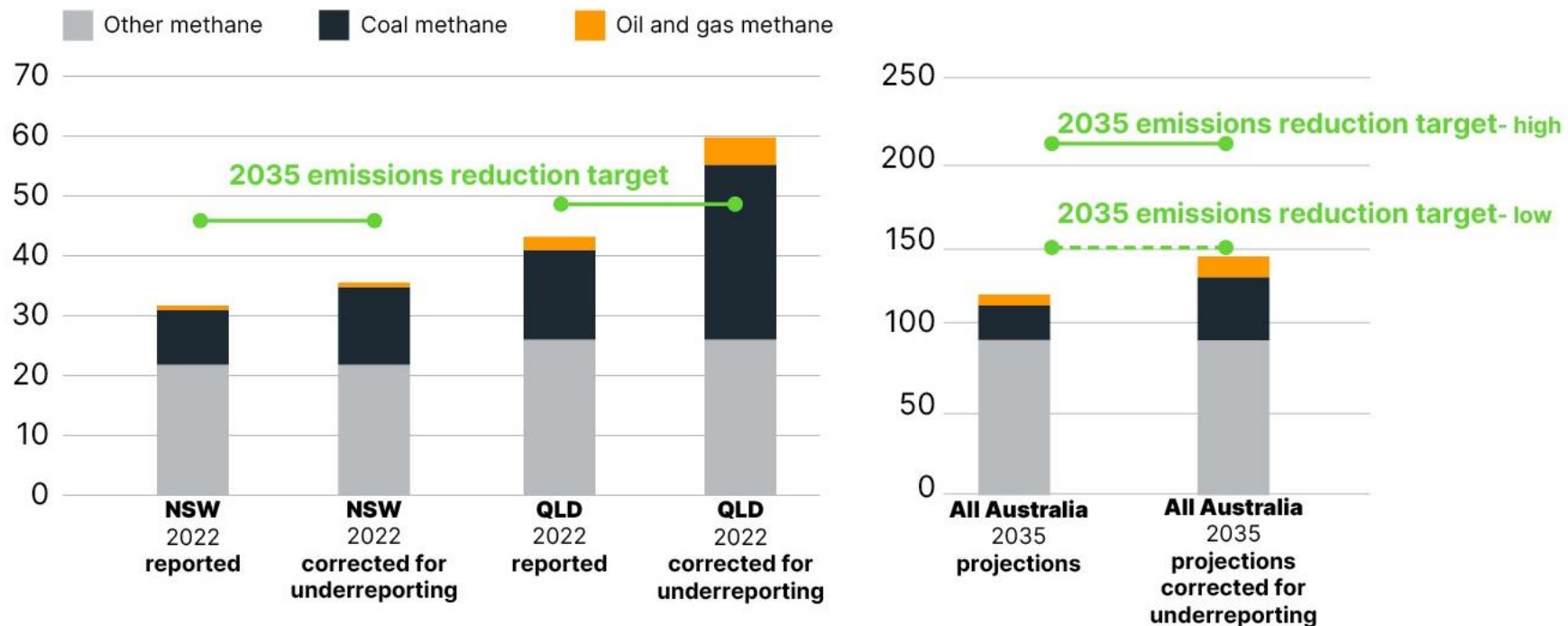


Source: IEEFA analysis based on Australian government, IEA, ClimateTRACE

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), MtCO₂e



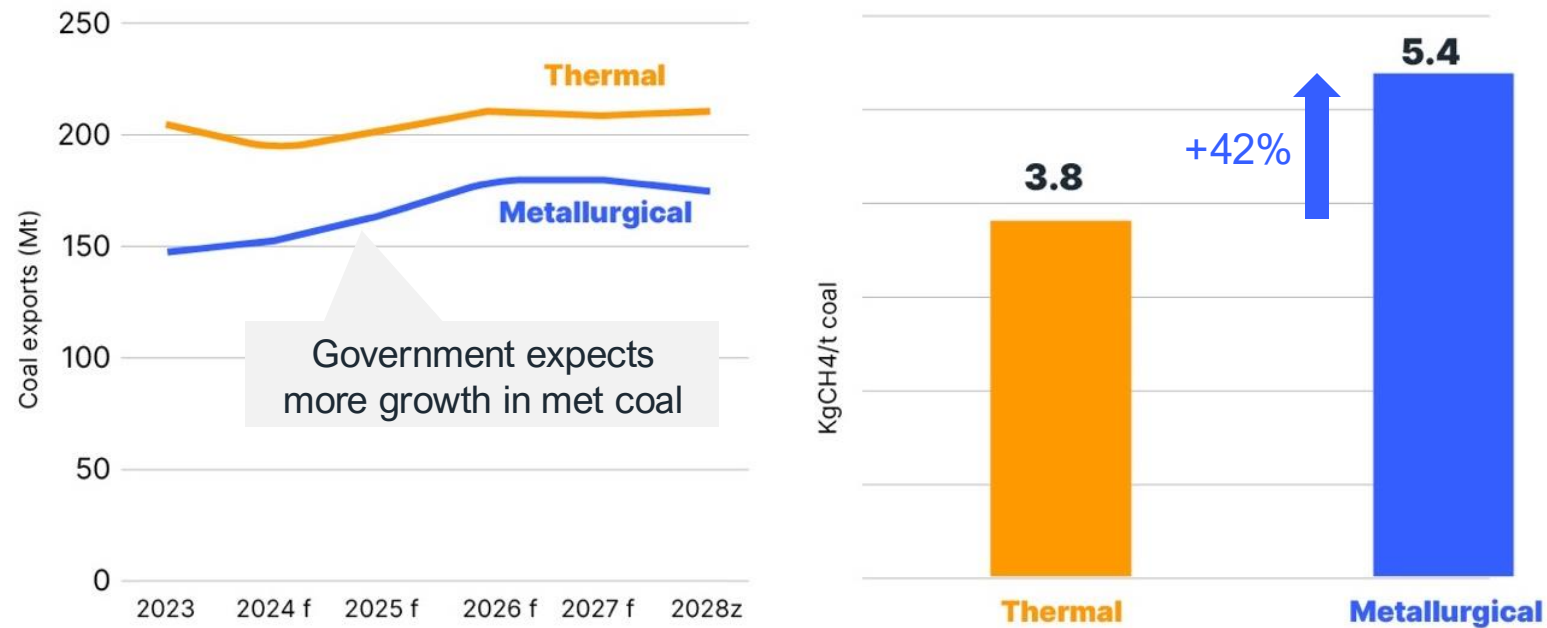
Source: IEEFA analysis based on Australian government, NSW government, QLD government, CCA

Fugitive methane emissions could rise



Metallurgical coal is more emissions intensive

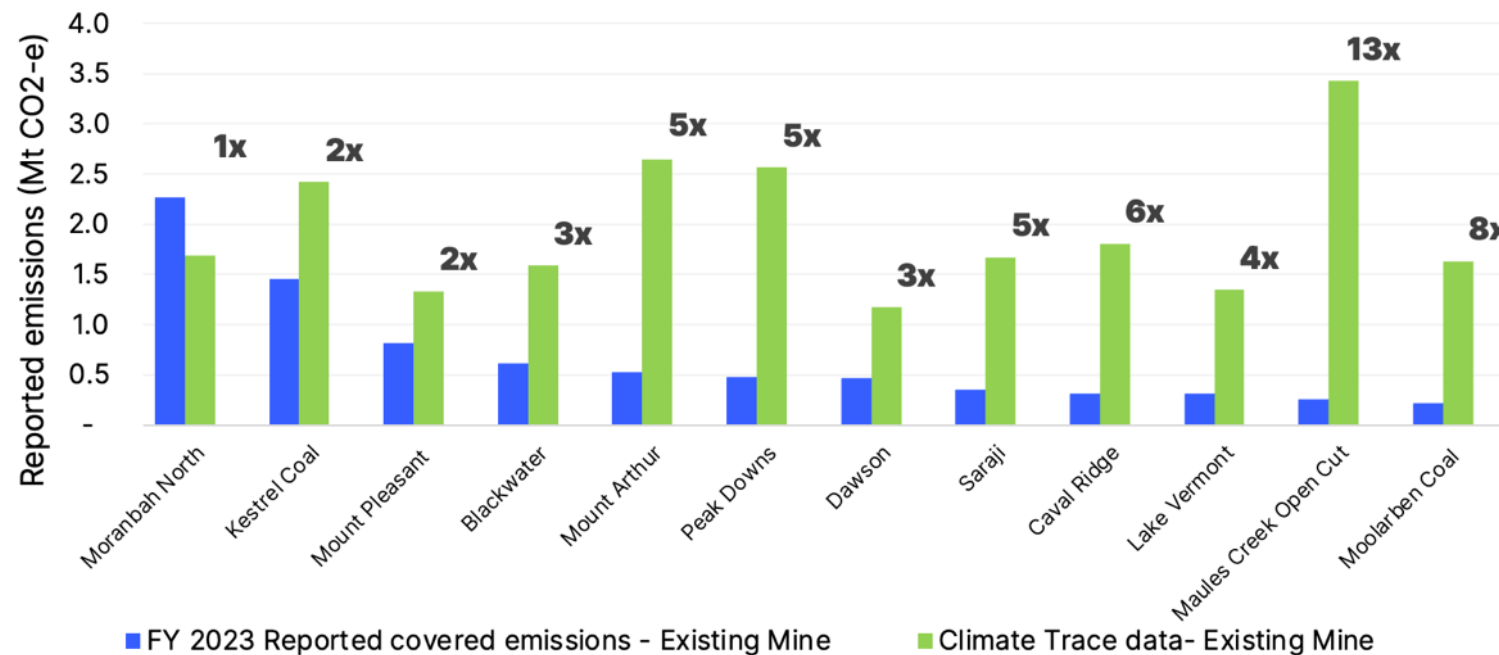
Australian coal export volumes (left), and methane intensity (right)



Source: Australian government forecasts and projections, IEA, IEEFA

High uncertainty of methane from coal expansions

Potential underreporting from coalmines with expansion plans

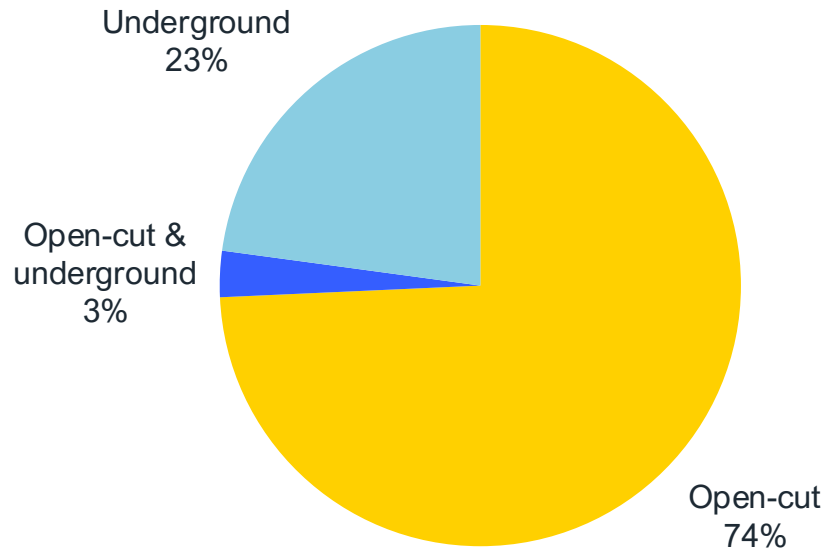


Source: Clean Energy Regulator, Safeguard Mechanism, facility data 2022-23; Climate Trace

Notes: Climate TRACE data refers to methane emissions quantity in 2023 reported in CO₂e, Safeguard Facility data reflects total greenhouse gas emission data not just methane emissions data, reported for FY2022-23.

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 $<1\text{MtCO}_2\text{e}$ in 2019, but there is a **high risk of underreporting**
- **Glencore's Ravensworth** was estimated to release $>1\text{MtCO}_2\text{e}$ when it was in care and maintenance from 2014 to 2020 – and not subject to reporting emissions
- **Estimates for EU:** $\sim 5.6\text{ MtCO}_2\text{e}$ per year
- **Estimates for US:** 12.5% of the country's coal methane

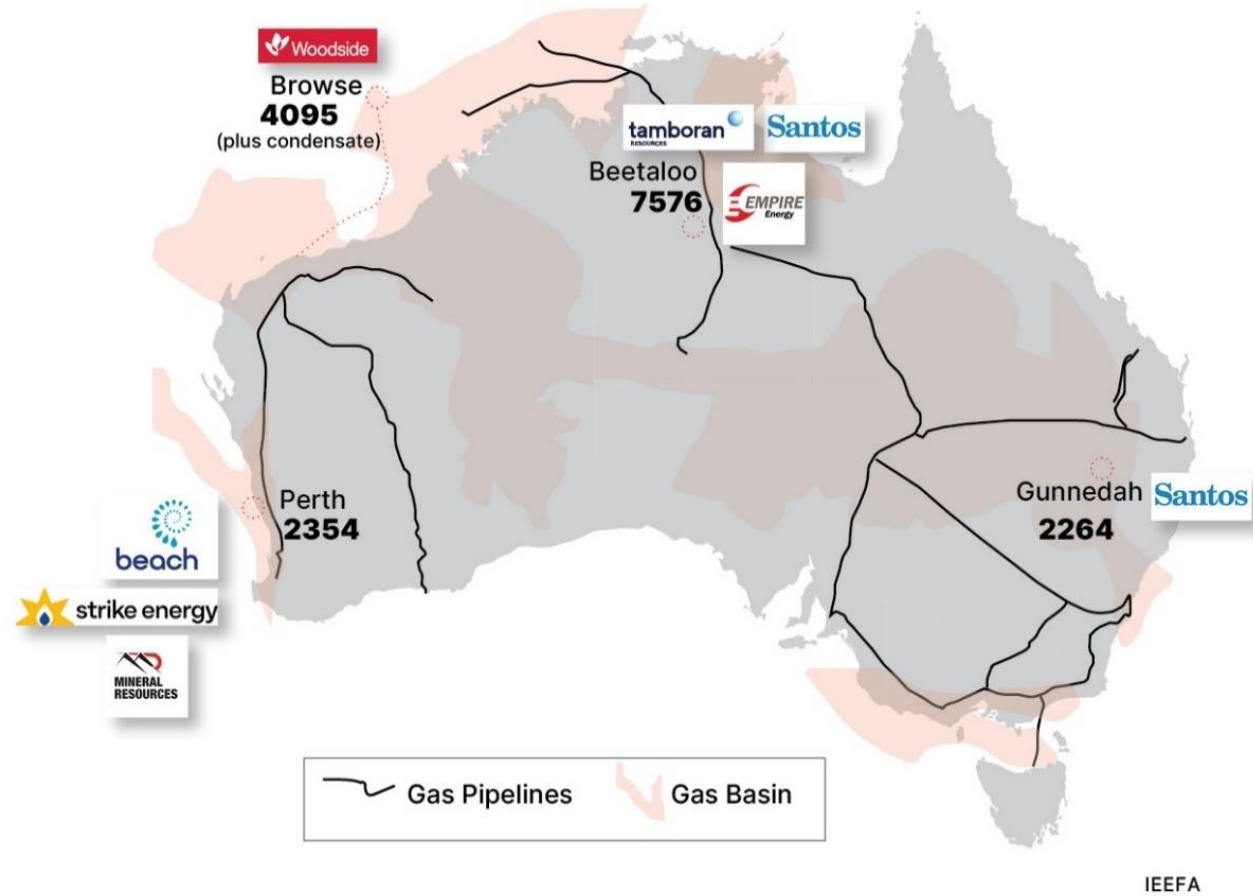


In 2015, the US captured and utilised about $\sim 5.6\text{PJ}$ of methane from 40 abandoned coalmines.

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

Proposed gas developments could add to emissions



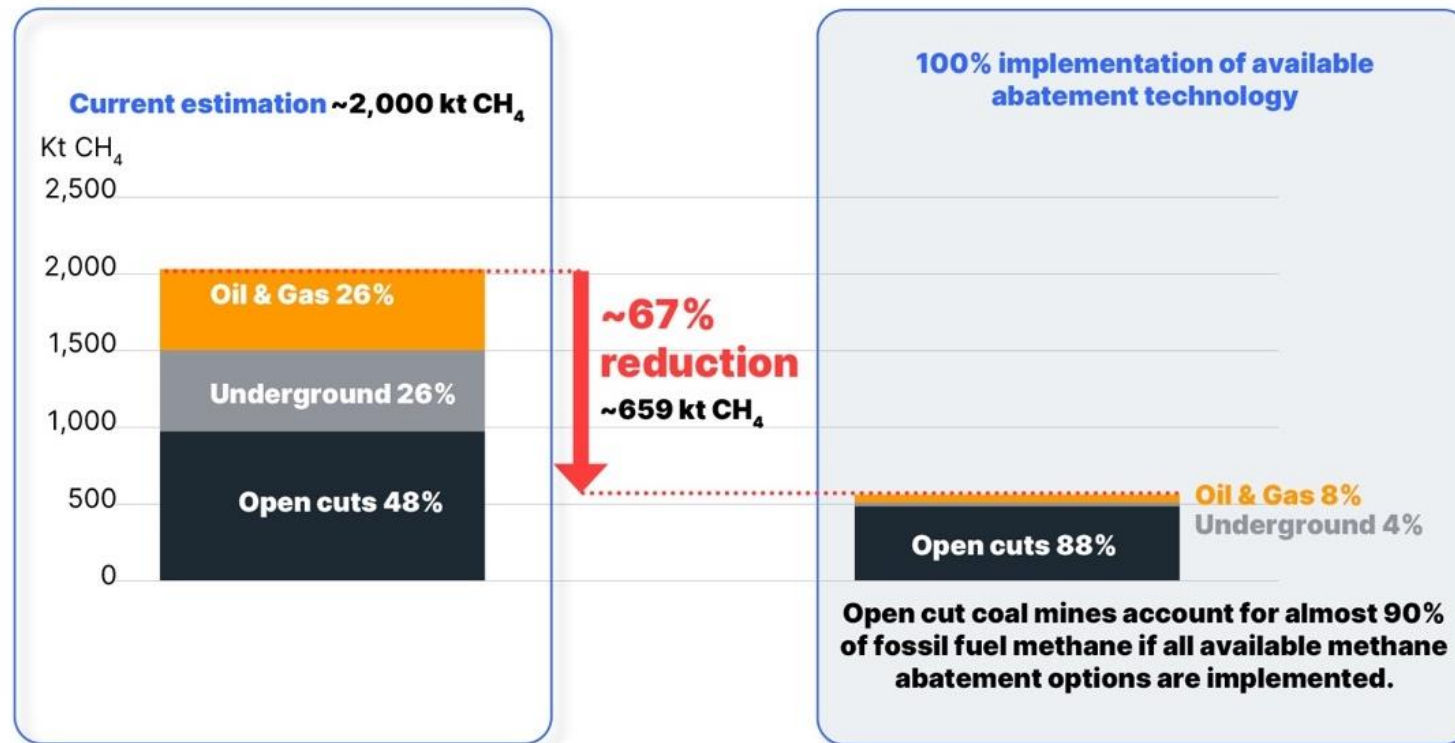
Source: Australian government, company reports

The economic case for methane abatement



Existing technologies could slash fugitive emissions

Fossil fuel fugitive methane emissions abatement potential, MtCH₄



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 CO₂ 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

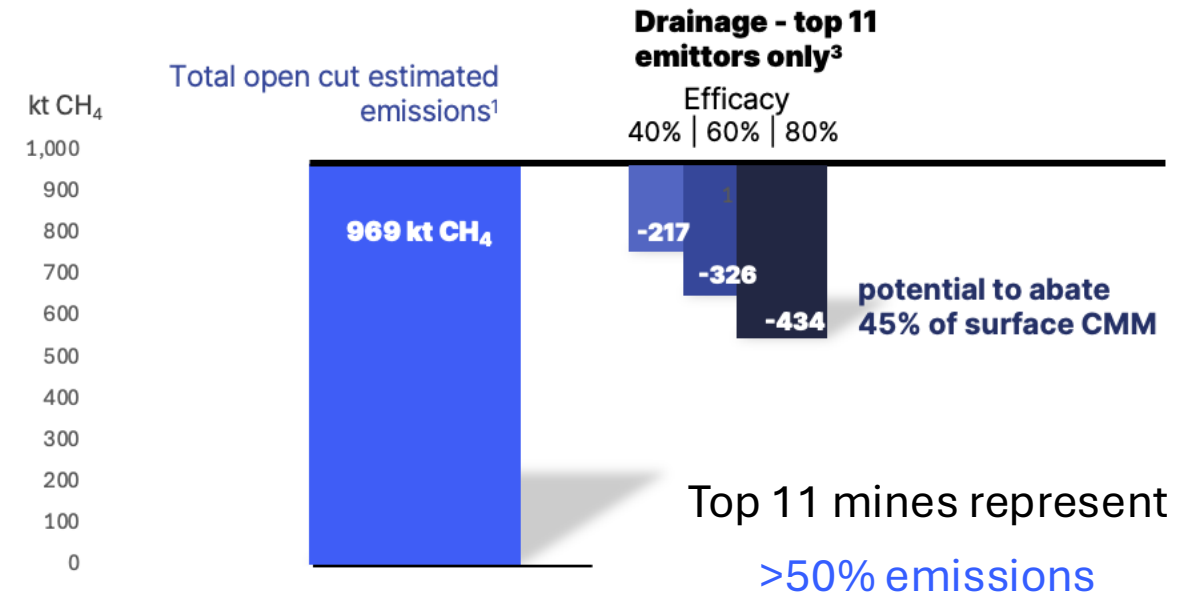
Open-cut coal mines: ~40% abatement possible

- **Pre-drainage** could capture 20%-80% methane
- No pre-drainage now, feasibility studies only
- Cost ~\$15/tCO₂e, but may delay operations

Emerging examples in QLD, supported by government funding:

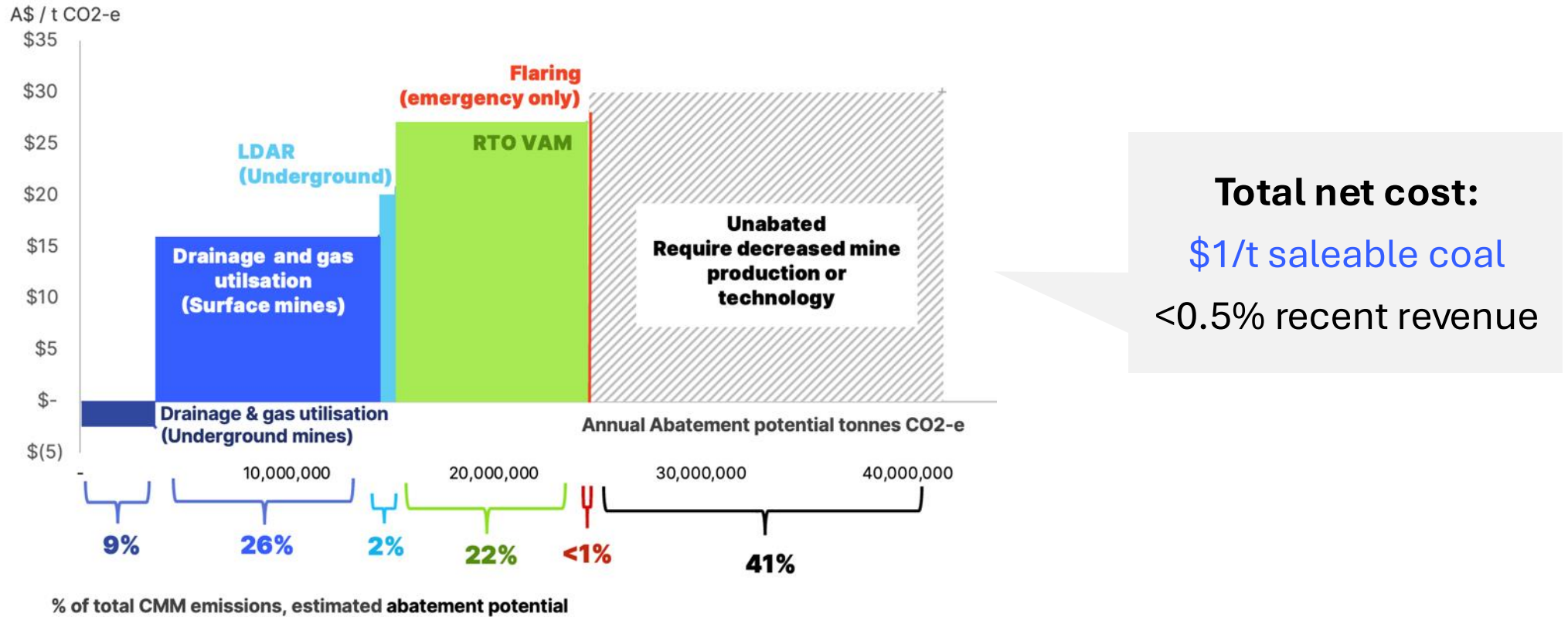
- Coronado Resources: Trialling methane pre-drainage and using it to **displace diesel in trucks**.
- Stanmore Resources: Capturing methane to power a new 20MW gas-fired **power station** for the mine.

Prioritising top emitters makes sense



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

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



Source: IEEFA analysis based on Rystad

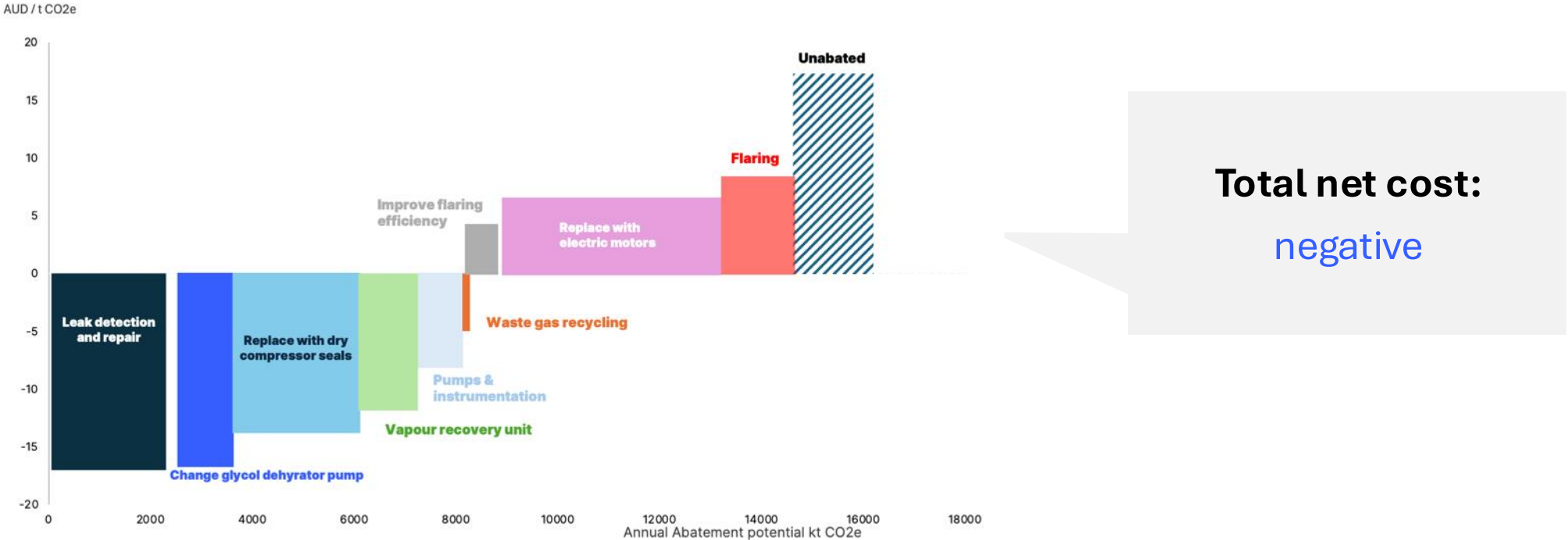
Gas: ~90% abatement achievable with best practices

- **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



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, 2021)
Total potential to capture methane	26.90	206	424
Coalmining sector	Potential methane capture/use (PJ)	Equivalent value (A\$M)	
Underground mines total	27.2	256	
Drainage & LDAR	8.9	84	
VAM abatement	18.9	178	
Open-cut mine drainage	21.6	209	
<i>Coalmines total</i>	<i>48.8</i>	<i>726</i>	
<i>Oil and gas + coal total</i>	<i>75.7</i>	<i>933</i>	

Total equivalent value:
\$933 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

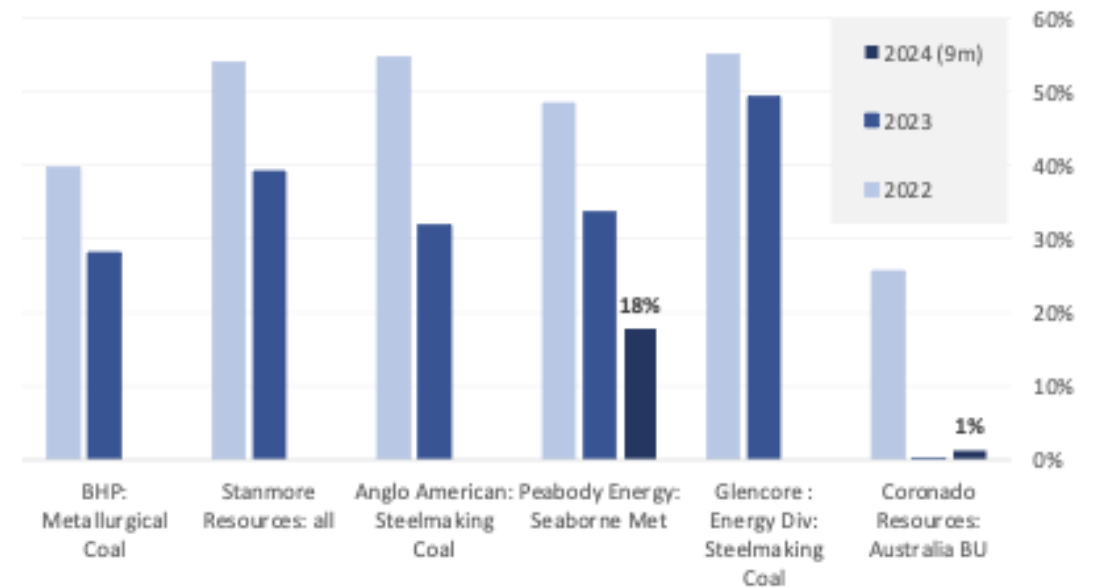
Same capital costs + Higher value of recovered methane = Lower net costs

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)

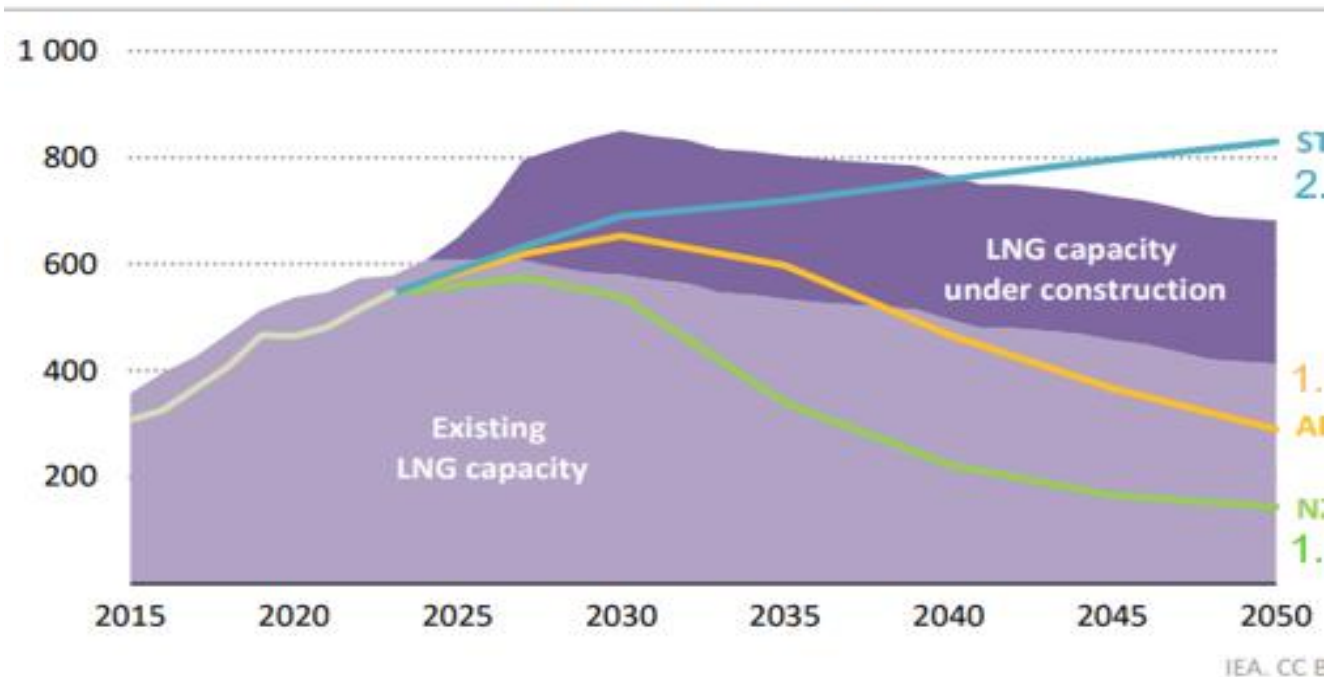
Met Coal miner EBITDA margins, %



Source: IEEFA, [New coal mines 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

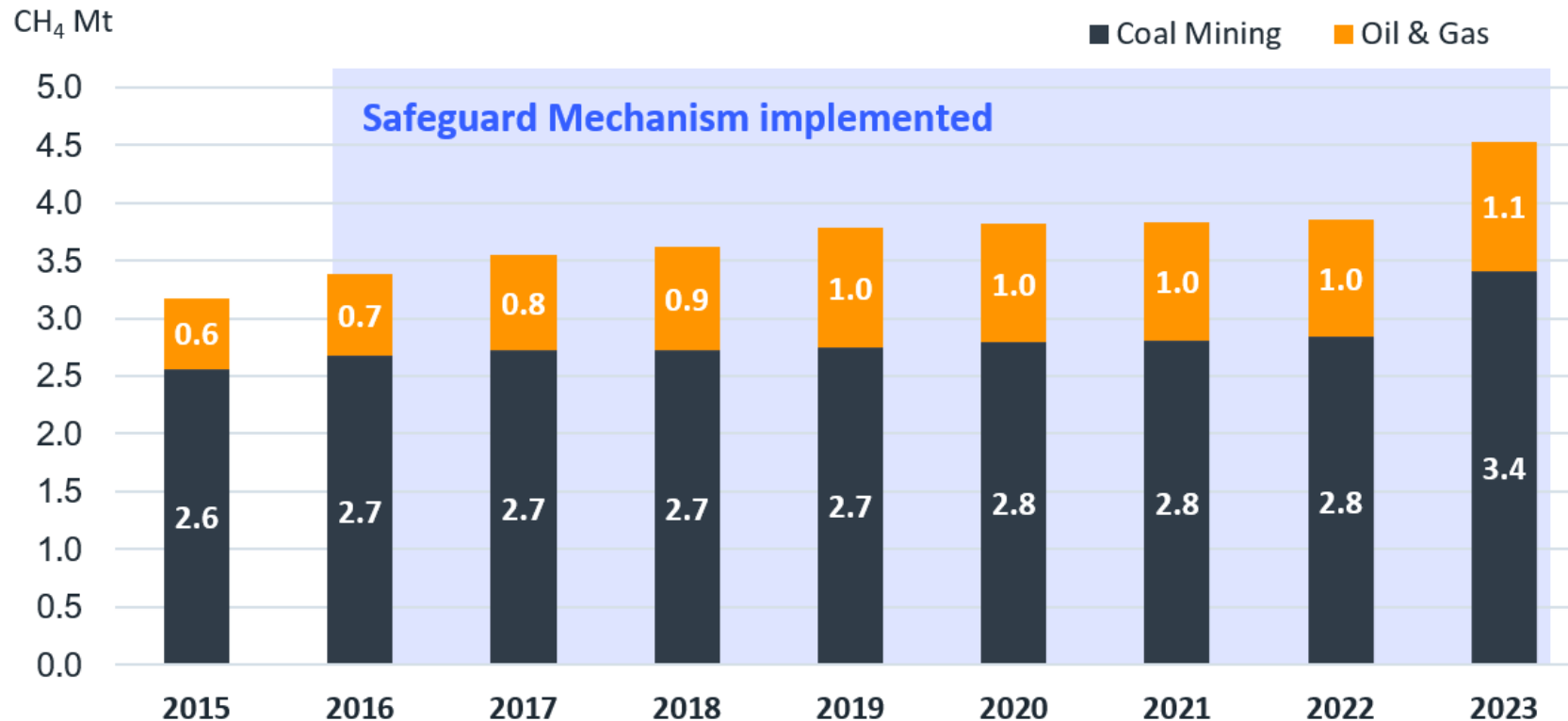
Source: IEA, World Energy Outlook 2024

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 MtCO₂e for coal mines, while they decreased by almost 7 MtCO₂e 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

URGENTLY FIX EXISTING PROCESSES



Scrutinise coal and gas development approvals

- New developments should be scrutinised on their net cost/benefits.
- Make approvals of new projects or expansions/extensions conditional on comprehensive methane plans.



Improve methane measurement

- Stop low order methods for open cut coalmines and oil and gas.
- Develop and move to higher order methods based on direct measurement and independent verification.
- Develop top-down methods for monitoring and verification.

DRIVE METHANE ABATEMENT OPTIONS INCLUDE:



Regulation

- Require best practice equipment and processes in the gas sector.
- Require VAM abatement and enhanced drainage and leak repair in underground mines, plus enhanced pre-drainage in open-cut mines, starting with the highest emitters.
- Further limit venting and flaring.
- Regulate post-operating emissions.



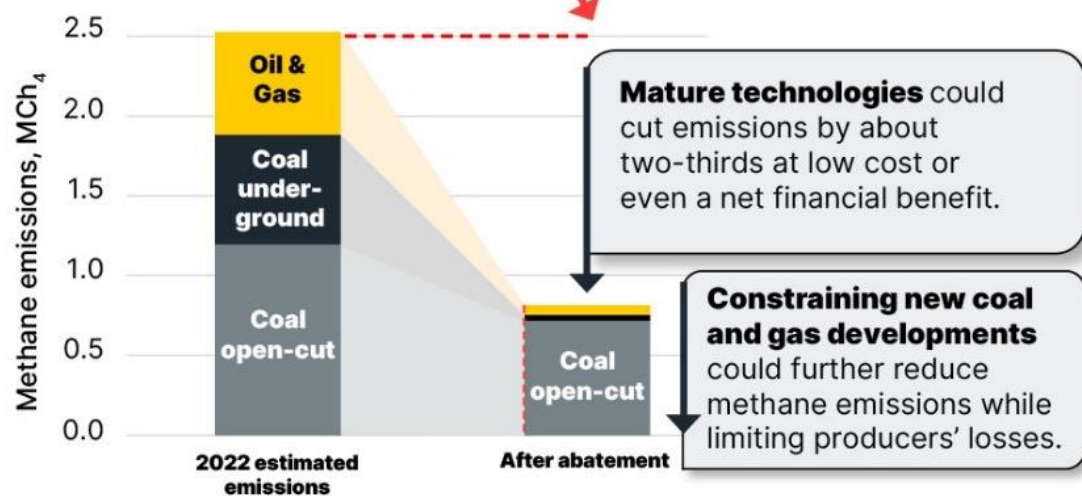
Price Signals

- Enhance existing price signals by amending the Safeguard Mechanism.
- Facilitate access to generate carbon credits for methane abatement.
- Consider new mechanisms such as a methane tax or tax incentives.
- Extend existing schemes to provide financial support to first movers and to cover post-operation emissions.

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

Prioritising methane abatement makes economic sense for Australia

Existing policies and incentives will not curb methane emissions. The government projects only a slight reduction to 2035, jeopardising federal/state emissions reduction targets.



🔥 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.

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