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Cutting Australian mining's diesel emissions

Governments may need to adjust expectations

- *Diesel use is emerging as one of the largest emissions sources in Australia's resources sector, with fuel use growing faster than mining production as strip ratios increase.*
- *Government projections of a rapid fall in mining energy emissions ignore recent trends and the long timelines required for fleet and fuel decarbonisation.*
- *Limited progress is likely before 2035 due to companies deferring decarbonisation plans, weak policy drivers, the diesel fuel rebate and lengthy implementation timelines.*

Australia's climate targets require deep emissions cuts across all sectors of the economy. For the resources sector to contribute, meaningful reductions in miners' diesel fuel use must be achieved. Fuel combustion accounts for 22 million tonnes of carbon dioxide-equivalent ($MtCO_2e$) emissions each year. It represents almost 10 billion litres of diesel consumption and makes up more than 20% of the sector's direct emissions.

Since 2005, diesel emissions in mining have been on a strong upward trend, rising by 6% a year on average. But the federal government expects these emissions to fall at a rate of 4.5% a year for the next decade – from 21.7Mt in 2023 to 12.6Mt in 2035. The largest reduction is expected to come from the coalmining sector due to decreases in production and the impacts of the Safeguard Mechanism. The policy is expected to drive the majority of emissions reductions across mining. To achieve this turnaround, significant structural changes to operating practices at mines across Australia are needed.

This briefing note investigates the underlying causes of the growth in mining's diesel emissions, what it means for government forecasts, what the evidence suggests about realistic emissions trajectories, and the economic implications.

Any long-range forecast is fraught with uncertainty, and technological change often occurs faster than originally anticipated. However, without significant changes to the drivers of emissions reduction, the government's expectations may need to be materially revised.

Why mining's diesel emissions are growing amid the energy transition

Australian government agencies and their policy analysts expect that as Australia transitions away from coalmining, mining sector emissions should decline. The federal government forecasts mining diesel emissions will fall by 42% by 2035 – from 21.8Mt in 2023 to just 12.6Mt. Most analyses assume this is achievable through existing policies such as the Safeguard Mechanism, declining coal production and emerging electric vehicle or clean fuels technologies.

Historical data trends don't bear this out. Diesel emissions in mining have doubled since FY2010-11 while coal production grew by only 18%. Furthermore, the proportion of coal produced from open-cut mines operating heavy surface equipment grew by 30% in that period. The net result: emissions per tonne increased by 50% (Figure 4). Considering the energy transition, diesel intensity in mining is increasingly moving in the opposite direction.

The government projects that resources sector emissions reductions of 40-45% will be required to meet Australia's overall emissions reduction targets of 62-70% below 2005 levels by 2035. Factors placing upward pressure on sector emissions include mine production activity, diesel use intensity and mine extension approvals. These are offset by forces such as technology commercialisation and policy implementation.

Understanding these competing pressures and timeframes clarifies the achievability of emissions reductions.

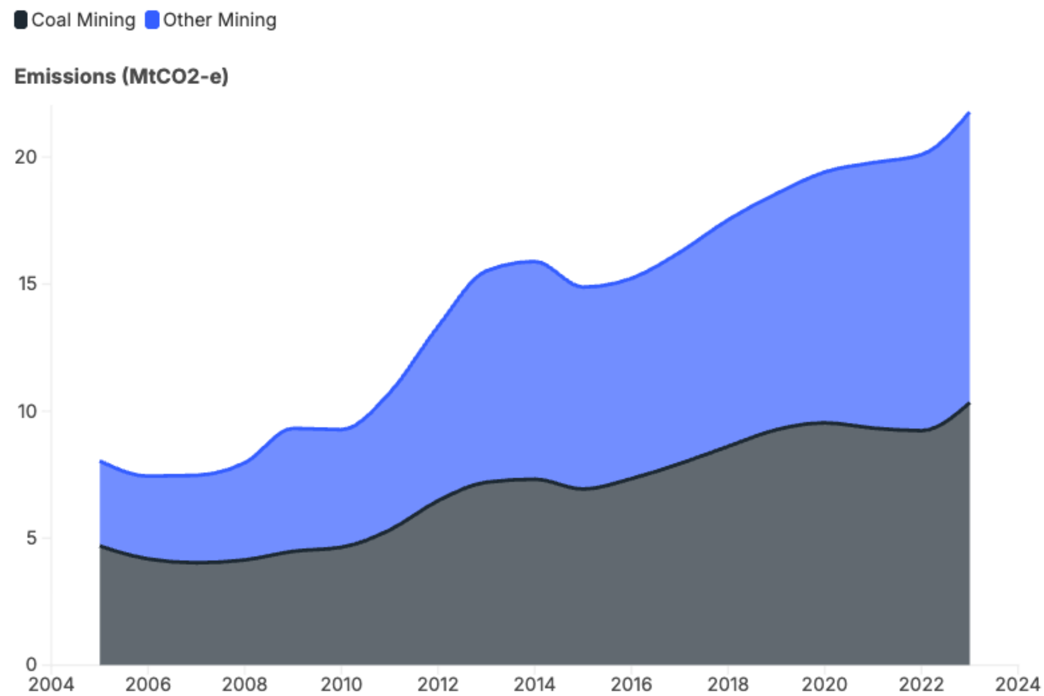
Resources sector diesel emissions are growing

Australia's resources sector releases about 100Mt of each year. According to the Climate Change Authority (CCA), fuel combustion in mining (mainly diesel) contributed 20% of the sector's total emissions in 2024. Emissions are split evenly between methane leakage from coalmining and oil and gas production, and energy emissions, such as from burning fuel at mine sites.

In New South Wales (NSW), most mining sector emissions come from coalmine fugitives. In other mining states, such as Queensland and Western Australia (WA), diesel emissions make up a larger share. The mining industry consumes 35% of the diesel used in Australia, according to the Australian Bureau of Statistics, up by more than 90% since FY2010-11 to 9.6 billion litres in FY2023-24.

Nationally, fuel combustion emissions in mining have doubled since FY2010-11 to 21.8Mt in FY2022-23, growing at a steady rate of 6.8% a year (Figure 1). Together, coal (48%) and iron ore (26%) mining account for three quarters of the mining industry's total diesel emissions.

Figure 1: Fuel combustion emissions in mining

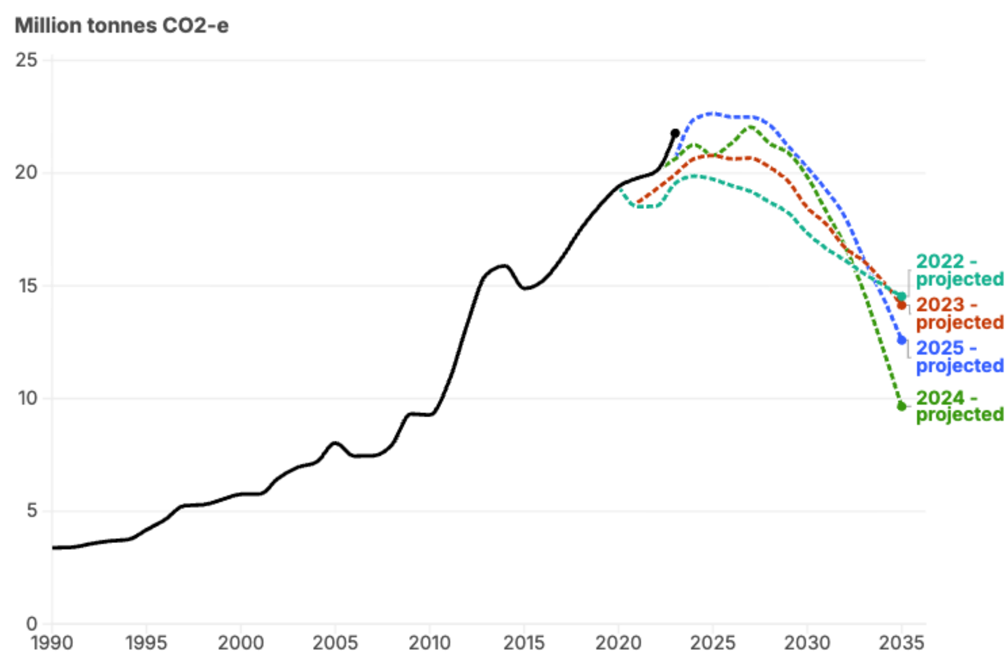


Source: National Greenhouse Accounts UNFCCC/Paris Agreement inventory. Coal Mining = series 1.A.1.c.ili, Other Mining = series 1.A.2.g.ili.

Government projections expect emissions to drop

The federal government publishes its annual outlook for fuel combustion emissions in mining in Australia's emissions projections (Figure 2).

Figure 2: Mining fuel combustion emissions trend



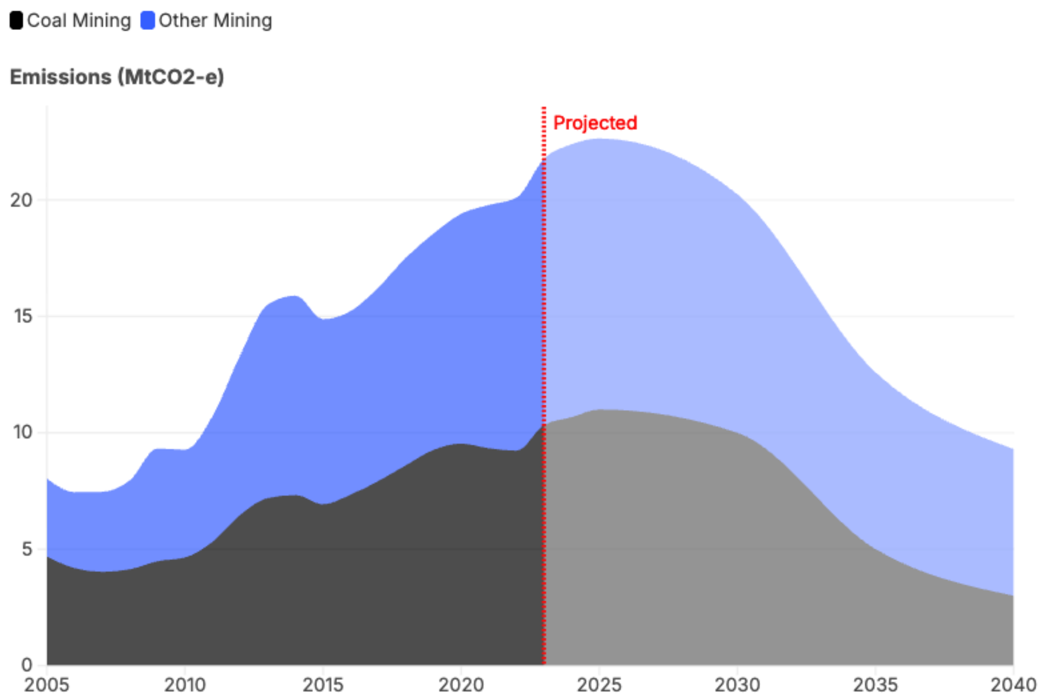
Source: DCCEEW Projected stationary emissions – Mining.

Emissions have risen steadily at an average annual rate of 6% for 20 years. In 2022, the Department of Climate Change, Energy, the Environment and Water (DCCEEW) began forecasting emissions to 2035. At the time, the projected reduction in emissions by 2035 was 4Mt (from 18.5Mt to 14.5Mt). The latest forecast in 2025 expects emissions to fall by 9.2Mt (42%) from 21.77Mt in 2023 to 12.6Mt by 2035.

However, each year actual emissions have continued to grow, exceeding government expectations.

This, in turn, forces even larger long-term cuts. The forecast reductions in coalmine diesel emissions are based on a predicted decline in production and increased emissions abatement via electrification or other strategies to replace diesel (Figure 3).

Figure 3: Mining diesel emissions trend and projections



Sources: National Greenhouse Accounts; DCCEEW Australia's Emissions Projections 2025

Government projections identify decreased coalmining production and the Safeguard Mechanism as the key drivers for those decreases: "The reduction [in stationary energy emissions from coal mining] is driven by lower coal production due to lower international coal demand and abatement from the Safeguard Mechanism. […] Decarbonisation activities incentivised by the Safeguard Mechanism across the other mining sub-sector is the major driver of a 59% decline in emissions between 2025 and 2040."

The fast pace of the emissions reduction seems at odds with the Department of Industry, Science and Resources' (DISR) 2025 Resources Sector Plan, which shows a slower pathway for reducing diesel emissions:

- By 2030: Demonstration and commercialisation of electrified haulage and equipment.
- By 2035: Deployment of heavy electric vehicles and equipment, with greater penetration of low-carbon liquid fuels and renewable energy in remote regions, and adoption of low-carbon fuels (liquid and gaseous) where electrification is not feasible.

Eight reasons government projections may be too optimistic

IEEFA has identified eight key reasons government projections on reductions in mining diesel emissions may be too optimistic, especially when it comes to coalmining.

1. Sustaining elevated mining activity, particularly at open-cut mines

Production trends are projected to diverge by commodity, with most minerals (iron ore, copper, nickel, lithium) expected to grow through to 2035, while coal production declines.

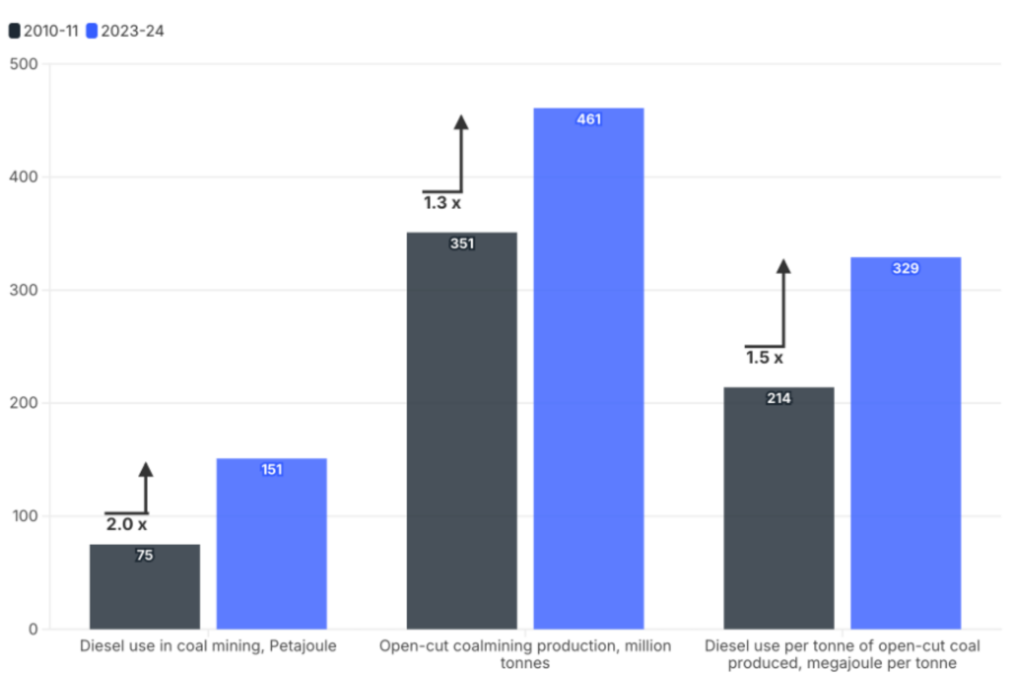
The government expects decreases in coalmining production to be one of the major drivers reducing diesel emissions. According to the International Energy Agency (IEA), Australian coal exports may decline by 3% to 2030, with longer-term trends affected by the global energy transition. McKinsey expects global coal production to decrease by 30% between 2030 and 2050, in line with IEA scenarios.

However, a continued shift towards open-cut coalmines could partially offset the impact of any reduction in coal volumes on diesel emissions. Since FY2010-11, open-cut coalmine production rose by 30% while underground mine production fell by 26%. Open-cut mines are more diesel-intensive, relying mainly on heavy mobile surface equipment, while underground mines are primarily powered by electricity. While there are some underground diesel vehicles, in NSW for example, it is estimated that 81% of all diesel consumed in coalmining is by heavy trucks and excavators.

2. Increasing strip ratios push up diesel use

Production growth cannot fully explain the growth in fuel combustion emissions in coalmining. Instead of keeping pace with coal production as expected, diesel consumption has doubled since FY2010-11 while open-cut coal production increased by only 30%. The resulting diesel use per tonne of coal produced increased by more than 50% in that time (Figure 4).

Figure 4: Diesel use in coalmining vs open-cut coal production



Sources: DISR; DCCEEW, Australian Energy Update 2025, Table F1; IEEFA.

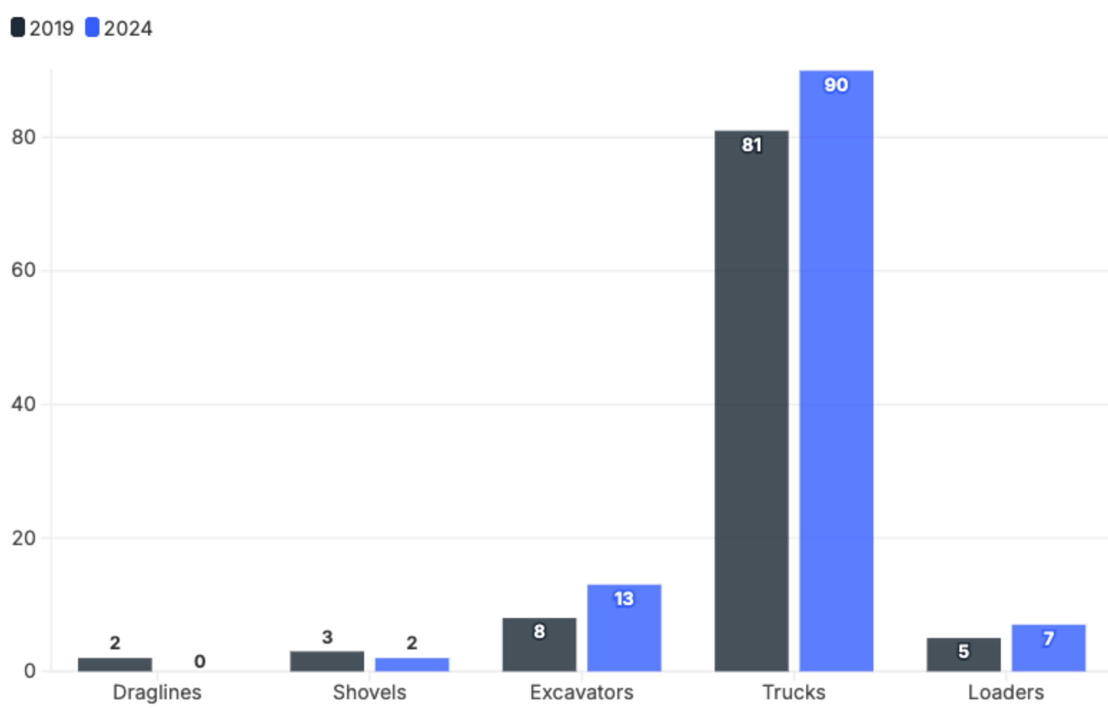
In other mining sectors, diesel use and emissions have doubled since FY2020-11, dominated by iron ore, where production has doubled. In other commodities, such as copper and gold, production fell.

The explanation: As open-cut mining operations move into higher strip ratio environments, they use more diesel per tonne of coal produced. As coalmining typically progresses to deeper deposits, the strip ratio – the amount of dirt and rock that must be moved to extract the coal – has increased and waste rock must be hauled longer distances to dumps. As geology becomes more restricted, high-volume equipment, such as electric draglines, is replaced with smaller, diesel-intensive truck and excavator operations. Over time, more activity is generally required for each tonne of saleable coal.

This is evident in the CCA's 2025 Annual Progress Report. It cited common reasons heavy emitters gave for significantly exceeding Safeguard Mechanism emissions baselines, including: "Increased mining haulage distances resulting in increased emissions from diesel fuel"; and "Reduced production levels but had gross emissions that did not scale proportionally with production."

Another factor is the change in mining fleet composition to more diesel-intensive operations. This is demonstrated at Hunter Valley Operations (HVO) mine, one of the largest coalmines in NSW. HVO ceased dragline operations in 2023, replaced by trucks and excavators (Figure 5).

Figure 5: HVO mine load and haul fleet diesel intensity (equipment units)



Source: HVO Annual Environmental Reviews.

In 2019 and 2024, the mine moved the same volume of material, but the run-of-mine (ROM) strip ratio has increased from 5.3 to 7.1 over the same period. The change, necessitated by the geology of the mine, caused a shift toward smaller, less efficient loading equipment. Three electric loading units (draglines and electric rope shovels which consume no diesel) were replaced with extra diesel-powered units: five more excavators, two more loaders and nine more haul trucks. This represents a structural increase in the mine's diesel demand. Excavators typically operate on diesel fuel and depend on additional haul trucks, making them less energy-efficient per unit of material moved compared with draglines.

3. Existing regulatory mechanisms unlikely to drive large reductions in emissions

Forecasts for emissions cuts are sometimes attributed to the effectiveness of the Safeguard Mechanism. For example, DCCEEW expects mining sector emissions to fall, from 22.7Mt in 2025 to 12.6Mt in 2035, partly due to "the Safeguard Mechanism driving energy efficiency improvements, electrification, and switching from diesel to low-carbon fuels across all mining equipment categories".

The Safeguard Mechanism's design limits its power to curb open-cut coalmine diesel emissions, which are far higher than in underground mines. Notably, it does not differentiate between mine types in its baseline emissions calculations, and requires far greater cuts from underground than open-cut coalmines. This is because underground coalmines are much more methane intensive. IEEFA previously estimated that, "Underground mines are required to halve emissions-intensity rates, on average, by 2030, compared with open-cut mines, which are capped at approximately current intensity levels."

A case in point is Whitehaven's application to expand the Daunia open-cut coalmine, which stated the mine's emissions reduction obligation under the Safeguard Mechanism equated to "an effective annual decline rate from FY23 to FY30 of 1% per annum". Diesel makes up more than 75% of the mine's direct (Scope 1) emissions.

Carbon credits can be used to meet Safeguard Mechanism obligations – either Australian Carbon Credit Units (ACCUs) or Safeguard Mechanism Credits (SMCs) – at one credit per tonne of CO_2e of excess emissions. Many miners have stated they intend to use carbon credits to comply. The OECD has noted that Australia has among the lowest implicit carbon prices in the world, stating: "In the future, it may be useful to switch to limits on total emissions if the current Safeguard Mechanism baselines, which are based on emissions intensity, fail to deliver the desired emissions reductions, and to consider broadening the coverage of the mechanism."

Some miners are investigating low-carbon liquid fuels (LCLF), such as biofuel blend or hydrotreated vegetable oil (HVO), to replace diesel. These fuels require minimal or nil capital investment but are cost-prohibitive due to Australia's lack of domestic supply. In 2022, Australia produced 15 million litres of biodiesel and no HVO fuel. This represents just 0.16% of mining's annual diesel use, and 0.05% of Australia's total annual diesel imports at 29 billion litres. Local industry development holds some promise but unless prices fall dramatically, cost-conscious commodity producers are unlikely to make the switch voluntarily.

The NSW EPA is considering imposing diesel transition targets on the state's coalmines, which would require 5% of fuel to be a low-carbon alternative to diesel by 2030, increasing to 10% by 2035. While this would be a step towards decarbonisation, it may not achieve any meaningful emissions reductions. For example, the "low-carbon alternative" can include a 5% biofuel mix (with 95% diesel), which would be the lowest-cost implementation.

That strategy, however, would deliver a diesel emissions reduction potential of just 0.25% (5% of 5%). Even 10% biofuel with a 15% biofuel blend – as is mandatory in Brazil – would reduce emissions by just 1.5%. None of these is consistent with the government's emissions reduction outlook for the sector. Only fuels such as 100% HVO fuel can achieve substantial carbon emissions reductions (from 50% up to 90%). In Australia, the reported Scope 1 emissions factor for renewable diesel/HVO fuel and biodiesel is close to zero, providing 96% carbon accounting benefit for its adoption.

4. Government and mining industry timelines to address diesel emissions do not align

Government forecasts indicate significant intervention is required to arrest the increasing diesel emissions trend before any material reductions can occur. However, mining capital allocation decisions are influenced by return-on-investment (ROI) requirements and technology risk assessment, which may diverge from government emissions reduction timelines.

Major miners such as BHP and Rio Tinto have deferred or delayed their diesel decarbonisation plans until after 2030. BHP stated in its Climate Transition Action Plan: "Our biggest remaining source of operational GHG emissions is diesel." Nonetheless, plans by Rio Tinto and BHP to scale up power generation for mines and add renewables have been trimmed considerably. BHP's planned spend falls to US$500 million from US$4 billion, while Rio Tinto's pre-2030 spending is US$1-2 billion, down from US$5-6 billion.

Glencore announced in its Climate Action Transition Plan that, "beyond 2035, we will look to identify abatement opportunities […] for decarbonisation of our truck fleet through electrification and the use of alternative fuels".

Anglo American maintains that diesel decarbonisation is a "challenge we aim to solve primarily during the 2030s as the necessary technology matures" and to "transition our mines away from use of fossil fuels as we approach 2040". However, in December 2024, it withdrew funding from a US$200 million programme to convert haul trucks to hydrogen, citing high (hydrogen) fuel costs.

A notable exception is Fortescue, which has extended its fleet electrification partnership with Liebherr to include Chinese supplier XCMG. In December 2025, Fortescue announced it had taken delivery of its first large-scale battery energy storage system as part of its multi-gigawatt renewable build-out. Fleet electrification requires Fortescue to materially increase electricity supply to its mines. It will progressively roll out electrification across mine sites, targeting zero emissions by 2030, introducing the first 240-tonne battery electric haul trucks into operations in 2026 to complement its first electric drill and 12 electric excavators already in operation.

In December 2025, it also took delivery of two of the world's largest battery electric locomotives at its Pilbara operations. For haul trucks, the company targets cost parity with diesel on the total cost of ownership (TCO, i.e. all direct and indirect costs of an asset over its lifecycle) by 2030. Fortescue's heavy mobile equipment contributed 1.3MtCO_2e diesel emissions in FY2024-25. While its diesel emissions represent just 6% of mining's total diesel emissions in Australia, it could act as a catalyst for other miners to follow.

5. Mining profitability and capital financing capabilities

With the majority of mining emissions coming from coal and iron ore mining, softer bulk commodity prices – particularly for coal – provide less cashflow for discretionary spending, such as on how to decarbonise their operations. Mining company boards generally favour near-term shareholder returns over long-term decarbonisation goals. When prices are low, miners would be expected to focus on cost-cutting activities.

The capital investment required for fleet replacement is significant, and strategies on the scale required should not be taken lightly. A new mining haul truck costs almost A$10 million. When the Hunter Valley Operations (HVO) group replaced a number of its mining fleet in FY2022-23, it commented: "Over five years HVO is investing around half a billion dollars in capital equipment as part of a $2 billion overall investment in operations."

BHP and Rio Tinto, for example, have 800 and 700 trucks respectively across dozens of mines in Australia as part of their 1,500 and 1,800 pieces of mining equipment respectively. Replacing all or part of their fleets would cost tens of billions of dollars, even without any premium for electric models.

6. Lengthy decarbonisation project implementation timelines

Emissions reductions sit at the end of a long chain of events. There is a lag between policy response and implementation, which can arise throughout the process. It starts with the right policy setting or company ambition, or perhaps the relative economic benefits of decarbonisation technologies, and then spreads through projects (Figure 6).

Figure 6: Mining decarbonisation process flow

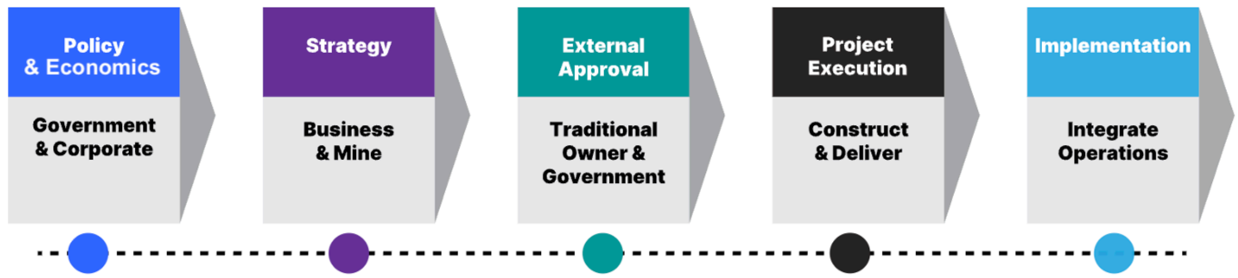


Table 1: Key factors affecting project decarbonisation timelines

1. Policy & Economics	No unified, overarching targets for resources sector or diesel emissions reduction. Lack of policy-driven investment incentives for near-term action. Economic viability of decarbonisation technologies.
2. Strategy	The Resources Sector Pathway phases – trials to 2030, demonstration to 2035, scale adoption post 2035 – are lengthy. Fleet electrification requires mines to substantially increase their electricity capacity and infrastructure, including charging stations, low-carbon generation capacity and energy storage systems. Whether grid connected or not, this additional power must come from zero-emissions energy sources. Building domestic production and a supply chain capable of delivering low-carbon fuels on a price par with diesel will take several years to develop. Addressing an industry-wide skills shortage of mining engineers that delays feasibility studies, mine planning and operations optimisation.
3. External Approvals	Local opposition, Traditional Owner considerations and finding suitable sites can delay large-scale renewable projects. Extended government approval timelines for large-scale renewable energy projects is also a key risk.
4. Project Execution	Construction challenges, such as getting qualified workers to remote sites. Strategies such as modular construction and infill projects at mine sites are keys to mitigating risk and improving the project economics. Lengthy timelines for renewable energy projects. For instance, onshore wind projects take 10.6 years on average from application to commercial operation. Existing mines face a particular challenge to integrate the staged delivery of electrified fleet and charging infrastructure without disrupting operations.

5. Implementation	Electrifying large mining fleets can congest supply chains, with only a handful of manufacturers for the 28,000 haul trucks (potentially) to be replaced globally. For example, delivery of two trial Cat 793 XE battery-electric haul trucks to BHP and Rio in the Pilbara was delayed by 14 months. Trials are needed to refine the technology, integrate it with mining operations, and adapt real-world testing in the extreme mining environment. Reskilling thousands of diesel fitters, technicians and mechanics amid growing demand for electrical trades skills required to install and maintain mine site and fleet electrification and autonomous systems.

7. Mining fleet replacement return on investment

Mining companies need to time diesel fleet replacement so new battery electric vehicles can recover the higher upfront costs over a typical 15-year asset lifetime through lower operating costs. Major fleet changes must align with remaining mine life, otherwise there may not be enough high-production years left to pay back the investment.

For example, the HVO Continuation Project proposes extending mining from 2027 to 2042 (South) and 2045 (North), consuming about 3.3 billion litres of diesel – and emitting 8.86MtCO_2e. HVO states that technical and commercial maturity are not sufficient for it to make a decision on decarbonisation yet. If that decision is delayed to 2030, and given the recently replaced fleet was not due for replacement until about FY2037-38, that would leave only about six full operating years to recover costs. Any fleet replacements scheduled in the lead-up to the mine closure will attract lower returns on investment. The proposed Moolarben OC3 mine extension in NSW faces a similar issue. With a 10-year project life, the state government concluded, "electrification of the fleet is not feasible due to the short project timeframe and availability of battery electric mobile equipment".

Fortescue's Climate Transition Plan outlines a mitigation strategy that synchronises the introduction of new technology with the retirement of existing fleet by 2030, while other equipment in use at 2030 will have battery-electric retrofit.

If miners wait until 2035 to implement the technology at scale, they will encounter issues with achieving acceptable returns on their investment. Companies facing either short remaining mine lives or deteriorating markets would be less likely to invest in new equipment.

The future of many NSW open-cut coalmines hinges on major mine extension approval decisions by 2035. Until those extensions are approved, miners are unlikely to commit to significant decarbonisation capital expenditure. Further, the decision by some miners to award long-term contracts for mining or pre-stripping operations to contractors effectively locks in diesel use, in some cases, to 2030.

8. Diesel Fuel Tax Credit rebate scheme

The diesel fuel tax credit (DFTC) rebate scheme supports the ongoing use of diesel in mining. It reimburses miners the full rate of fuel excise on diesel (at 52.6 cents per litre, from February 2026) for site-specific vehicles and equipment not used on roads. In FY2023-24, Climate Energy Finance (CEF) reported that the top 12 mining companies (coal and iron ore miners) received A$2.6 billion in rebates via the scheme. CEF estimates this will reach A$5 billion in FY2025-26.

The rebate significantly reduces the price miners pay for diesel, amounting to a 32% discount on the national average wholesale diesel price for FY2025-26 to date. One ultra class haul truck can use 1 million litres of diesel in a year. IEEFA calculates that the value of the diesel rebate over the truck's 15-year lifespan is equal to the total purchase price of the truck. In effect, the rebate pays for all the diesel mining equipment and fleet replacements for the lifetime of the mine, and is a material disincentive to investing in alternatives to diesel-fuelled heavy mining equipment.

Uncertainty considerations

Any 10-year forecast is fraught with uncertainty. Despite consistent historical trends of escalating diesel use and emissions in mining, many factors will shape the rate of decarbonisation. Fortescue's electric truck deployment demonstrates significant progress is possible. But uncertainty remains around technology and the cost trajectories for electric mining vehicles and charging infrastructure, supply chains and renewable diesel. How these technologies compare on total cost of ownership with diesel use is still evolving. Impacts of the redesigned Safeguard Mechanism are still largely unknown, after only one year of reported results from the reformed scheme. The outlook for Australia's commodity export markets remains uncertain, and miners' long-term decarbonisation plans are largely unknown. The volatile price of diesel and the impact of any fuel tax reforms on the cost of diesel also cloud the outlook for miners.

Conclusion

Diesel could become the mining sector's largest source of emissions by 2030. In a scenario where historical trends persist without policy change, diesel emissions could increase by 30% to 40% (8-10MtCO_2e) by 2035, making sector emissions targets challenging to achieve. Put simply, without policy change, Australia gets the worst of both worlds: higher diesel emissions from mines and a heavily eroded tax base as excise receipts fall and fuel tax credit spending on mining climbs.

The government expects diesel emissions reductions will be substantial, falling by 46% to 12.6Mt by 2035. It bases this on structural changes under way, primarily the Safeguard Mechanism, declining coal production, and commercial deployment of electric mining equipment.

In practice, real structural change could prove difficult until after 2030, potentially only gaining traction after 2035. The Safeguard Mechanism lacks incentives to drive emissions cuts at open-cut coalmines. Declining coal production will not lead to a corresponding reduction in emissions. Lengthy project implementation and the deferral of decarbonisation capital expenditures will delay commercial deployment of electric mining equipment.

Governments at all levels should prepare for uncertainty in their emissions forecasts. They should develop integrated resources sector plans and targets for diesel decarbonisation. Federal action could address Safeguard Mechanism issues, while states could support with mining sector initiatives. Armed with strong policies, governments could position themselves as agents of change. Instead, inconsistent policies and incentives to retain diesel prevail.

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The Institute for Energy Economics and Financial Analysis (IEEFA) 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. www.ieefa.org

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