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Digging mining out of diesel dependence

Short-term options to enhance fuel and future-proof industry

- *Mining's rising diesel use has outstripped Australia's overall demand growth for this key fuel.*
- *Reducing fuel use in mobile plant, off-grid power and transport could save 10–20% across mining's expansive diesel footprint.*
- *Coal and iron ore fuel savings are most critical, and their pursuit could benefit from well-resourced corporate reform efforts.*
- *Government should invite industry targets and remove barriers to their achievement, including tying Fuel Tax Credits to fuel efficiency improvements.*

Introduction

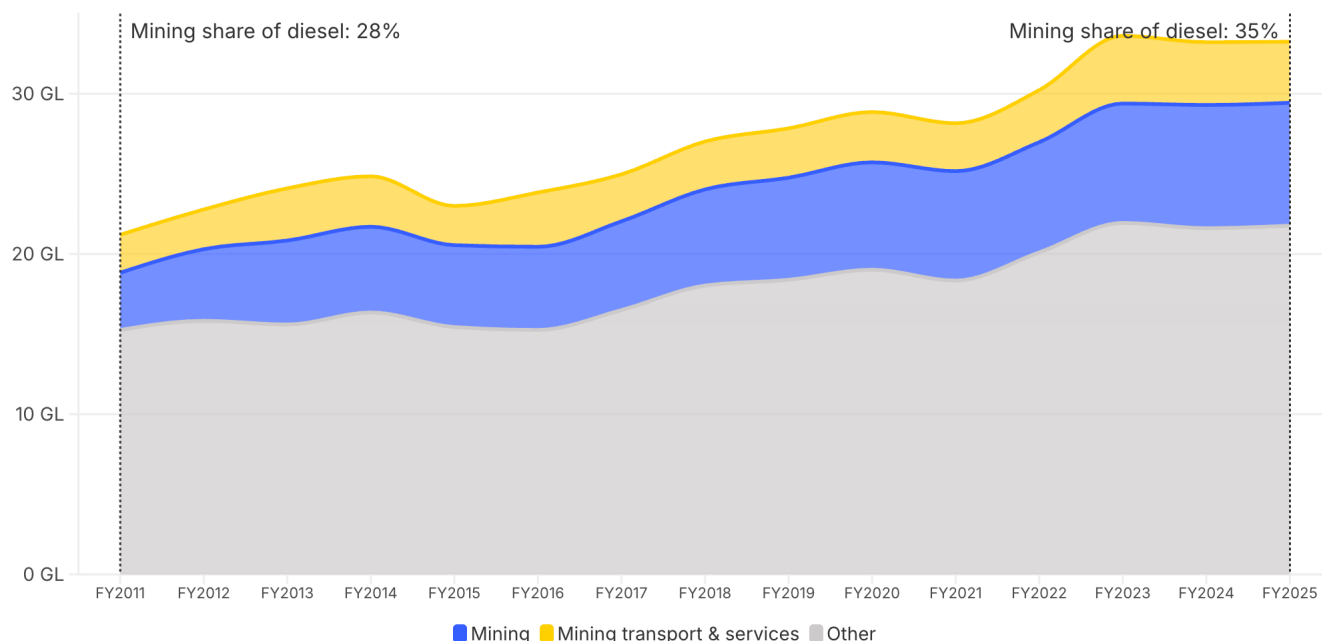
Mining is a key driver of Australia's atypically large diesel dependency. As a discrete activity, mining is Australia's second-largest consumer of diesel — behind transport and logistics — responsible for [7.66 gigalitres \(GL\) of annual consumption](#) (not including use in oil and gas). If transport and other services are included, mining is Australia's largest diesel-using industry, consuming [11.5GL, or 35%, of the national total](#).

Mining's combined diesel demand has also increased significantly since 2010 — at a faster rate than Australia's overall consumption of this fuel (Figure 1).

The decline of Australian domestic oil production and refining capacity over several decades has coincided with expanding national demand. This has resulted in a growing reliance on international supply chains for the diesel that drives mining and other sectors, to the point where imports now meet more than [90% of Australia's annual consumption](#).

Figure 1: Mining uses more than a third of Australia's diesel

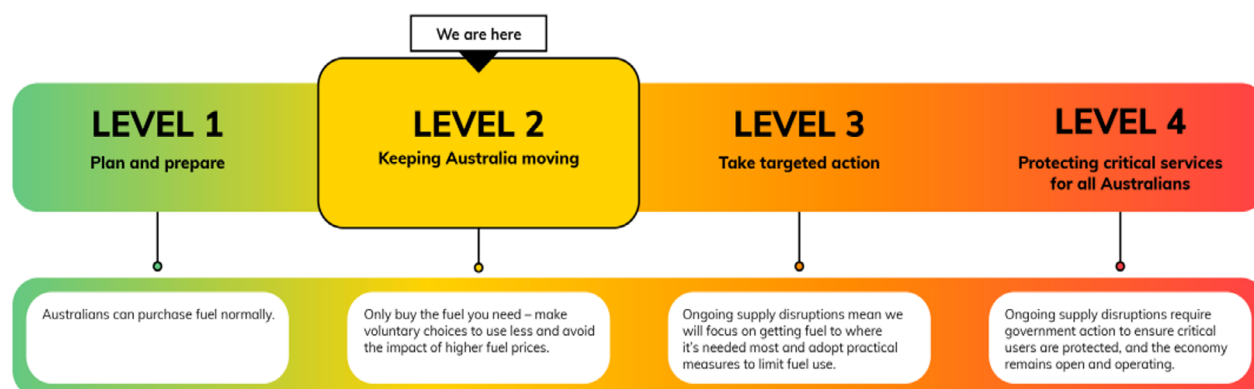
Annual diesel consumption for Australian mining (including transport & services), compared with total remaining consumption, giga litres



Sources: Calculations from [Australian Energy Statistics 2024-25](#), Table F, and Australian Bureau of Statistics (ABS), [Energy Account, Australia FY2022-23 and FY2023-24](#), Table 4. Note: Energy units converted to physical units.

The ongoing Iran-linked energy crisis has exposed Australia's vulnerability as one of the world's [largest users of diesel](#) on a per dollar GDP basis, largest diesel importer in absolute terms, and destination for [10% of global diesel seaborne trade](#). Continued deterioration of diesel supply could lead to an escalation of Australia's [National Fuel Security Plan](#) (Figure 2).

Figure 2: Australia's National Fuel Security Plan



Source: [Australian government](#)

Even discounting the threat of serious physical disruption, Australia likely faces a prolonged period of inflated diesel prices and the threat of future recurrence. This would be particularly damaging for the mining sector, given diesel accounts for up to [15% of industry operating costs](#).

Continued sector challenges could, in turn, harm the broader Australian economy. Mining contributes about [10% of Australian GDP and 58% of export value](#). It also employs about [2% of Australians](#), heavily concentrated in regional and remote areas.

The need for mining to decarbonise to meet national climate targets and seize clean commodity opportunities makes reducing diesel use an imperative. Diesel combustion in mining vehicles and equipment alone generates almost [14 megatonnes of CO₂ equivalent](#) (MtCO₂e) each year.

Electrifying mining equipment and transport, and displacing diesel power with renewables, could progressively reduce use. But solutions are needed for assets with long operating lives. Options including drop-in biodiesel, integrating batteries with diesel-electric drivetrains, and trolley assist systems, require considerable time and resources. Fuel efficiency, however, can be delivered more quickly and easily, and is the subject of this briefing note.

If accompanied by appropriate policy reforms, solutions could still be valuable if the fuel crisis continues, and particularly if it worsens. They could complement longer-term electrification. Enhanced fuel efficiency could also reduce any need to mitigate risk from sustained, elevated diesel use. There is, for example, a proposal to build [Australia's first oil refinery since the 1960s](#), with proponents noting the need to cater to future mining diesel demand.

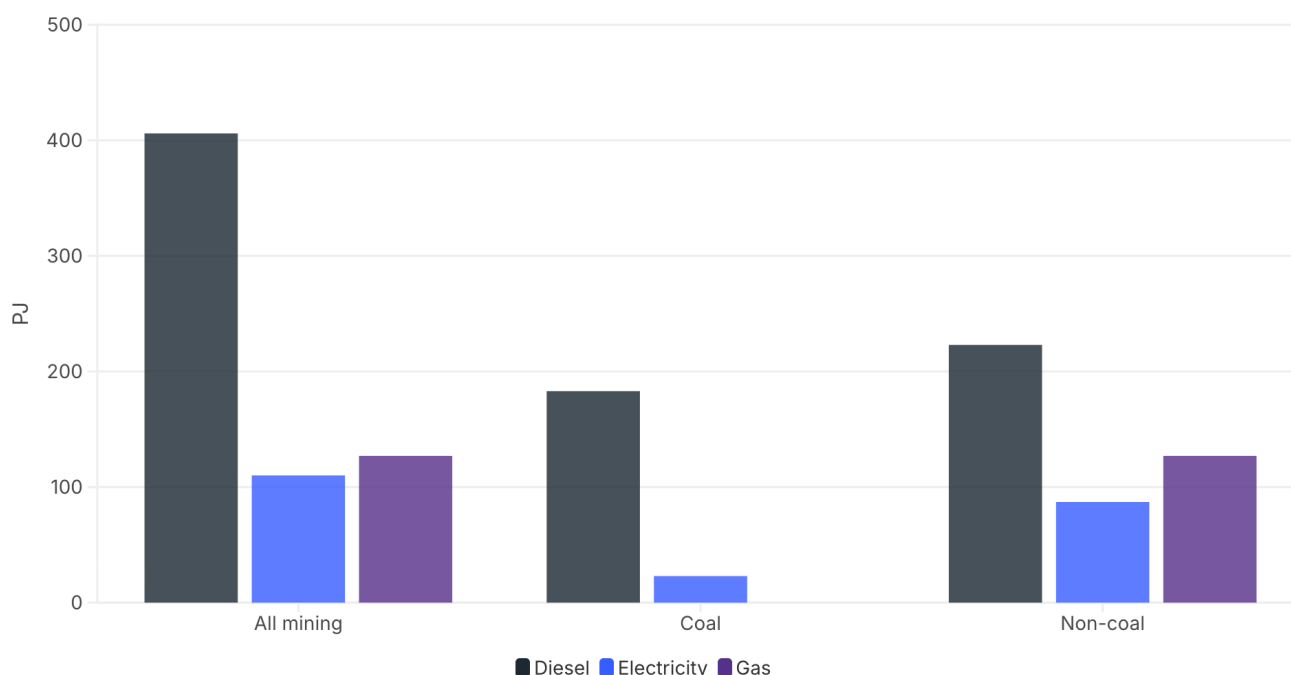
As [previous IEEFA research](#) assessing diesel use in freight noted, fuel saving is a logical priority for industry members themselves, purely for its cost-saving ability.

Diesel use varies widely by sector and applications

Reducing diesel consumption begins with understanding its usage. Mining is a universally diesel-intensive industry, but key differences exist across mining sectors and applications. Coalmining uses about eight times as much diesel as it does electricity. Other mining has more diverse energy consumption but also higher total diesel use than coalmining (Figure 3).

Figure 3: Diesel dominates Australian mining's fuel consumption

Annual consumption of diesel and other fuels/energy sources in Australian mining and sub-sectors, petajoules, 2022-23



Source: ABS [Energy Account, Australia FY2022-23](#), Table 4. Note: FY2022-23 figures used due to discontinuation of mining subsector breakdown in subsequent ABS releases. Electricity includes on- and off-grid. Energy use is on an end-use basis and thus excludes diesel for electricity generation.

Diesel has three main uses across the mining industry (Figure 4):

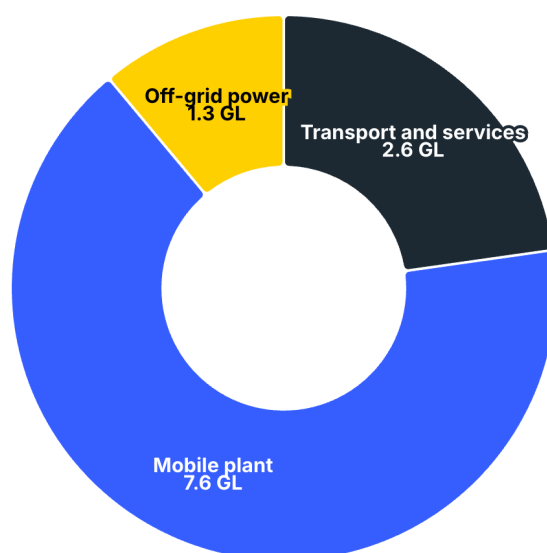
- Fuelling mobile plant (e.g. haul trucks, excavators and drill rigs).
- Fuelling transport (mainly rail) and other services.
- Generating off-grid power for fixed plant (e.g. crushers, conveyors and processing mills).

Ore qualities and mineral concentrations heavily influence diesel demand for mobile plant, by altering the need to remove overburden and waste rock, and undertake [beneficiation](#) and further downstream processing.

The degree to which largely electrified processing activities also drive up diesel demand, and how much transport contributes, are in turn affected by factors including the remoteness and infrastructure connections of mine sites, including access to electricity grids and rail networks.

Figure 4: Mobile plant consumes the most diesel in mining

Estimated annual consumption of diesel across Australian mining applications, giga litres, 2024-25



Source: Calculations from [Australian Energy Statistics FY2024-25](#), Table F and Table O; ABS, [Energy Account, Australia FY2022-23 and FY2023-24](#); and ARENA/AECOM, [Australia's Off-Grid Clean Energy Market Research Paper](#).

Coal directly consumes [more diesel \(3.97GL\) than other mining \(3.69GL\)](#). As coal operations have near total grid connection or non-diesel power for remaining electricity generation, this is mostly used by mobile plant. Adding the [820 megalitres](#) (ML) consumed by transport and services brings the total footprint to about 4.79GL a year. Although not isolated in official figures, iron ore clearly dominates non-coal diesel demand. Applying [industry average](#) diesel use suggests iron ore mine mobile plant alone consumes about 3.3GL a year of diesel. In addition, iron ore likely uses an extra 1.5GL for off-grid power and transport and services, which brings its total to about 4.8GL, slightly higher than coal.

This means coal and iron ore together account for more than 80% of mining diesel use. This dominance is largely a matter of scale, as their combined production volumes dwarf other subsectors such as copper, nickel and gold. Nonetheless, remaining mining consumes 1.9GL, or almost 6%, of Australia's total annual diesel demand.

Changes in the [diesel intensity](#) — the volume of diesel per tonne of production — of coal and iron ore mining, such as from higher [strip ratios](#), can have a much more significant impact on diesel consumption than growth in the volume of higher diesel-intensity commodities.

Coal's diesel use (excluding transport and services) has doubled since FY2010–11 while mining output [has only increased by 17%](#). This is partially a result of Australian coal produced from open-cut mines that operate diesel-powered heavy equipment [growing by 30% since FY2010–11](#) while output from underground mines run predominantly on grid-supplied electricity fell by 26%.

As well as growing in importance, open-cut coal operations have also increased their strip ratios. These changes have driven a 74% increase in coalmining's diesel intensity since FY2010–11.

In that period, aggregate diesel use in other (iron ore-dominated) mining increased by [about 130%](#), excluding transport and other services, while iron ore production grew by about 114%. This was also a key factor in diesel intensity in other mining increasing by 13% since FY2010–11.

Iron ore depletion is likely driving up diesel intensity in other mining. Rio Tinto, among other miners, noted increased diesel use as a key factor in many of its operations failing to meet their [Safeguard emissions baselines](#) in FY204–25. Citing a “higher work index”, the company explained: “As mining operations mature and expand further from processing facilities, mobile equipment must travel greater distances to move material, therefore consuming more diesel.”

Short-term options to reduce diesel demand

Diesel use in mining's main applications can be reduced through various short-term options.

For **mobile plant**, the main options are:

- **Site planning.** Miners can integrate diesel-saving features into the physical environment in ways other industries cannot. [Earthworks and asset siting](#) decisions can influence distances travelled, gradients traversed, water runoff and time spent braking and idling, to reduce fuel use. Intelligent layouts can also ensure vehicles remain on main circuits during downtime, further reducing fuel use.
- **Site maintenance.** Maintaining ideal haul road conditions includes reducing variability in terrain, and improving surface quality and rolling resistance. [One study](#) found a wet road could add 820 kilolitres of diesel consumption if moving 20Mt of material. Improved site maintenance has [saved up to 17% in fuel](#) in fuel in some operations.
- **Fleet management.** Working with the established mine plan and design, fleet managers can ensure trucks, excavators and other assets operate with optimal efficiency. Altering the nature, scheduling, duration and frequency of equipment duty cycles, as well as refuelling, downtime and equipment maintenance (including using predictive systems) also heavily influence fuel use.

Scheduling work to environmental changes, including avoiding unfavourable weather, is also important. So too is payload optimisation; ensuring haul trucks [operate within 95% of target range](#) can avoid additional journeys from underloading, and engine strain from overloading, with [potential fuel savings of 35%](#).

- **Driver/operator behaviour.** Drivers/operators — including those working remotely — retain significant influence over mining diesel use. Basic principles applicable to all transport, including around smooth braking and accelerating, and avoiding idling, apply to mining. In contrast to other sectors, however, one service provider noted higher average speeds — while operating safely — was generally more efficient, contributing to a [10% fuel saving](#).

Drivers/operators can also ensure smooth loading and [hitting payload targets](#). Worker behaviour can particularly influence fuel consumption where planning, design and management have not established effective framework conditions — as can happen if mine plans shift quickly with time and budget constraints — or where working on a contract basis.

- **Equipment modification.** Complete asset replacement is not a short-term efficiency gain and, given technically mature electrification options, can lock in unnecessary long-term diesel use. But various affordable and affordably implemented after-market additions to mobile plant can achieve net efficiency gains. Options include [low rolling-resistance tyres](#) and engine idle-control technologies.
- **Data gathering and analysis.** Technology-enabled benchmarking of fuel use and change is a critical enabler of all solutions. This starts by ensuring accurate measurement — standard equipment control module estimates can have [error margins as high as 12%](#).

Adopting fleet-management systems can deliver fuel and related cost savings of [up to 20%](#). These can be coupled with onboard telematics to significantly improve data gathering and analysis, including offering real time identification of areas of improvement, including driver/operator behaviour, operational conditions and equipment performance.

The greatest fuel savings are possible when using integrated solutions tailored to individual environments and continually recalibrated based on new knowledge or operational changes. One mining services provider reports [customers saving as much as 33% fuel](#) through integrated strategies. Another expert consulted by IEEFA estimated up to 40% fuel efficiency was possible for some miners if adopting best practice, while a 15% improvement was realistic at an industry average.

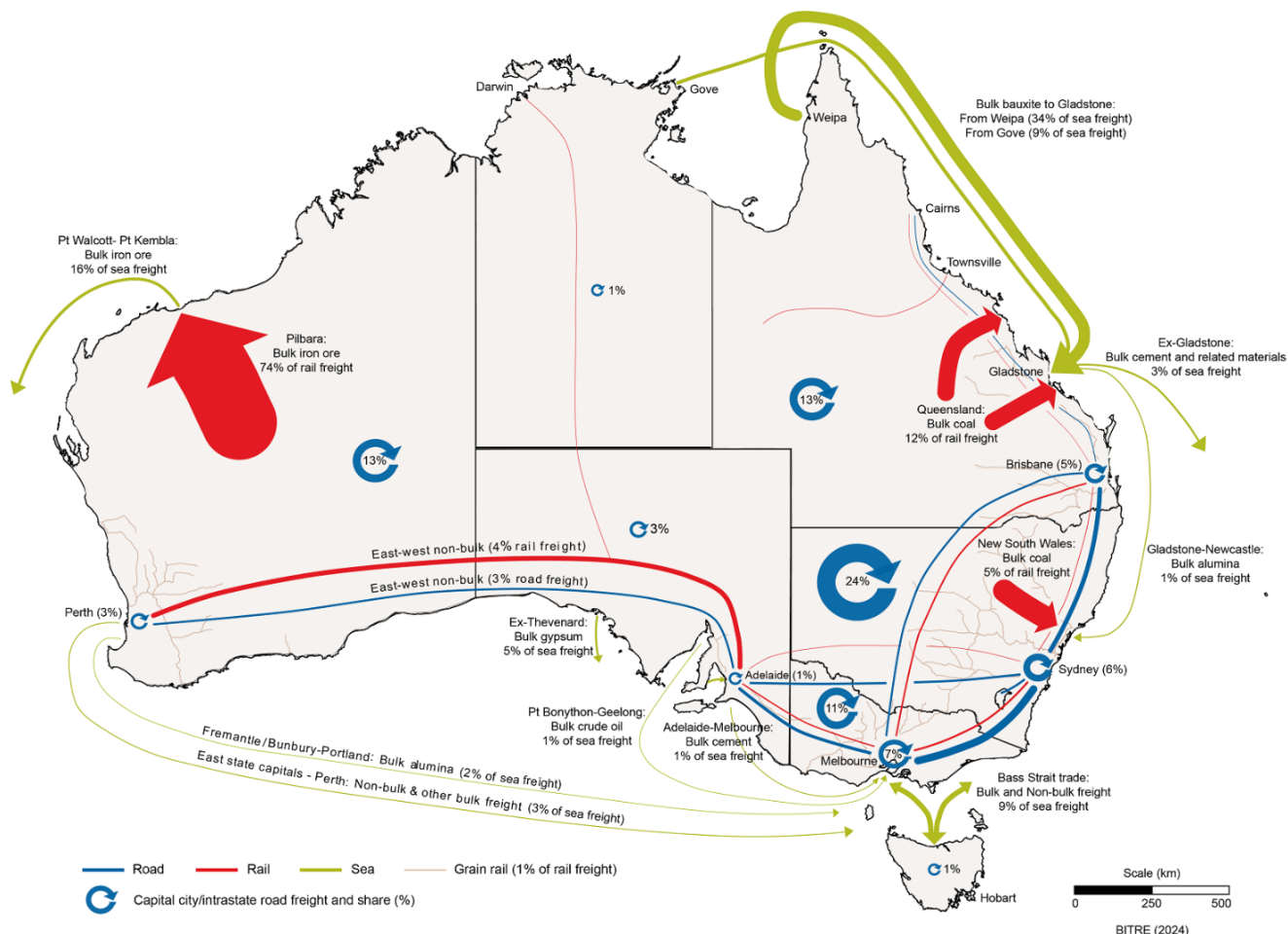
In **transport**, diesel-powered rail dominates mining, and vice versa; the Pilbara iron ore trade alone commands about [75% of Australia's total rail freight](#), while Queensland and New South Wales (NSW) bulk coal provide another 17% (Figure 5). Road plays a comparatively small role across the industry — including delivering inbound freight to mine sites. Some minor diesel-powered [transshipping](#) also uses barges to move ore to offshore vessels when deepwater ports are unavailable (however, most coastal shipping related to mining is heavy fuel oil-based).

Rail is already estimated to be at least [three times as fuel efficient as road](#), making mining's dependence on this mode a comparative asset. The Pilbara's privately owned and operated networks and rolling stock make particularly strong use of sparsely populated transport corridors to integrate numerous fuel-saving practices, including massive load consolidation and virtually uninterrupted mine to export transit.

Autonomous control and remote operations also allow close control of speed, braking, throttling, idling and other fuel-saving behaviours. Yet technology is constantly evolving and improving, particularly where AI capabilities are concerned. There is thus potential for further gains through [optimal maintenance](#), e.g. lubrication, payload management, aerodynamics of configurations, and integration with haulage and export operations.



Figure 5: Australia's major freight flow routes



Source: Bureau of Infrastructure and Transport Research Economics, [Australian Freight Flow Map](#).

Potential additional gains could also come from:

- **Efficiency on road.** [Previous IEEFA research](#) on freight outlined a wide range of fuel-saving solutions that also apply to mining-related road transport. This includes improved driver behaviour on speed, braking and idling (which could deliver 30% fuel savings alone); improved maintenance; vehicle modifications including low rolling resistance tyres and aerodynamics; payload optimisation; improved planning and logistics, and; using more fuel-efficient vehicles and combinations, including larger dimension, high productivity vehicles.
- **Modal shift.** In the non-bulk sector, IEEFA estimates moving just 1–2% of freight from road to rail could save [43–86ML diesel a year](#). There is minimal mining modal shift ability under current conditions. Rail already dominates transport due to greater competitiveness and restrictions on the road movement of coal. The Pilbara's private rail networks heavily limit iron ore mining's potential fuel savings. However, there has been some progress in South Australian copper mines, with Aurizon and BHP agreeing a [new freight deal](#) that prioritises rail over road in 2025. Where there is capacity to further grow rail's share of mining freight, a severe fuel shortage would give the government more leeway to temporarily influence modal decisions.

- **System-wide optimisation.** Diesel use could be further reduced via a company- and industry-wide overhaul of transport and logistics systems and their various connections. This includes improved scheduling of freight operations in line with mining activities, and necessary routes and delivery times. It also includes improving scheduling of inbound and outbound freight, to facilitate greater backhauling and payload optimisation. Such arrangements would ideally be co-ordinated with other miners for shared, enhanced efficiencies.

Electricity generation

Displacing at least some diesel generation via the integration of renewables, battery storage and related energy optimisation technologies might still qualify as a short-term solution in some circumstances, given recent cost and reliability gains and relatively quick deployment.

Technology-aided generator improvements can also save fuel. Optimising load matching to more consistently cater to baseline demand over peak spikes, with generators running at [50–80% capacity](#), can maximise fuel conversion efficiency. It is equally important to avoid long periods of [low-load operation \(~30%\)](#), which can “glaze” cylinders and waste fuel.

[Improved maintenance](#), including cleaning air filters, maintaining proper fuel injector sprays, and keeping turbochargers and exhaust gas recirculation systems clear is also important.

Huge fuel savings possible if barriers can be overcome

The sum of available fuel-efficiency solutions suggests **diesel savings of 10–20% are possible in mining**, with first results possible within six months. This is consistent with past IEEFA conclusions on an economy-wide level and in freight. Taking the expansive view of mining’s diesel use, including transport and services, **this would equal 1.15–2.3GL of diesel saved per year**.

As well as the wide range of available solutions, the biggest mining fuel-saving enabler is:

Concentrated diesel use: Not only do two sectors—coal and iron ore—drive the preponderance of diesel use, but a handful of companies in these sectors dominate associated activity. Of these, BHP is easily Australia’s leading corporate diesel consumer, according to Climate Energy Finance [analysis](#). Four iron ore majors round out the top five, with coal producers and integrated coal and commodity freight companies comprising the next 10 (Figure 6). Together, these 15 companies consume almost 6GL of diesel a year.

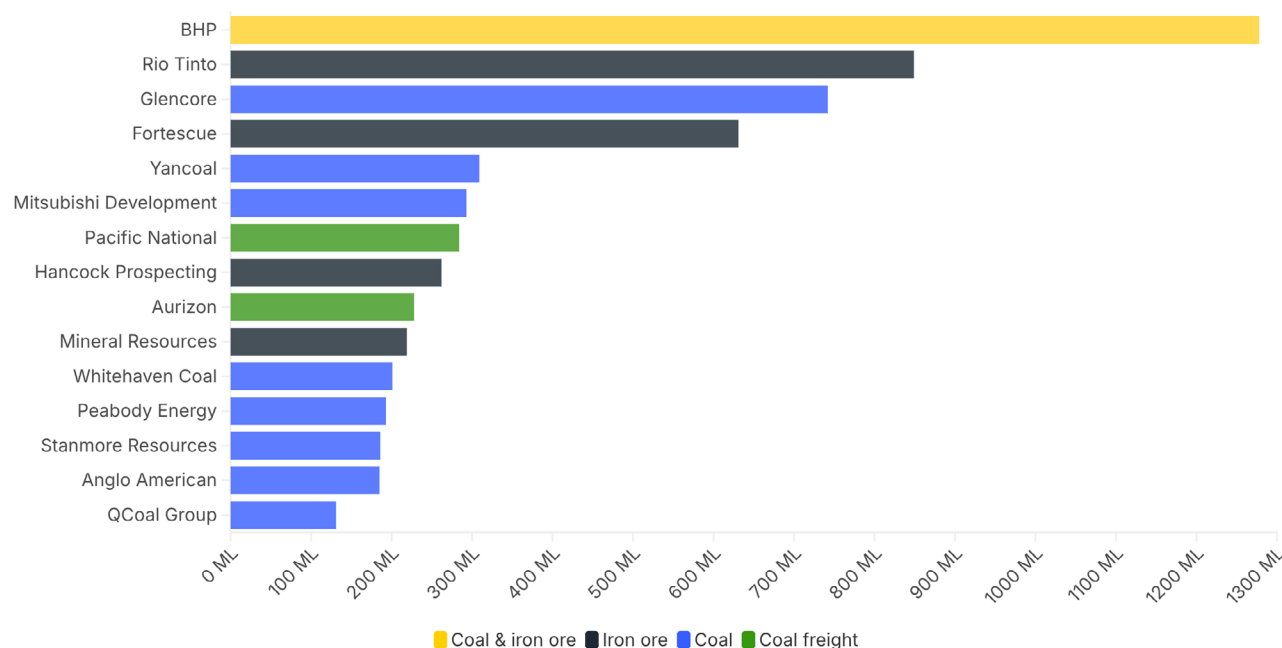
This industry structure might be an unalloyed asset if demand for diesel saving were sufficiently high. Concentrated demand by sector and company removes the need for highly individualised pathways. Large and consolidated corporate resources can also be leveraged. Leading diesel consumers could, for example, relatively easily offer incentives for fuel efficient driver/operator behaviour, particularly as associated outlays could be easily paid back through fuel savings.

Industry sources consulted for this paper noted larger firms had already implemented most proven fuel-saving practices, as a matter of financial prudence. However, consistency of application is never assured.

Data from Australia’s previous [Energy Efficiency Opportunities](#) (EEO) program (2006–2014) showed highly divergent energy efficiency performance among [mining companies](#). The top quintile of participants achieved savings of 14%, average-performing companies achieved a 2% reduction, and the bottom quintile had no improvement at all.

Figure 6: A handful of iron ore and coal companies dominate mining diesel demand

Estimated annual diesel consumption by largest mining and related freight users, 2023-24 megalitres



Source: Climate Energy Finance [analysis](#)

Achieving maximum results will nonetheless require removing impediments to diesel efficiency. The largest of these — operational changes that invite more fuel-intensive production — has already been outlined above. Other important concerns include:

Dependence on contracting: Mining companies often use third-party labour and equipment, with some operations moving to [100% contracted arrangements](#) in recent years. Mining transport, electricity (including off-grid generation provided by [independent power providers](#)) and other needs are also often met by third parties.

This dynamic could enhance fuel efficiency through increased specialisation and competitive bidding. Contractors made notable contributions to the [mining fuel efficiency knowledge bank](#) assembled under the EEO.

However, split incentives can complicate efforts. Miners often retain responsibility for procuring fuel but, even where efficiency requirements are explicitly included in terms, contractors determine consumption. Where contractors are responsible for fuel procurement, they may have comparatively less capacity to respond to pricing volatility than mining principals. Existing contracts also often [limit renegotiation of terms](#), contributing to the likelihood of rising costs being absorbed without operational change.

Workforce challenges: On a related note, the mining workforce is not only heavily contracted but typically engaged via rotational shifts and, in remote locations, a fly-in, fly-out or drive-in, drive-out basis. There is also considerable churn of workers, who regularly move between sites, employers and sectors.

Worker shortages are also common, and there is a [mismatch](#) between where most skills development (Queensland) and employment (Western Australia) occurs, including with respect to the differing dominant industries — coal and iron ore, respectively — in each location.

These combined factors also limit fuel-saving knowledge accumulation and application.

Mine life and commodity cycle exposure: The volatility inherent to mining can affect fuel saving. Even solutions that can be delivered with low upfront cost might struggle to achieve expected rates of return when factoring in the life of underlying resources.

Commodity cycle peaks can drive increases in aggregate mining activity, alongside energy use, and, if prices are sufficiently high, attention diverted to priorities other than constraining costs. The bottoms of cycles theoretically incentivise greater fuel efficiency, but capital discipline can divert investment away from necessary solutions. The regularity of project start-ups, scale-backs, and closures also limits application of efficiency best practice.

Regulatory disincentives: The Fuel Tax Credit (FTC) system for diesel is the biggest policy disincentive to fuel saving in mining. The system provides miners and contractors a considerable reduction in the cost of diesel burned offroad. It granted [AU\\$4.6 billion](#) to the sector in FY2024–25 (here including oil and gas), accounting for 47% of Australia’s total.

The lack of an effective price on greenhouse gas generation is another enabler of significant mining diesel use. Mines, mining power plants and predominantly mining-linked transport operations constitute [128 of 208 facilities, and 35% of emissions](#), covered by the Safeguard Mechanism, Australia’s main national climate instrument.

However, this system’s ability to incentivise diesel efficiency is compromised by allowing compliance largely through cheap offsets rather than operational change.

Indeed, the interaction of the FTC and Safeguard system means miners often earn more back in diesel rebates than they need to spend on Australian Carbon Credit Units, which can in turn be far cheaper than eliminating diesel use where new capital investment is required.

Poor industry co-operation: Large parts of Australian mining have developed without considerable government planning. This has likely increased diesel use, and denied potential future breakthroughs. Restricted rail access regimes in the Pilbara can, for example, limit optimisation of this fuel-efficient transport mode.

In the power sector, continued dependence on off-grid, diesel-fired power over grid-supplied electricity is also a legacy of poor co-ordination. In the Pilbara, a longer-term focus on common user infrastructure to facilitate a renewable energy buildout is estimated capable of [saving AU\\$30 billion](#) over 25 years (while avoiding 2.8–3.6GL a year of diesel via electrification).

The short-term option is to increase shared access to existing infrastructure and resources. This had some precedent in the Covid era, when miners were granted [temporary immunity from competition laws](#) to collaborate on logistical arrangements to ease supply-chain pressures.

If these barriers are lowered even partially, much of the fuel savings potential identified in this note can be achieved. A [US Department of Energy study](#) (from 2007) found diesel use in materials handling could be reduced by a third through industry-wide application of best practice efficiency. While already sizeable, the practical minimum consumption was 50%, and the theoretical minimum 70%, less than the status quo.

Policy priorities and recommendations

Dramatically reducing diesel use in mining through efficiency alone is no easy task. But government has the potential to advance solutions. Short-term priorities include:

Establish clear objectives and obligations

Set a 10–20% diesel-reduction target for mining and communicate to industry that progress is expected within six months, with penalties for non-compliance.

Require mining companies with diesel use above 100ML a year to formulate diesel-saving plans, with regular reporting and public disclosure of results.

Use the reporting process to improve measurement and benchmarking of mining diesel consumption on a sector- and application-specific basis.

To fill the void left by the defunct EEO program, produce updated and more detailed resources on mining diesel saving, particularly for coal and iron ore, which respond to challenges such as increasing strip ratios and exhaustion of past efficiency breakthroughs.

Develop a fuel-saving incentive for companies. For instance, those with large savings are rewarded with priority fuel allocation for if Australia's fuel security significantly deteriorates, leading to the National Fuel Saving Plan escalating to Level 4 (Figure 2).

Resolve split-incentive and workforce challenges

Work with mining companies and industry associations to ensure the fuel-saving message reaches contractors and the broader industry workforce, such as through new driver/operator incentives, training programs and fuel efficiency contracting terms.

If the fuel crisis worsens, the Fair Work Commission could issue an order requiring fuel cost rises to be passed through supply chain contracting, replicating actions taken in the [road freight sector](#).

Provide targeted financial support where needed

Investigate the need for targeted financial support, particularly for smaller-scale miners and contractors, to meet the capital costs of fuel-saving measures. Any required support could include tax incentives or rebates for investments, e.g. in: improved site planning and maintenance; fleet management and telematics system upgrades, and; driver/operator training programs.

Consider “contract for difference”-based support, tied to diesel prices; if fuel savings achieved by recipients are larger than anticipated due to rising prices, equivalent support could be returned.

Lower barriers to fuel-saving co-operation

Work to increase industry use of the fuel-saving assets of other companies, including through potential rail network optimisation, and sharing excess renewable energy production.

Start with removing any competition law barriers that prohibit practices such as joint purchases/operation of more efficient mobile plant, and the sharing of information related to transport backhaul and payload optimisation.

Scale back incentives for sustained diesel use

Enact initial reforms of the diesel Fuel Tax Credit (FTC) system, including diminished eligibility to claim rebates (for, say, 10% of diesel use within the first year, escalating thereafter) for miners that fail to meet government fuel efficiency benchmarks or comply with fuel-savings plan and reporting obligations. IEEFA has previously recommended linking FTC eligibility to miners' environmental performance, as measured by the [Safeguard Mechanism](#).

In the longer term, government should:

Address structural barriers to fuel saving

Create minimum fuel efficiency standards for mining, beginning at a voluntary level and focused on coal and iron ore, with a long-term pathway to a compliance-based, industry-wide system.

Escalate the phase-out of diesel use incentives

Use the Safeguard Mechanism review that began in 2026 to introduce fuel saving reforms. This could include setting new mining-linked benchmarks and related emissions baselines and decline rates that reflect global best practice fuel saving ability.

Develop a predictable legislated schedule for phasing out diesel FTCs for mining, potentially with a transition period tying rebates to investment in fuel efficiency or electrification solutions. This is consistent with the [Transition Tax Incentive proposal](#) to cap FTCs at AU\$50 million per company, with any rebates above this cap required to be invested in diesel-avoiding technologies.

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