Climate Energy Finance
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CLIMATE ENERGY FINANCE

Transition Tax Incentive: Reforming Fuel Tax Credits into a Decarbonisation Tailwind

A policy proposal to phase-out the fuel tax credit scheme for its largest beneficiaries with a transition tax incentive scheme to accelerate electrification and decarbonisation.

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About Climate Energy Finance

Climate Energy Finance (CEF) is an Australian based, philanthropically funded think tank established in 2022 that works pro-bono in the public interest on mobilising capital at the speed and scale needed to accelerate decarbonisation and the energy transition consistent with the climate science.

We conduct research and analyses on global financial issues related to the energy transition from fossil fuels to clean energy, as well as the implications for the Australian economy, with a key focus on the threats and opportunities for Australian investments, regional employment and value-added exports. Beyond Australia, CEF's geographic focus is the greater Asian region as the priority destination for Australian exports, particularly India and China. CEF also examines convergence of technology trends in power, transport, mining and industry in accelerating decarbonisation. CEF is independent, works with partners in the corporate and finance sector, NGOs, government and the climate movement.

About the Authors – Matt Pollard

Matt Pollard, Net Zero Transformation Analyst, focuses on the significant growth opportunities future-facing companies have in the electrified transport and energy transition. He has a Bachelor of Economics from the University of Queensland, majoring in International Trade and Finance. Previously, Matt spent 2.5 years studying biotechnology, focusing on chemistry and nanotechnology at the University of Queensland. Matt has published numerous reports and op-eds on the energy transition, with a focus on the strategic opportunities for Australia to become a renewable energy powered value-added critical minerals superpower, ideally in partnership with our key trade partners.

About the Authors – Tim Buckley

Tim Buckley, CEF's founder, has 35 years of financial market experience covering the Australian, Asian and global equity markets from both a buy and sell side perspective. Before starting CEF as a public interest thinktank in 2022, Tim founded the Australia and Asian arms of the global Institute for Energy Economics and Financial Analysis in 2013 and was Australasian Director until 2022.

Prior to this, Tim was a top-rated equity research analyst over 2 decades, including as head of equity research in Singapore at Deutsche Bank and MD and head of equity research at Citigroup for 17 years. From 2010-2013, Tim was co-MD of Arkx Investment Management, a global listed clean energy investment start-up jointly owned with Westpac Bank. Tim is widely recognised and extensively published as an expert on Australian and international energy transition and the accelerating shift of global capital to decarbonisation, and is a sought after commentator and advisor.

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Important information

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Key Points

The Fuel Tax Credit (FTC) Scheme rebates the full federal fuel tax (currently 51.6 cents/litre) on imported diesel used off-road in industry, predominantly mining. It is Australia's largest taxpayer-funded fossil fuel subsidy. The fuel tax does not fund roads – **it is industry assistance**.

1. Massive and Growing Budget Expense – A Top 20 federal budget expense, the FTC Scheme costs $11bn annually, climbing to $13bn pa by the end of the decade. It has cost $122.7bn since inception in FY07, rising to $184.3bn by 2030.

2. Major Mining Companies, including Foreign Coal Majors, the Main Beneficiary – Mining receives the lion's share of credits: $57.5 billion to date, projected to exceed $84 billion by 2030 – 3.6x more than agriculture, and 2.4x more than transport.

3. Drives Fossil Fuel Use and Emissions – In FY24, the top 15 diesel users burned nearly 6 billion litres, received $2.9bn in credits, and emitted 16.2 million tonnes of CO2 (MtCO2-e). The Scheme has subsidised over 815 MtCO2-e to date – nearly 2x Australia's current annual emissions. It is misaligned with our climate ambitions.

4. Rising Use Despite Climate Targets – From FY23 to FY24, diesel use among top claimants rose 440 million litres, with FTC claims increasing by $670 million (+29%) as the Scheme entrenches fossil fuel dependence.

5. Undermines Safeguard Mechanism (SGM) – The carbon subsidy from the FTC (~$190/tCO2) is over 5x the effective carbon price penalty under the SGM (Australian Carbon Credit Units average $30–40/t), undermining the SGM's efficacy.

6. Disincentivises Clean Investment – Fortescue analysis shows the FTC Scheme halves the post-tax return and extends payback periods on cleantech investments, disincentivising electrification and decarbonisation of mining.

7. Reform Proposal: $50m Cap + Transition Tax Incentive (TTI)

CEF proposes capping FTC claims at $50m pa per group, with credits above the cap retained only if reinvested into electrification and decarbonisation, e.g. electric trucks, renewable energy infrastructure – converting a fossil fuel subsidy into a cleantech investment incentive.

CEF recommends recouped tax revenues be directed into a **Diesel Decarbonisation Fund** to support decarbonisation of smaller-scale mining operations that are below the proposed cap.

8. Revenue-Neutral + Major Upside – In FY24, the TTI would have unlocked $2.2bn for clean capex. Over the forward estimates, this could rise to $13.6bn – without impacting the budget.

9. No Impact on Farmers or SMEs – The proposal excludes farmers, road transport, family businesses, small and medium enterprises and sole traders. It impacts only major industrial diesel users, predominantly mining giants.

10. Productivity and Economic Resilience Gains – Electrification and local energy infrastructure are more efficient than diesel combustion, increasing productivity as well as enhancing energy security by replacing imported fuel. Reform aligns with government goals on productivity, resilience, budget sustainability and emissions reduction, and helps position Australia to lead in renewables-processed exports such as green iron.

Policy on a Page

Climate Energy Finance proposes that the Federal Fuel Tax Credit (FTC) Scheme, which subsidises imported high-emissions diesel use, be capped at $50 million per year per consolidated group claiming under the Scheme.

We recommend a **'Transition Tax Incentive' (TTI) to reform the FTC Scheme.** Any tax credits an entity would be eligible to receive above the cap are returned to that entity on the condition the entity deploys an equal or greater investment into decarbonisation capex each year.

This would reform the FTC Scheme into a '**cap-and-reinvest**' model, turning a headwind to diesel displacement by electrification and decarbonisation into a tailwind.

A $50m cap means no changes to fuel tax credits to farmers, road transport companies, agriculture, family businesses, sole traders or small-medium enterprises.

Eligible infrastructure and technology investments under the TTI would be defined by a common sustainable finance taxonomy, including but not limited to enabling electrification infrastructure, i.e. transmission and distribution networks, charging networks, renewable energy generation and firming capacity, or electrified heavy mobile equipment procurement (e.g. electric trucks).

The TTI proposal aligns economic incentives for industry with the key themes of the Government's productivity reforms to be addressed at the August 2025 Productivity Summit.

The TTI **increases productivity** through investment incentives to displace inefficient imported energy inputs (i.e. diesel) and increase capital-intensity in Australia's resources sector.

It builds **resilience in the face of global uncertainty** by securing energy independence through the replacement of imported diesel with accelerated electrification and deployment of domestically-produced, low-cost firmed renewable energy.

Finally, the TTI is revenue-neutral with upside potential to address the rapidly rising cost of the FTC Scheme to Australia's budget, **strengthening the budget and aligning its sustainability goals**.

The FTC Scheme is destructive to fiscal sustainability and intergenerational equity. Since its introduction in 2006-07 under the Howard Government to 2024-25, Australia's taxpayers have provided over **$122 billion in diesel subsidies** to industry, primarily to multinational mining firms. Over the forward estimates, this will rise to over **$184 billion** by the end of the decade.

The Scheme **costs Australian taxpayers almost $11 billion a year** and is forecast to grow to over $13 billion a year by the end of the decade. It is a top 20 budget expense.

The FTC Scheme is misaligned with Australia's climate ambitions and undermines progress. From 2006-07 to 2024-25, it **subsidised over 815 $MtCO_2$-e GHG emissions** from the burning of diesel and petrol by industry, largely coal and iron ore mining. Australia's 15 largest diesel consumers burned almost 6 billion litres in FY24, receiving $2.9bn in tax concessions to emit **16.2 $MtCO_2$-e**.

The continued subsidisation of diesel used by Australia's largest consumers massively undermines the Safeguard Mechanism (SGM) and climate-industry policies that encourage decarbonisation.

Reform of the FTC Scheme is critical to achieving Australia's interim emissions target to 2030, and will support a significant step-change in ambition for Australia's 2035 NDC target.

Executive Summary for Policymakers

The Problem: The FTC Scheme is an Unsustainable Fossil Fuel Subsidy Undermining Decarbonisation and our Energy Security

The **FTC Scheme** is a taxpayer-funded subsidy for imported high-emission expensive liquid fossil fuel consumption, primarily diesel. It is administered by the ATO on behalf of the Treasury, providing tax concessions to industry through the crediting of fuel excise paid, a general revenue-raising tax mechanism. The forgone taxation through the FTC Scheme is an unsustainable budget measure, damaging fiscal sustainability, intergenerational equity and massively undermining Australia's progress towards its climate targets and decarbonisation ambitions.

In Australia, imported liquid refined petroleum products such as diesel, automotive petrol and fuel oil are subject to a fuel tax, a customs duty applied to the base price of imports, currently indexed biannually to the CPI. As of August 2025, customs duties are 51.6 cents per litre (cpl). The Fuel Tax Credit Scheme rebates to the entity the full customs duty (fuel tax) paid on the imported diesel it consumes.

Australia's big miners – including iron ore majors BHP, Rio Tinto, Fortescue, and Hancock Prospecting and foreign-owned coal miners Glencore, Peabody Energy, Yancoal, Mitsubishi, Whitehaven and Anglo American – are eligible to avoid paying fuel tax entirely for the diesel consumed by off-road vehicles such as heavy haulage trucks, mobile mining equipment and locomotives on their mining sites.

Based on CEF analysis, the top 15 consumers of diesel in Australia consumed almost 6 billion litres of diesel with the weighted-average fuel excise rate of 49 cpl providing over $2.9bn in forgone taxation over FY24, with the largest beneficiaries including BHP (1,279 million litres (ML); $627m rebate), Rio Tinto (849 ML; $416m rebate) and Glencore (742 ML; $364m rebate). CEF's analysis, based on publicly-listed corporate emissions and energy consumption data, estimates the top 15 largest beneficiaries grew their diesel use by over 440 million litres in FY24 compared to FY23. This translated to an increase in tax concessions of $670m in just one year, up a massive 29% from FY23.

As currently designed, the FTC Scheme disincentivises FTC recipients from investing into the decarbonisation of diesel-consuming assets. By entrenching the burning of vast quantities of imported fossil fuels, it significantly counteracts and undermines the effectiveness of climate-industry policies geared to curbing industrial emissions, such as the Safeguard Mechanism.

Further, absent urgent reform, this current policy setting actively positions investment decision-making as favouring the continued burning of diesel, dismantling the business case for decarbonisation and electrification. This is demonstrated in a Fortescue analysis, which shows that a ~50 cpl fuel tax credit applied to an average import price of A$1/litre of diesel halves the post-tax internal rate of return for investments into decarbonisation, and significantly increases the payback period, acting as a major headwind to shifting capex into clean technologies and infrastructure.

The costs of the FTC Scheme to the Australian economy are staggering:

- In the 18 years from the introduction of the Fuel Tax Credit Act in FY07 to FY25, Australia provided **$122.7bn in tax concessions for the consumption of diesel**. Analysis of historical distributions from ATO data show an estimated **$57.5bn credited to the mining sector**, and just $15.2bn to agriculture and forestry. The FTC Scheme has, since its inception, always disproportionately provided industrial assistance to the world's largest miners.

- **A further $61.5bn in subsidies will be provided to industry 2025-26 to 2029-30** if the government fails to reform the FTC Scheme.

- In total, if the FTC Scheme is not reformed, the federal government will provide **an estimated $184.3bn in fuel tax credits from FY07 to FY2030**. The historical distribution indicates the **mining sector will receive almost $84bn of this**, 3.6x the assistance provided to agriculture, and 2.4x the subsidy paid to the second largest sector beneficiary, transport.

- The scale of the opportunity cost this fossil fuel subsidy represents is starkly illustrated by comparisons to critical expenditures:

    - The Australian Energy Market Operator (AEMO) models the total capital cost of Australia's transition to a decarbonised, renewables-based electricity system is $122bn (AEMO 2024 Integrated Systems Plan (ISP) – optimal development pathway). Put simply, **Australia will expend 50% more on this fossil fuel subsidy in the 23 years to 2030 than on transitioning our energy system to renewables by 2050**.

    - In the broader context of federal budget expenditure, the FTC Scheme is #16 in the Top 20 budgetary expenses for FY26, at $10.8bn only ~$1.4bn less than allocations to, respectively, #15 'Government schools – national support' ($12.23bn) and #14 'Financial support for carers' (12.27bn). It is unconscionable that multibillion dollar corporations are publicly subsidised to pollute in an amount near-equivalent to federal expenditure on social good measures such as schooling and carer support.

CEF recognises the positive policy shift recommendations from the Productivity Commission in August 2025 to reform heavy vehicle FTC access, however the recommendations did not address the single largest beneficiary of forgone taxation that operates as a disincentive to decarbonisation - mining.[1]

The Emissions Bomb of the FTC Scheme

From FY05 to FY23, Australia's total emissions dropped 26% to 453 million tonnes pa (Mtpa) CO_2 equivalent (CO2-e). Over the same time frame, mining sector emissions, including coal, metal ore and oil and gas extraction, have risen 77% to 107 Mtpa CO_2-e, with mining's share of national emissions rising from 10% in FY05 to a record high share of 24% in FY23.

This includes CO2 emissions emitted from the burning of fossil fuels, primarily diesel, used in the extraction and processing of resources, as well as leaked fugitive methane (CH_4) emissions primarily released in open-cut coal mining operations. This separation is critical to identifying the trends of fossil fuel consumption in mining operations.

Excluding fugitive emissions, direct CO2 emissions from the burning of fossil fuels, e.g. diesel, in the extraction of coal and metal ore have risen 128% and 122% respectively to a total of 34 Mtpa CO_2 in FY23. Scope 1 CO_2 specific emissions from coal and metal ore mining now represent a significant 7.6% of all emissions across Australia.

Equally as important, the upward trend of diesel consumption has not slowed, undermining Australia's progress towards its legislated climate targets. The current climate-industry policy landscape has proven insufficient to drive structural change in phasing-out diesel in Australia's mining sector, largely a consequence of the tailwind to continued use provided by the FTC Scheme.

From 2006-07 to 2024-25, the FTC Scheme has **subsidised over 815 $MtCO_2$-e GHG emissions directly for the burning of diesel and petrol by corporates**, largely to coal and iron ore mining. Australia's 15 largest consumers of diesel burned almost 6 billion litres in FY24 alone, receiving $2.9bn in tax concessions to emit 16.2 $MtCO_2$-e.

[1] Productivity Commission, Interim Report: Investing in Cleaner, Cheaper Energy and the Net Zero Transformation, 03 August 2025

Under the current tax credit scheme, there are no signs of this slowing, let alone declining in alignment with the climate science and the government's own stated objective.

The FTC Scheme Undermines the Effectiveness of the Safeguard Mechanism

Some beneficiaries of the FTC Scheme argue that its reform is unnecessary. They contend Australia has now introduced an implicit carbon pricing scheme – the Safeguard Mechanism (SGM) – that incentivises emissions reduction by the main industrial emitters, including the FTC Scheme's largest beneficiaries.

The SGM requires industrial emitters to reduce their emissions below a declining baseline (via investment into and deployment of clean technology) or pay a financial penalty by purchasing and surrendering Australian Carbon Credit Units (ACCUs). Alternatively, they can offset emissions by applying SGM Credits (SMCs) earned by other facilities that overachieve on emissions reductions.

However, for the SGM to impose a marginal carbon price sufficient to eliminate the implicit carbon subsidy of the FTC Scheme, the price of SMCs or ACCUs would have to rise to $190 a unit. Average ACCU prices have fluctuated between $30-40 in recent years. As a result, the FTC Scheme carbon subsidy is over 5x greater than the carbon penalty on emissions above a Safeguard facility's baseline.

The 2023 reforms to the SGM are not sufficient to eliminate the massive subsidy via the FTC Scheme. The SGM and FTC Scheme introduce directionally-opposed and incompatible policy signals towards decarbonisation, with the FTC Scheme significantly undermining the efficiency and efficacy of the SGM.

The Solution: Transition Tax Incentive Proposal

If Australia is to reach its climate and decarbonisation goals, the FTC Scheme is overdue for substantial reform.

CEF proposes the introduction of a $50m per annum cap per consolidated corporate entity on credits able to be claimed under the Scheme. CEF notes the Australian Council of Trade Unions in August 2025 advocated for a more ambitious reform, proposing a $20m per annum cap to the scheme.[2]

Under CEF's proposal, FTC receipts above the $50m cap would be returned to the company as a conditional investment tax incentive – a **Transition Tax Incentive** (TTI) – on the proviso that the miner deploys that capital return into defined investment classes that will enable the phase-out of diesel in its operations. In other words, entities would retain the value of the TTIs if a commensurate investment into decarbonisation capex is made.

Eligible infrastructure and technology investments would be defined by a common sustainable finance taxonomy, including but not limited to enabling electrification infrastructure such as transmission and distribution networks, charging networks, renewable energy generation and firming capacity, or electrified heavy mobile equipment procurement – for example battery-electric heavy haulage trucks to replace diesel fleets, where technology innovation and capacities have raced ahead in 2024/25.

The conversion from FTCs to TTIs must be administered in a way that ensures net no loss to a corporate entity's income statement, protecting corporate profit & loss (P&L) statements in each respective compliance period.

CEF has outlined a possible administration structure for how this could be achieved in Section 4.

From CEF's analysis, the introduction of **the TTI could have mobilised almost $2.2bn pa into decarbonisation in FY24** under a federal government revenue-neutral approach. As fuel excises continue to rise through indexation, the annual value of the TTI proposal would rise materially. If the TTI proposal was implemented from the current forward estimates period, CEF forecasts over

[2] ACTU, Unions Want to Make Housing Affordability a Key Roundtable Issue, 03 August 2025

$13.6bn of decarbonisation capex could be mobilised, or returned to the government from just the entities covered from FY24. As fuel excise is indexed, more large-scale consumers of diesel would be captured by the scheme.

CEF also recommends the additional revenues to the government through TTI clawback be ring-fenced and directed into a Diesel Decarbonisation Fund that provides budgetary assistance to mining firms that are not captured over the $50m cap to the FTC Scheme.

This mechanism can provide an economic incentive to decarbonise large-scale mining operations through the TTI, as well as provide an economic incentive to smaller mining entities without the loss of the current value of fuel tax credits. This would enable and support a whole-of-industry buy-in approach that provides additional support for smaller miners and entities as well as reduce budgetary assistance to the largest firms that benefit significantly from economies of scale.

This reform would instantaneously reshape one of Australia's worst climate and industry policies to become a major tailwind to electrification, accelerating regional investment in the deployment of infrastructure to leverage Australia's abundant and world-leading renewable energy resources to embed decarbonisation into value-added exports, and permanently build a global competitive advantage of both zero emissions, low cost energy. A win-win-win, for the environment, for Australia's energy security and terms of trade, and for a 'Future Made in Australia' (FMIA).

CEF supports the continuation of support for the road transport and agricultural sectors. Emerging from a cost-of-living crisis, **CEF emphasises the TTI proposal would have no impact or inflationary pressures on farmers, food supply chains or Australia's trucking industry.**

The proposal to introduce the 'cap-and-reinvest' model articulated here would only apply to the mining sector, ensuring no small–medium enterprise, sole trader or family business in the agriculture, forestry, fishing, road transport, freight, or manufacturing sectors would be affected.

CEF analysis on FY24 emissions and energy data estimates that a $50m cap to the Scheme would cover 15 entities.

We note that Fortescue is in full support of CEF's proposal for the introduction of the TTI.[3]

Fortescue's "preferred option for FTC Scheme reform is the proposal put forward by CEF to introduce a $50 million cap on the FTC paid to consolidated groups. All additional funds should be converted to a Transition Tax Incentive paid to the taxpayer but which can only be invested in mine electrification and decarbonisation in Australia. This budget neutral approach would improve the internal business case for decarbonisation projects and effectively convert a decarbonisation headwind into a tailwind."

CEF reiterates that a market-based price on carbon is the most effective way to incentivise the private sector to make low-carbon investments and drive down emissions, as consistently demonstrated by The Superpower Institute and Rio Tinto in its recent submission to the Productivity Commission.

The most economically-efficient and optimal reform of government incentives would be the introduction of an economy-wide carbon pricing mechanism. CEF sees the progression towards this as imperative to drive structural change in fossil fuel consumption across all economic sectors in Australia. CEF's TTI proposal is a transitional measure that can be effectively deployed right now that aligns economic incentives with Australia's industrial decarbonisation objectives in a targeted measure to Australia's largest consumers of fossil liquid fuels. CEF recommends this measure to be replaced long-term with a direct carbon pricing mechanism that captures emissions from all sources of fossil fuel use and extraction.

[3] Fortescue, Incentivising Diesel Decarbonisation, 30 May 2025

The FTC Scheme Aligns Economic Incentives with the Objectives of Treasurer Chalmers' Productivity Reform

Three key themes have been put forward by Federal Treasurer Chalmers for the critical Productivity Roundtable to inform economic reform objectives of the Albanese Government, including:

- Making our economy more productive;
- Building resilience in the face of global uncertainty; and
- Strengthening the budget and making it more sustainable.

CEF's proposal to reform the FTC Scheme into a TTI cap-and-reinvest model addresses these themes, aligning economic incentives with natural interest objectives of capital deepening across the economy, improving economic resilience and security and improving fiscal sustainability.

The proposal **makes our economy more productive**. Primary goods account for more than 80% of Australia's goods exports, with manufacturing just 15%. Of Australia's primary goods export, 98% are in unprocessed form.[4] In most advanced economies, high-value manufacturing accounts for most business R&D expenditure, with such expenditure strongly correlated with productivity growth.

In Australia, reform in the context of our industry structure will likely play a greater role in improving total factor productivity, which measures the efficiency of an economy's use of its inputs to produce outputs, than policy aimed at directly influencing R&D expenditure across the economy. Productivity gains can be made through capital deepening in Australia's future-facing resource industries, with reformed tax structures incentivising the deployment of capital into renewable energy generation and electrified equipment.

Fossil fuel based infrastructure is intrinsically inefficient, with much of the input energy and costs wasted in combustion. In the conversion of primary energy to usable final energy, electric equipment is ~ 100-120% more efficient than their fossil fuel counterparts. The TTI proposal incentivises the displacement of imported diesel with more capital-intensive energy infrastructure with significantly improved energy efficiency. With Australia's world scale mining export sector, this reform could place Australia at the forefront of this global sector transformation, aligning with the FMIA objectives as well, if we draw Original Equipment Manufacturer (OEM) assembly and development investment into Australia as part of a Team Australia approach.

Increasing the energy efficiency of resource extraction and processing, deepening capital intensity of production and producing zero-emission electricity domestically can be leveraged as key drivers of total factor productivity.

The FTC Scheme currently protects mining companies from the full cost of diesel, externalising the cost from company balance sheets, and disincentivising innovation by entrenching the ongoing use of this high-cost, high-emissions fuel. Capping the FTC Scheme rebate and requiring that 100% of any amount above the cap be reinvested into decarbonisation would permanently reduce this market distortion and can unlock productivity gains across the mining sector.

It builds **resilience in the face of global uncertainty** by securing energy independence through the replacement of imported diesel with accelerated electrification and deployment of reliable, domestically-produced, plentiful and low-cost firmed renewable energy. This is critical to reducing Australia's vulnerability to the imported oil price shocks to which we are currently exposed. This was recently exemplified in heightened concerns about oil supply chain disruption and price hyperinflation during the May 2025 US bombing of Iran, and brought home during the sustained fossil fuel price spike and resulting energy and cost of living crisis driven by Russia's Ukraine invasion.

Australia imports more than 90% of its oil products, and has just 26 days of diesel reserves as of April 2025, 31 days coverage for petrol, and an average of 32 days cover for all oil and petroleum products.

[4] UTS and BCA, Australia's Export Mix, Industrial Base and Economic Resilience Challenge, 03 November 2021

This wafer-thin margin of reserves presents a threat not just to our energy security, but to our economic and national security, given they are inextricably linked.

Our TTI proposal **strengthens the budget and makes it more sustainable** by converting the FTC Scheme from a massive expense and huge opportunity cost to the economy, to a revenue-neutral scheme – in the worst case scenario – with significant upside potential of new regional investments.

Based on our analysis from corporate reporting of emissions and energy consumption data, CEF estimates the corporations that would be captured by the TTI proposal consumed an aggregate 5.9 billion litres of diesel in FY24, representing $2.9bn in forgone taxation via the FTC Scheme (at 49 cpl).

From CEF's analysis, the introduction of the TTI could have mobilised $2.2bn pa into decarbonisation in FY24 under a federal government revenue-neutral approach, both strengthening the budget and providing a major financial incentive to companies to accelerate the deployment of decarbonisation capex without cost to taxpayers. As fuel excises rise through indexation, the value of the TTI proposal would rise materially, building further momentum into decarbonisation investment.

Our proposal that impacted firms reinvest 100% of credits above the cap enables the critical capital required to deploy renewable energy capacity, common user electricity infrastructure and renewable energy industrial hubs, key to establishing green metals precincts in strategic regions of Australia.

Australia's #1 export commodity is iron ore, contributing $116bn in export value in 2024-25. Our dependence on primary good production means Australia is heavily impacted by external global factors and commodity price fluctuations, driven historically by shifts in supply-demand equilibria, and increasingly impacted by our trade partners' green re-industrialisation initiatives and climate policies, including carbon pricing and border adjustment mechanisms. To remain competitive we must electrify and decarbonise iron ore production at speed and scale.

Global market dynamics have already deflated earnings forecasts for Australia's resource and energy exports, with total revenues forecast by the Office of the Chief Economist to decline by $33bn in 2026-27 compared to 2024-25, driven by a 17% drop in iron ore to $97bn and 20% decline in LNG.[5] This will ultimately have adverse budget impacts for Australia with decreased royalties and corporate tax revenues.

Aligning economic incentives with electrification and deployment of renewable energy infrastructure, Australia can establish a foundation for the future value-adding of resources onshore. This will take time, but Australia has an opportunity right now to reform its fossil fuel subsidies to displace the billions of imported diesel and petrol that have experienced significant price volatility from global negative supply shocks.

Australia cannot capture its opportunity to build a world-leading green metals and iron industry – with the potential to double the value of our iron exports to >$250bn pa – without decoupling from regressive policies that undermine industrial decarbonisation, namely the FTC Scheme.

[5] Renew Economy, As Coal Crumbles, Failure to Pivot to Green Iron Risks Halving Australia's Export Revenues, 04 July 2025

Section 1. Economic Opportunities in Reforming Headwinds to Decarbonisation into Tailwinds

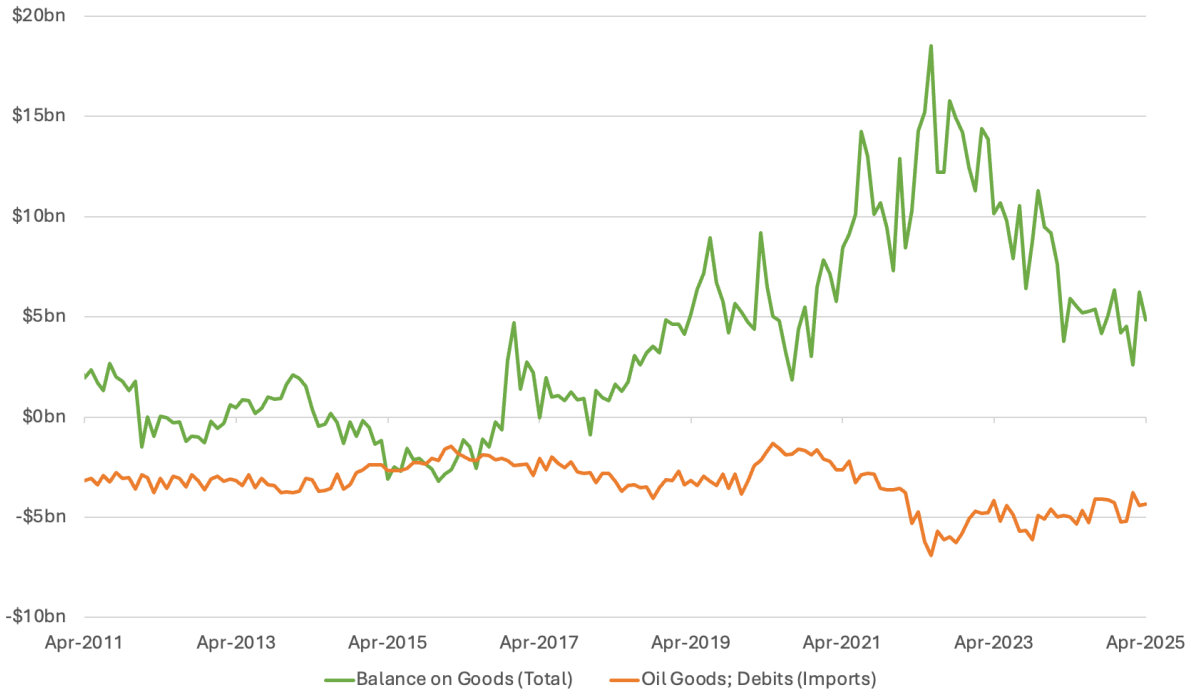
Fossil fuel subsidies like the FTC Scheme, cause significant environmental harm, are costly, distortive, undermine the global efforts to mitigate climate change, aggravate local pollution and place considerable strain on public budgets, draining scarce fiscal resources that could otherwise be invested in sustainable energy infrastructure, research and up-skilling of Australia's workforce.

According to Australia Institute analysis, fossil fuel subsidies over the current 2025 forward estimates will reach a cumulative **$67bn** in the four years to 2028-29. In 2024-25, fossil fuel subsidies were valued at $14.9bn, up 3% from 2023-24, driven primarily by an upward revision in the FTC Scheme.[6]

Reducing fossil fuel consumption through FTC Scheme reform can improve Australia's terms of trade. Over 2024, Australia's balance of goods, a subset of Australia's balance of trade, was recorded at $67.7bn, a significant decline from the $124.6bn recorded over 2023. Across 2024, Australia's balance on oil goods, in which the imports of crude oil and refined petroleum products are recorded, was -$56.5bn - see Figure 1.1.[7] The electrification of Australia's diesel imports, valued at ~$30bn pa, could significantly boost Australia's terms of trade, replacing high cost, high-emission fossil fuels with domestically produced renewable energy to power electrified fleets.

Australia's balance of goods fluctuates significantly as a result of global commodity prices given the exposure to trade-intensive resource and commodity industries. The electrification of Australia's mobile mining equipment can provide a structural change to Australia's terms of trade.

Figure 1.1: Monthly Balance of Goods (Seasonally Adjusted, Current Prices), Quarterly Value of Oil Imports (Original, Nominal Prices)



Source: Australian Bureau of Statistics (2025)
Note: ABS current prices are referenced to May 2025.

[6] The Australia Institute, Fossil Fuel Subsidies in Australia 2025, March 2025
[7] ABS, International Trade in Goods Statistics: Table 1. Goods, Summary – Seasonally Adjusted and Trend Estimates - Current Prices, 03 July 2025

Further, introducing ambitious policies to accelerate electrification and decarbonisation can significantly improve Australia's **national energy security**, replacing volatile, inflationary fossil fuel imports with deflationary, domestically-produced renewable energy.

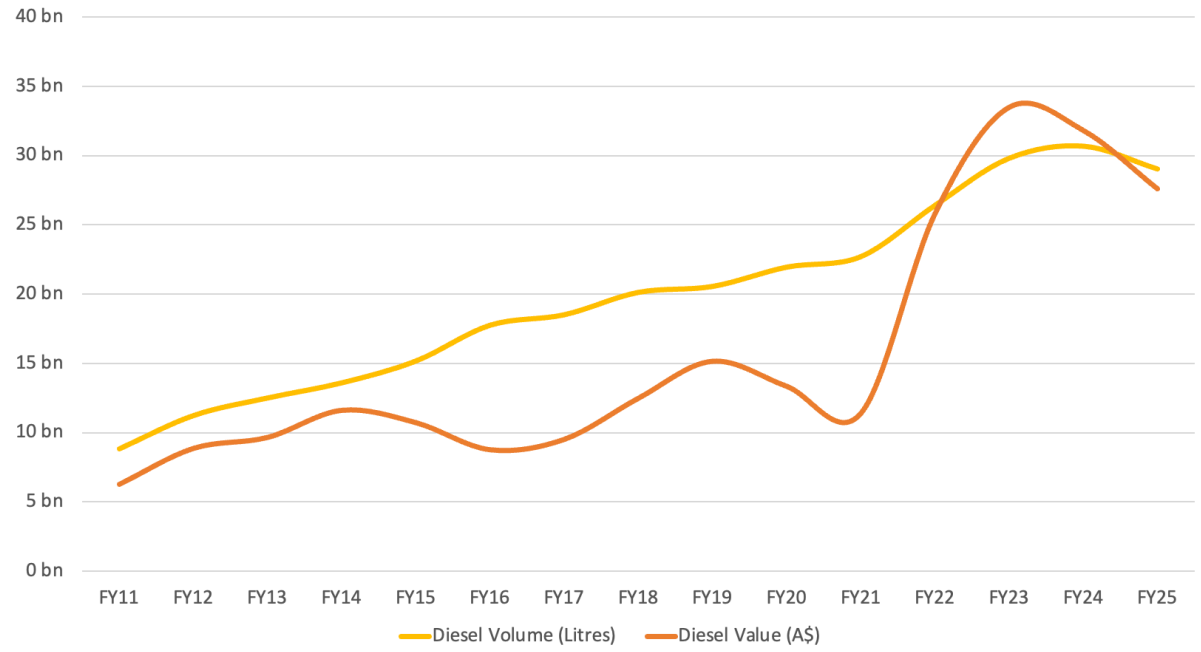
Australia is almost entirely reliant on imports for its oil supplies, with over 90% of all refined oil products imported, like diesel, petrol and aviation fuels, as well as crude oil feedstocks used in refineries.[8] While Australia's largest oil imports are from Singapore's refineries, Asian supply chains depend heavily on primary fuel extracted in the Middle East.

Our degree of vulnerability is apparent in the latest energy import data published via DCCEEW's Petroleum Statistics.[9] It shows Australia has just 26 days of diesel reserves as of April 2025, 31 days coverage for petrol, and an average of 32 days cover for all oil and petroleum products based on consumption figures. This wafer-thin margin of reserves presents a threat not just to our energy security, but to our economic and national security, given they are inextricably linked.

From the last global energy crises spanning 2020-2023, we saw rapid hyperinflation of diesel and oil product imports into Australia, exacerbated by Russia's invasion of Ukraine in February 2022 reshaping energy dynamics. From lows in October 2020 during COVID-19, average oil import prices rose 244% to June 2022 in Australia. While average prices have deflated from these highs, they remain significantly elevated. A global supply shock from this position risks hyperinflation well above prices realised in 2022.

For diesel specifically, the last energy crisis saw average import prices surge from $0.50/litre in FY21 to $1.12/litre in FY23, a 124% rise in just two years, or an annual inflation of 62%. Since the commodity's highs in FY23, weighted-average diesel prices have reduced 15% in the 10MFY25, but remain significantly elevated above their longer-term averages – see Figure 1.2.[10]

Figure 1.2: Australian Diesel Imports by Volume and Value



Source: Australian Petroleum Statistics (2025)

[8] The Australia Institute, Over a Barrel: Addressing Australia's Liquid Fuel Security, April 2022
[9] DCCEEW, Australian Petroleum Statistics 2025: Data Extract April 2025, 13 June 2025
[10] DCCEEW, Australian Petroleum Statistics 2025: Data Extract April 2025, 13 June 2025

Australian policy reform that shifts capital and deploys resources into structural changes that bring fossil fuel demand down, rather than temporarily alleviate pressures during periods of fossil fuel hyperinflation, will provide lasting protection to Australia's energy security.

To support its clean energy transition and its global competitiveness in mining, Australia needs to strengthen its resilience to supply disruptions across all fuels, including diesel and petrol, whether from climate change impacts or global energy price shocks. Volatility in fossil fuel prices drives home the unsustainability of the world's current energy system, and significantly underscores the benefits of the energy transition – including, critically, the scaling of clean energy deployment and the electrification of diesel-dependent industries.

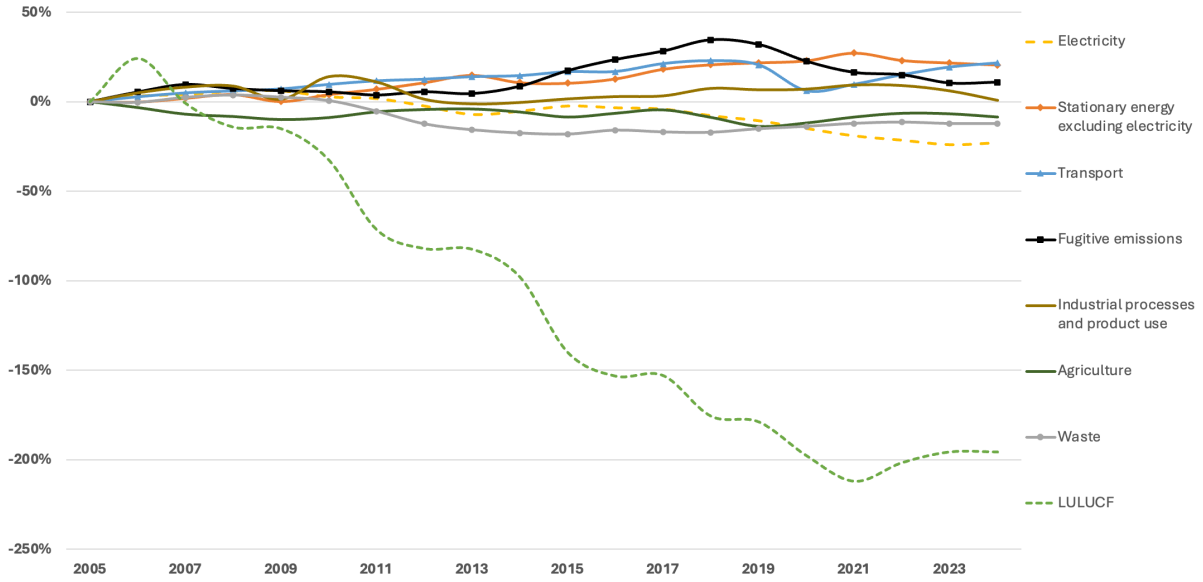
Additionally, there is an urgent need for budgetary reforms to accelerate the rate of progress in Australia's emissions reductions from economic activity to reduce the overdependence on the land-based sector to achieve Australia's legislated climate targets. Nature-based solutions can only provide so much from the unsustainable rate of growth in global GHG emissions that are having increasingly devastating long-term **environmental and climatic impacts**.

Australia has committed to achieving net zero emissions by 2050, and has established an interim target to reduce greenhouse emissions by 43% relative to 2005 by 2030. This is a significant step-up in ambition from its previous target of 26-28% emissions reduction by 2030. Australia's Nationally Determined Contribution (NDC) of 43% reduction by 2030 positions the nation on a trajectory to achieve net zero by 2050, in line with the Paris Agreement to keep 1.5ºC within reach.

Australia's headline emissions in the year to December 2024 were 27% below the year to June 2005, driven primarily by long-term developments in the Land Use, Land Use Change and Forestry (LULUCF) sector. The LULUCF sector has declined 195.8% over this time frame, or 150.6 Mt CO2-e as a result of decreased land clearing, native forest harvesting, increases in plantations and native vegetation.

However, stationary energy emissions (excluding electricity), which covers emissions from the direct combustion of fuels, predominantly in manufacturing and mining sectors, have realised the largest gains since 2005, increasing 20.6% (or 16.7 Mt CO2-e) - see Figure 1.3.[11]

Figure 1.3: Percentage Change in Emissions by Economic Sector



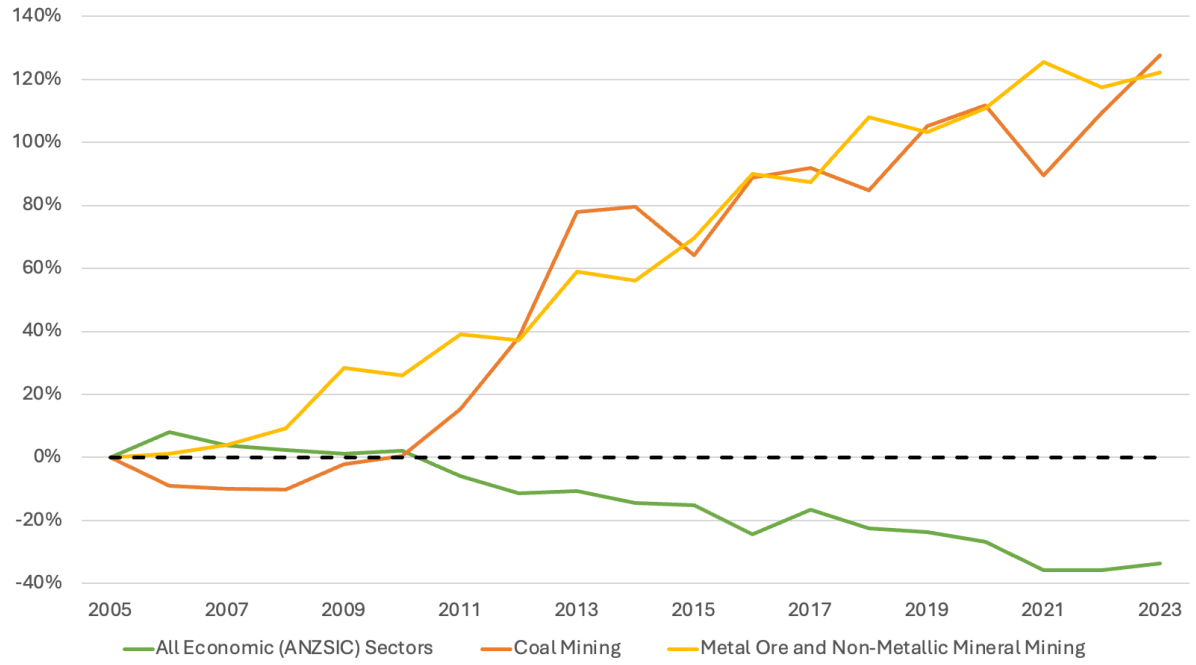
Source: National Greenhouse Gas Inventory Quarterly (2025)

[11] DCCEEW, National GHG Inventory Quarterly Update: December 2024, 30 May 2025

The growth in Australia's mining sector emissions is more evident when isolating CO_2 emissions trends, removing the fluctuations of methane fugitive emissions that are primarily released from open-cut coal mining. The burning of fossil fuels in the extraction of Australia's resources is the largest source of CO_2 emissions.

Aggregate CO_2 emissions from all economic sectors have declined from 435 Mtpa CO_2 in FY05 to 288 Mtpa CO_2 in FY23, a decline of 34%. In comparison, CO_2 emissions from mining, oil and gas have risen 175%, driven primarily by the growth in Australia's LNG export production. Excluding growth in CO2 emissions from oil and gas, CO_2 emissions from coal mining and metal ore mining have risen 128% and 122%.[12] Combined, emissions from the burning of fossil fuels in the extraction process have risen to over 34 Mtpa CO_2 from coal and metal ore mining - see Figure 1.4.

Figure 1.4: Cumulative Growth in Mining Sub-sector CO_2 Emissions Since 2005, Excluding Fugitive Methane and Nitrous Oxide Emissions



Source: Australian National Greenhouse Accounts (latest available data)
Note: Gas: CO2 – AR5. Carbon dioxide gas is isolated to remove fugitive emissions from mining.

The accelerated electrification and decarbonisation of our off-road diesel fleet is critical to addressing the largest source of unregulated pollution in Australia. Australia currently has no regulations to control noxious emissions from non-road diesel engines.

Despite the number of non-road diesel engines being just 3% of the number of on-road engines, total particulate matter from non-road diesel engines are double that of total particulate emissions from all on-road vehicles.[13]

Despite comparable nations implementing standards over 20 years ago, Australia does not have any national noxious emissions standards for non-road diesel engines. The US first implemented non-road diesel emission standards in 1996, with the European Union following in 1999. Providing economic incentives to accelerate electrification of off-road diesel equipment can provide a pathway to decarbonisation without the need to implement off-road vehicle efficiency standards.

[12] DCCEEW, Australia's National Greenhouse Accounts – National Inventory by Economic Sector: Carbon Dioxide Emissions – (IPCC AR5), accessed latest available data July 2025
[13] DCCEEW, Cost-Benefit Analysis of non-road Diesel Engine Emissions Standards, July 2022

Section 2. The Fuel Tax Credit Scheme

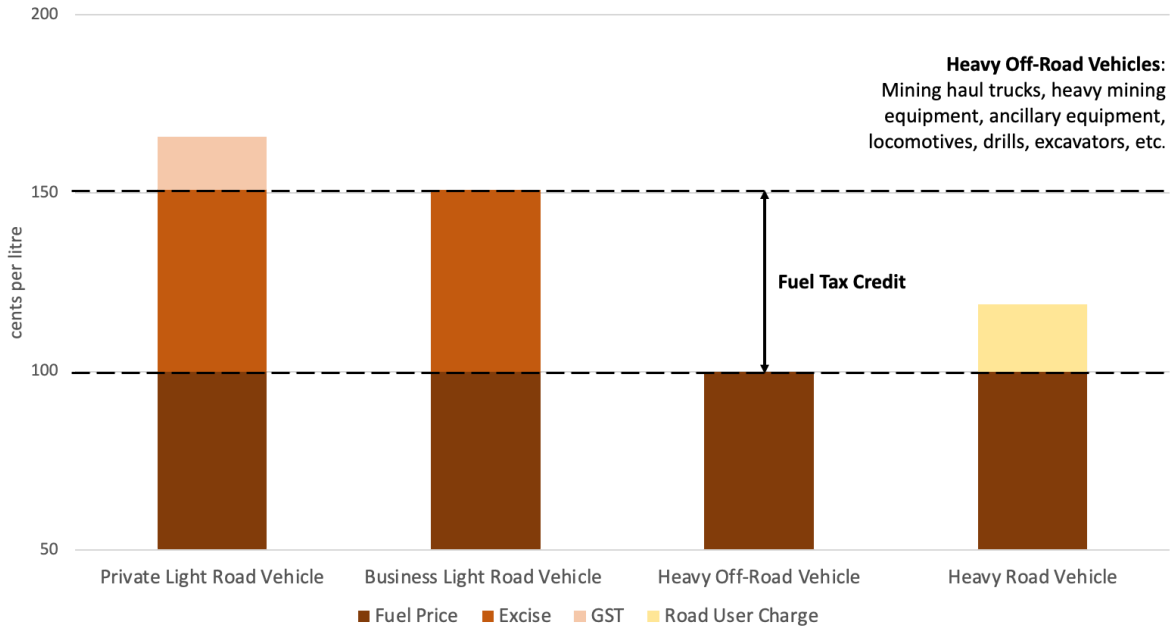
How is fuel taxed in Australia and how is it rebated?

In Australia, liquid refined petroleum products (such as automotive petrol, diesel, fuel oil, etc.) are subject to a fuel tax, a customs duty applied to the base price of imports, typically indexed twice a year to the Consumer Price Index (CPI). As of August 2025, diesel and petrol excise and customs duties are 51.6 cents per litre (cpl).

Total taxation on fuel consumption in Australia is dependent on its application. Diesel used in private light road vehicles is subject to fuel tax and GST. Commercial road vehicles are eligible for GST tax credits. Companies are eligible to remove the fuel tax and GST entirely for off-road vehicles through BAS (Business Activity Statement) claims under the **Fuel Tax Credit Scheme**, a mechanism to rebate customs duty (fuel tax) paid on imported liquid fuels.

Commercial road vehicles exceeding 4.5 tonnes are eligible for fuel tax credits, however, are subject to the Road User Charge (RUC), currently indexed at 30.5 cpl, creating an effective tax concession for large consumers of liquid fuels of 20.3 cpl as of June 2025. As businesses use liquid fuels as a business input, no GST is applied to business light road vehicles and heavy on-road vehicles.

Figure 2.1: Breakdown of Fuel Taxation by Vehicle Application



Source: Climate Energy Finance (2025); ATO (2025)

No, fuel excise does not pay for roads

Australia has a long history of liquid fuel taxation, with various iterations introduced to serve different objectives and budgetary aims. From 1901 to 1929, imports of diesel and petroleum products were subject to tariffs as a protectionist measure for Australia's domestic oil industry. From 1929 to 1959, excise on petrol was formally introduced, with the policy objective to use the revenue for financing road development and associated road infrastructure. This was extended to diesel in 1957 for on-road use to reflect the hypothecation of all fuel excises to road funding.

When the federal government introduced the on-road excise on diesel in 1957, with its policy objective for revenues generated to be hypothecated to road funding, an exemption certification scheme was introduced for off-road consumers of diesel. This formally recognised the purpose of a

fuel tax credit structure for consumers of liquid fuels for off-road use, as the excise was intended to finance road-related infrastructure.

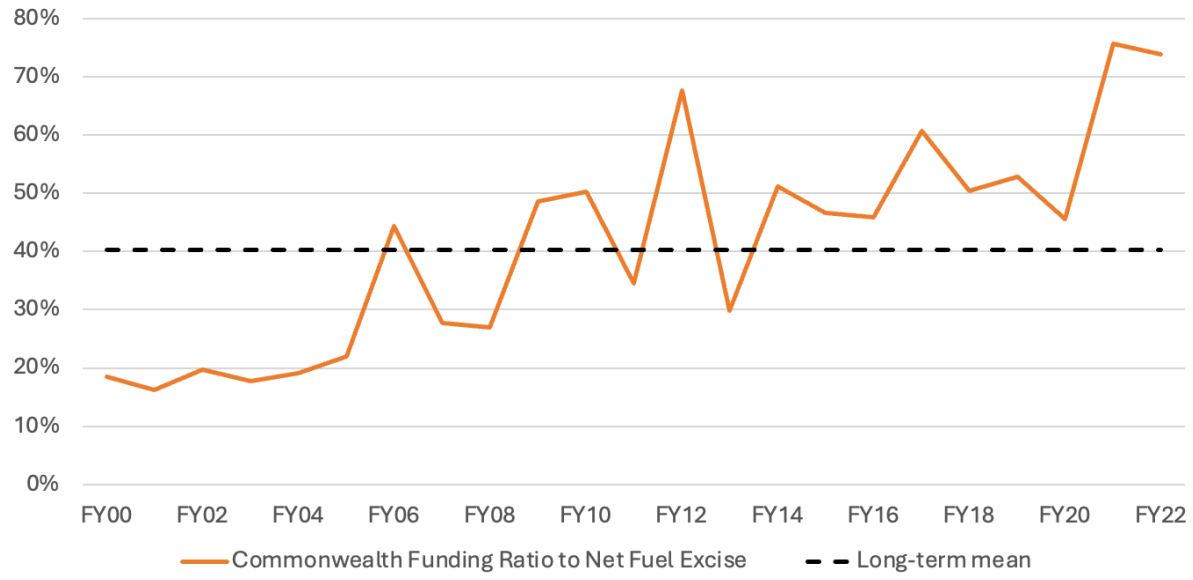
However, in 1959, only 2 years after the exemption certification scheme was introduced for off-road users of diesel, the federal government **formally abolished the hypothecation of fuel taxes for road-related funding**, with fuel excises being directed into general revenue.[14] In the Commonwealth Aid Roads Bill 1959's second reading, the Commonwealth Government announced the termination of fuel excise revenues directed into road funding, principally as a result of the recognition that fuel excises were largely paid by commercial transport operators, who then passed the cost onto consumers.

In 1982, the Diesel Fuel Rebate Scheme was introduced to replace the exemption certification scheme as part of an administrative change, with no changes to the policy objectives of the excise as a general revenue-raising mechanism.

In 2006, the Australian Government established the Fuel Tax Act 2006, a single fuel tax credit system.[15] The Fuel Tax Act and Fuel Tax Credit Scheme are the current form of fuel excise and tax credits.

In 1992, the transition away from fuel excise exemptions on the basis of off-road applications was again confirmed, **ceasing all formal links of fuel excises to road funding**.[16] Since 1992, Australian government capital allocation for road infrastructure has been **set independently** of fuel excise revenue. Fuel excise has since been a general revenue-raising tax system, with the role of petroleum excise to contribute to the broader budget. Road-related expenditure from the federal government has **not followed movements** in fuel taxation for decades - see Figure 2.2.

Figure 2.2: Commonwealth Funding of Road Infrastructure Share of Net Fuel Excise



Source: Bureau of Infrastructure and Transport Research Economics (2023); CEF calculations

In addition, State Governments and road tolls are the largest sources of financing for road-related infrastructure, far exceeding contributions from the Commonwealth Government, of which revenues from the FTC Scheme are distributed to. In FY22 (the latest available data), over $35bn of

[14] Australian Treasury, Fuel Tax Inquiry Report, Background Paper: History of Fuel Taxation in Australia, Treasury archive 13 February 2003
[15] Australia Parliament House, Fuel Tax Bill 2006, 26 June 2006
[16] Parliamentary Budget Office, Fuel Taxation in Australia, 21 September 2022

road-related expenditure was provided from federal, state and local governments. Of this, 61% came from State Governments, with Federal and Local Governments providing 22% and 17% respectively.[17]

Total Government road-related expenditure and net fuel excise have experienced **opposite trends for decades**. From FY00 to FY22, government road-related expenditure has grown at a CAGR of 3%, rising from $17bn pa to $35bn pa. Conversely, net fuel excise has fallen at a CAGR of -2% pa, dropping from almost $16bn pa to $10bn pa over the same time frame. In other terms, in the 22 years to FY22, road expenditure has risen a total of 106%, while net fuel excise has fallen 35%. The erosion of Australia's fuel excise revenues have been a result of the steady expansion of the FTC Scheme to broader activities and applications. Since the introduction of the Fuel Tax Act in FY07, tax concessions have risen by 52% to FY22.

The false connection that off-road users should be rebated for a fuel tax designed to fund road-related infrastructure is outdated, and simply an incorrect statement often repeated by fossil fuel lobbyists, who also like to hide behind our farmers as well, for added political cover. This false connection became one of the largest headwinds to decarbonisation of industry in Australia, with the persistent subsidisation of fossil fuel consumption acting as a major pricing support mechanism for the use of diesel in mining.

A critical obstacle to understanding and reporting Australia's true support for the propagation of fossil fuel production and consumption is the lack of Federal acknowledgement of the Fuel Tax Credit Scheme as a subsidy.

The obfuscation of Australia's fossil fuel subsidies have undermined the progress towards decarbonisation

Over the past 20 years, Australia's mining industry and independent advisory groups have convinced the Federal Government that the Fuel Tax Credit Scheme is not a subsidy. Subsidies persist as a consequence of poor disclosure on their value, distribution and effects, and putative concerns over the economic impact of eliminating the subsidies that reduce the operational cost of fossil fuels on export competitiveness. As the largest beneficiary of the FTC Scheme, the mining industry has continued to advocate that diesel consumption subsidies are key for the industry to remain competitive in global resource markets.

Despite the political rhetoric of Australia becoming a renewable energy superpower and a clean energy economy, Australia has continually abrogated its international agreements to phase-out support for fossil fuels, particularly in global climate accords of the Paris Agreement and Glasgow Agreements.

In 2009, member governments of the G20 and of the Asia-Pacific Economic Cooperation forum (APEC) recognised the problems that arise from fossil fuel subsidies. At the Pittsburgh Summit, the G20 made the commitment to rationalise and phase out the medium-term, inefficient fossil fuel subsidies that encourage wasteful consumption.

In 2010, Australia announced it did not subsidise fossil fuels within the scope of the G20 commitment.[18] However, a Freedom of Information (FOI) request on Australia's submission to the G20[19] revealed the Federal Government argued its position on the basis of subsidy definitions, claiming a subsidy is a measure that reduces local prices below the market price, i.e. the price-gap approach.[20]

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[17] Bureau of Infrastructure and Transport Research Economics, Road-related Revenue and Expenditure Statistics, December 2023

[18] AFR, Commonwealth Denies Fossil Support, 30 June 2010

[19] Australian Treasury, G20 Commitments on Fossil Fuel Subsidies Freedom of Information, 27 June 2012

[20] Australian Treasury, G20 Commitment on Fossil Fuel Subsidies: SOP and Australia's Response

In this argument, Australia's submission excluded assistance measures that are available across the economy (i.e. not industry-specific). Following the FoI request, bureaucrats identified up to 17 Federal fossil fuel subsidies – at a cost of more than $8bn a year in 2010 – that may have to be cut for Australia to meet its G20 fossil fuel subsidies commitment, notwithstanding the Government's claims to the G20 forum that no such subsidies existed.

By exploiting various loopholes, manipulating definitions, and disputing whether certain subsidies were 'inefficient', bureaucrats whittled down the 17 subsidies to just 3 that fall under the G20 commitment, of which the FTC Scheme was not one that remained.

The FOI revealed that bureaucrats had agreed that 'while we should be transparent and list everything for internal discussions, there is a concern that listing subsidies publicly may leave Australia open to criticism from non-government organisations.[21]

At the 2019 United Nations Climate Action Summit, UN Secretary-General Antonio Guterres addressed the lack of action by G20 members to phase out fossil fuel subsidies: "The biggest cost is subsidising a dying fossil fuel industry and denying what is plain as day. We are in a deep climate hole and to get out, we must first stop digging".[22]

Over these years, and to date, the Federal Government has based their determinations of fossil fuel subsidies on the Productivity Commission's (PC) flagship annual Trade and Assistance Review (TAR), the key annual update on developments in Australian trade and industry assistance policies, fails to recognise the distortive and disproportionate subsidy of the FTC Scheme as industry assistance.

The PC is the Australian Government's independent research and advisory body on economic, social and environmental issues that impact and affect the welfare of Australians.

The PC defines government assistance as 'any act that, directly or indirectly: assists a person to carry on a business or activity; or confers a pecuniary benefit on, or results in a pecuniary benefit accruing to, a person in respect of carrying on a business or activity.'

Under this definition, the FTC Scheme should be recognised as industry assistance on the basis of a government revenue that, otherwise due, is forgone. This concession, or consumption-based tax credit, grants (read: confers) a monetary (read: pecuniary) benefit that reduces the operational expenditure for a person or entity carrying on a business or activity.

However, the PC does not include FTC claims by industry as industry assistance on the basis that the policy does not lower the effective price of a good (fuel) below their supply price (the price that producers need to supply that good or service).

As a result, the latest 2023-24 TAR determined the mining sector received a combined $567.7m in budgetary assistance, with $121.8m from tax concessions. In reality, the mining industry received a further $4.6bn in fuel tax concessions from the FTC Scheme in 2023-24, based on CEF analysis on historical distributions and budget figures. Combined, this represents an omittance of 89% of industry assistance. This 89% is industry assistance that directly goes against the national interest of Australia in achieving its legislated emissions reduction and climate targets.

By contrast, as Climate Energy Finance articulated in the Australian Financial Review, the Commission has mischaracterised efforts to deploy capital support and spending programs to rebuild Australian manufacturing and value-add our world-leading renewable resources pre-export as high-cost protectionism.[23]

As the economic and environmental costs of the climate crisis grow and grow further, and against the backdrop of profound geopolitical shifts in government intervention, Australia can ill-afford an

[21] AFR, Swan Under Pressure over Fossil Fuels, 28 February 2011
[22] United Nations, Antonio Guterres Remarks at 2019 Climate Action Summit, 23 September 2019
[23] AFR, It's Time to Power Up from a Petrostate to an Electrostate, 01 August 2023

approach in industry policy that will further hollow out the manufacturing sector and consign us to a zero value-add, dig-and- ship mentality of the fossil fuel mining sector of old.

The FTC Scheme is a fossil fuel subsidy

Internationally, there are a number of highly regarded international agencies and organisations that recognise the Fuel Tax Credit Scheme as a fossil fuel subsidy.

The **Organisation for Economic Cooperation and Development** (OECD), of which Australia has been an active member since 1971, uses the Agreement on Subsidies and Countervailing Measures (ASCM) under the World Trade Organisation (WTO) to define a subsidy.

The WTO defines fossil fuel support as budgetary transfers and tax expenditures that provide a benefit or preference for fossil fuel production or consumption.[24] The WTO identifies that a subsidy shall be deemed to exist:

1. If there is a financial contribution by a government or any public body within the territory of a country, where:
   i. A government practice involves the direct transfer of funds (e.g. grants, loans, equity infusion) or the potential direct transfers of funds or liabilities;
   ii. A government revenue that is otherwise due is forgone or not collected i.e. **fiscal incentives such as tax credits**;
   iii. A government provides goods or services other than general infrastructure, or purchased goods;
   iv. A government makes payments to a funding mechanism, or entrusts or directs a private body to carry out one or more of the type of functions illustrated in (i) to (iii) which would normally be vested in the government and the practice, in no real sense, differs from practices normally followed by governments.

Supporting the OECD's methodology, the International Energy Agency (IEA) recognised the FTC Scheme as a form of budgetary assistance in its 2023 Australia Energy Policy Review.[25] The IEA concluded that at the Federal level, energy taxation and rates are not in-line with sustainable or efficient energy consumption and are not reflective of carbon content. The International Monetary Fund (IMF) has also determined the FTC Scheme as a fossil fuel subsidy.[26]

In support of the IEA, OECD, IMF and WTO, the International Institute for Sustainable Development (IISD) has consistently highlighted the growth and bias in public support measures for fossil fuel consumption in Australia, predominantly through the rise in tax credits.

Furthermore, Australia is also amongst 90+ countries that have joined the Coalition of Finance Ministers for Climate Action (CFMCA), a consortium designed to bring together the fiscal and economic policymakers to lead the global climate response and secure a just transition towards low-carbon resilient development.[27]

The Finance Minister Coalition was developed to harness the leading role these Ministers play in the development of climate-informed public expenditure and the utilisation of climate fiscal tools such as carbon taxes and emissions trading systems to reduce emissions and enable low-carbon growth. These policymakers are critical to the management of the economic consequences of climate change, but also increasingly, responsible for the opportunities of climate action in mobilising the trillions of dollars of sustainable capital investment in the energy transition.

The CFMCA confirms the methodologies for determining subsidies used by the IEA, OECD and WTO.

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[24] OECD, Fossil Fuels Methodology – Glossary
[25] IEA, Australia 2023 Energy Policy Review, April 2023
[26] IMF, Fossil Fuel Subsidies
[27] CFMCA, About: Finance Ministers Hold the Keys to Unlocking Climate Action

In September 2024, the CFMCA made clear the central role the government plays in determining the price of fossil fuels through fiscal policy instruments like taxes and subsidies. As such, they are pivotal economic actors in the removal of inefficient subsidies that general fiscal space and mobilise private investment into clean energy sources.

The distortion of price signals resulting from both implicit and explicit fossil fuel subsidies promote the inefficient allocation of an economy's resources, encourage the continued overconsumption of fossil fuels at artificially low prices, and discourage investment in cleaner sources of energy, ultimately hindering sustainable longer-term growth and increasing global warming and air pollution.[28]

The failure to accurately account for Australia's true subsidisation of fossil fuels directly undermines its integrity in aligning with its commitment to phase out inefficient fossil fuel subsidies under the Glasgow Agreements of COP26.

It is in Australia's national interest to implement a user-pays principle into the externalities of the factors of production. The user-pays principle calls upon the user of a natural resource to bear the cost of running down natural capital

The exemption for large-scale industrial emitters to pay fuel excise acts as distortion to the economics of consuming fossil fuels, resulting in industrial industries paying the private marginal cost, rather than the true social cost. This social cost is then borne by individuals globally that pay for the impacts rapidly emerging from climate change, including diminishing crop yields, health care costs, skyrocketing insurance premiums from increasing severity and frequency of heat waves, floods, droughts, etc.

Reforming the FTC Scheme to internalise the negative externalities associated with the burning of fossil fuels, such that the entity responsible for the emissions pay, act as a Pigouvian/corrective measure to improve the efficient allocation of finite resources and align with our strategic national objectives.

A key responsibility of the government is to establish the regulatory environment in which markets operate, and to intervene when systematic failures persist and non-government means are unable to resolve the failure in an equally effective manner.

[28] CFMCA, Fossil Fuel Subsidy Reform - Removing Harmful Incentives and Appropriately Pricing Fossil Fuel Products, September 2024

Section 3. The Safeguard Mechanism is Insufficient to Level the Playing Field

A number of fossil fuel producers and industry representative organisations within the minerals and resources sector have urged against fuel tax credit reform. A key point consistently elevated is that Australia has now introduced an implicit carbon pricing scheme that covers the main industrial emitters, which includes the FTC Scheme's largest beneficiaries, via the Safeguard Mechanism. As a result, fossil fuel subsidy reform is unnecessary, burdensome, and duplicates regulatory restrictions for large operators in Australia's resource sector.

This tactic is leveraged by industry lobbyists to ensure the continuation of fossil fuel subsidies. The scale of the FTC Scheme means any reform would drastically change investment propositions into decarbonisation capex that firms are currently unwilling to mobilise.

The Safeguard Mechanism (SGM) is the Australian Government's policy for reducing emissions at Australia's largest industrial facilities. The SGM was first introduced on 1 July 2016, requiring Australia's highest emitting facilities to keep their emissions below a baseline limit. The SGM applies to all industrial facilities emitting more than 100,000 tpa CO_2-e, covering facilities within mining, oil and gas production, manufacturing, transport and waste.

The SGM underwent a significant and positive reform in 2023, with the amendments enforced from 1 July 2023. The previous iteration of the Safeguard Mechanism would set baseline emissions at business-as-usual levels. Although some facility baselines adjusted with annual production, the overall emissions baseline remained relatively consistent over time. Despite the Safeguard Mechanism's purpose to hold accountable the industrial facilities that contributed significantly to Australia's emissions, covered facilities' emissions rose 7% from July 2016 to 2020-21 to 140 Mt CO_2-e, accounting for 28% of the emissions in 2020-21.[29]

The reforms restructured the SGM as a baseline-and-credit ETS, with the legislated limits (baselines) declining predictably and gradually to assist Australia in achieving its NDC commitments of 43% emissions reduction target by 2030, relative to 2050, and net zero by 2050.

When a Safeguard facility's emissions are below the production-adjusted baseline, the facility will generate Safeguard Mechanism Credits (SMCs), each representing one tonne of CO_2-e emissions below the baseline. SMCs are tradable credits, designed to incentivise facilities to reduce their emissions beyond their baselines. SMCs can be banked by Safeguard facilities to meet future baseline obligations, or sold on the Unit and Certification Registry to facilities that require SMCs to meet their current baseline obligations.

The SGM only applies to **Scope 1 emissions** from covered facilities in mining, manufacturing, transport, waste and oil and gas production sectors. As only Scope 1 emissions are counted, covered facilities must address the hard-to-abate aspects of their products, e.g. fossil fuel consumption for heat and mobility in iron and bauxite production, carbon anodes in aluminium production.

The SGM is built upon product variables, a criterion for the definition of specific industrial products and the sources of emissions that are embedded in each industrial product. As iron ore mining and coal mining's energy consumption, excluding electricity, is primarily a function of the emissions from liquid fuel consumption, exceeding baseline emissions on a product variable such as run-of-mine iron ore is largely attributable to excess diesel consumption.[30]

Safeguard facilities are also able to use Australian Carbon Credit Units (ACCUs) to meet their baselines. ACCUs are tradable financial products, generated through eligible carbon abatement

[29] RepuTex, The Economic Impact of the ALP's Powering Australia Plan, December 2021

[30] In the context of coal mining, the degree of coal mine methane fluctuates significantly per Safeguard facility

projects under the ACCU Scheme, ranging from reforestation to energy efficiency schemes. ACCU prices are determined by market dynamics, with average prices maintaining ~ $30-40/t (US$19-25/t) since 2022.

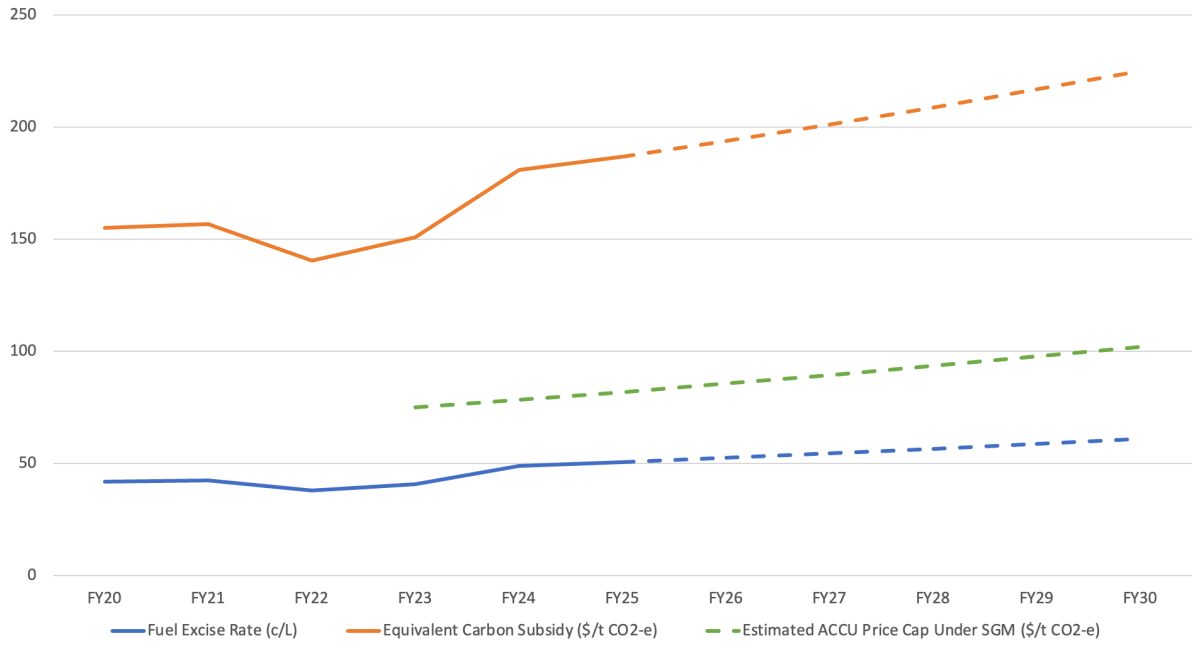
Therefore, the marginal carbon price for excessive diesel consumption is represented as the price of an SMC or ACCU. Climate Energy Finance believes the like-for-like comparison between the introduction of marginal emission penalties via reducing baselines under the SGM to that of the FTC fossil fuel subsidy scheme is intentional and deliberate, to both overinflate the carbon imposts imposed under the SGM and underrepresent the scale of the subsidy of the FTC Scheme represented as an equivalent carbon cost.

At the FY25 weighted-average fuel tax rate of 51.6 cpl, fuel tax credits provide an **implicit carbon emission subsidy of $190/tCO$_2$-e**, based on diesel emissions intensities from DCCEEW's NGERS 2024 GHG Account Factors.

This means for the Safeguard Mechanism to provide a marginal carbon price to eliminate the implicit carbon subsidy via the FTC Scheme, the price of Safeguard Mechanism Credits (SMCs) or ACCUs would have to rise to $190 a unit. However, average ACCU prices have fluctuated between $30-40 in recent years. As a result, the carbon subsidy is over 5x greater than the carbon penalty on marginal emissions above a Safeguard facility's baseline.

In addition, the Safeguard Mechanism also introduced a compliance cost containment measure, capping the value of ACCUs for Safeguard baseline compliance to $75 in FY23, rising by CPI + 2% per annum. Based on the compounding annual growth rate (CAGR) of fuel excise indexation since FY20, fuel excise could reach an annual weighted-average rate of 61 cpl by FY30, equivalent to a $225/tCO2-e implicit carbon subsidy. In comparison, assuming a CPI rate in-line with RBA cash rate targets of 2-3% (average 2.5%), the cost containment measure would restrict ACCU costs for compliance to $102 a unit in FY30, just 45% of the implicit subsidy – see Figure 3.1.

Figure 3.1: Carbon Emissions Subsidy from Fuel Tax Credit Scheme



Source: Parliamentary Budget Office (2025)

As CEF has demonstrated in previous publications, fossil fuel lobbyists have used Australia's agriculture and land-based sectors, largely occupied by family-owned operations and small-medium enterprises, as 'human shields' to safeguard the fossil diesel subsidy's persistence.[31]

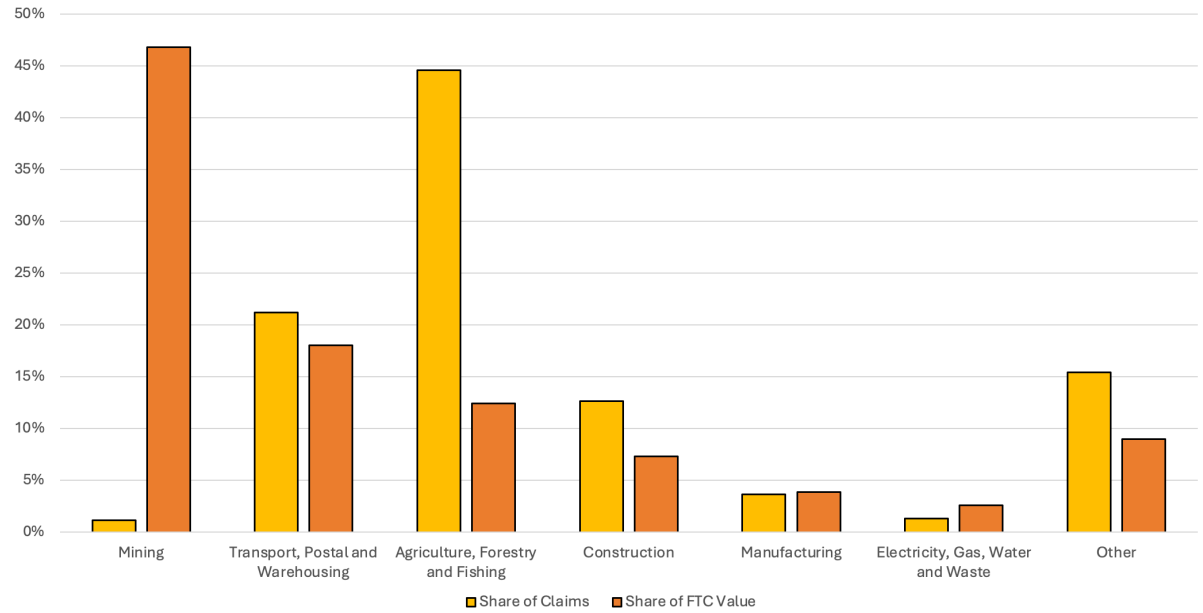
In August 2024, the Fuel Tax Credit Alliance published material warning that reforms to the FTC Scheme would inflict severe damage on the economy, drive up grocery prices, and result in job losses across the country. The Alliance includes the National Farmers Federation, Master Builders Australia, Minerals Council of Australia (MCA), Australian Energy Producers, Australian Grape and Wine, Seafood Industry Australia, Tourism Tropical North Queensland, Canegrowers, National Irrigators' Council, Victoria Tourism Industry Council and Maritime Industry Australia.

However, it is important to demonstrate that the supportive analysis behind the impacts of such reform were not commissioned by representative groups and organisations of agriculture, transport or tourism industry but were commissioned, and prepared solely for the use of the Minerals Council of Australia. The MCA represents 125+ firms in Australia's resources sector, including the largest beneficiaries of the FTC Scheme, including BHP, Rio Tinto, Glencore, Roy Hill, Yancoal Australia, Whitehaven Coal, Peabody Energy, and Anglo American.[32]

According to the latest available statistics from the ATO on the distribution of FTC concessions, the mining industry claimed a total 46.7% of all FTCs by value, well above the agriculture, forestry and fishing industries combined 12.4% of credits by value. However, the mining sector represented just 0.9% of all entities claiming fuel tax credits in 2022-23. In comparison, the agriculture, forestry and fishing industries represented 46.5% of all entities claiming diesel rebates.

Of the 84,499 entities within the agricultural sectors, this equates to an average claim of $11,328 per entity. Conversely, of the 1,674 entities within the mining sector, this equates to an average claim of $2,155,493 per entity, or over 190x that of the agriculture sector – see Figure 3.2. This inequality is further exacerbated when isolating the coal industry, the second largest single economic sub-sector behind metal ore mining. Of the more than $1bn in FTCs claimed by the 52 coal entities in Australia claiming credits, this rises to **over $20.2m per unconsolidated entity for the coal sector**.

Figure 3.2: Distribution and Concentration of FTC Concessions to Industry



Source: Australian Taxation Office (2024)

[31] CEF, "Human Shields": Fossil Lobby is Exploiting Farmers in Campaign to Keep its Massive Diesel Subsidies, 30 August 2024

[32] CEF, Fuel Tax Credit Scheme Report Response, 29 August 2024

CEF reiterates that many of these entities operating in the resources sector are subsidiaries that are grouped under a much larger consolidated entity, further concentrating the distribution of fossil fuel tax credits. The coal mining and iron ore mining industries are, in particular, dominated in terms of production volume by a small number of globally significant firms.

CEF wholly supports the continuation of the FTC Scheme for the road transport and agricultural sectors and recognises that the FTC Scheme has provided much needed industrial support to these sectors. However, the FTC Scheme has, since its inception, always disproportionately provided industrial assistance to the world's largest miners.

The proposal to introduce a 'cap-and-reinvest' model articulated below would only apply to the mining sector, ensuring no small-medium enterprise, sole trader or family business in agriculture, forestry, fishing, road transport, freight, or manufacturing sectors would be affected.

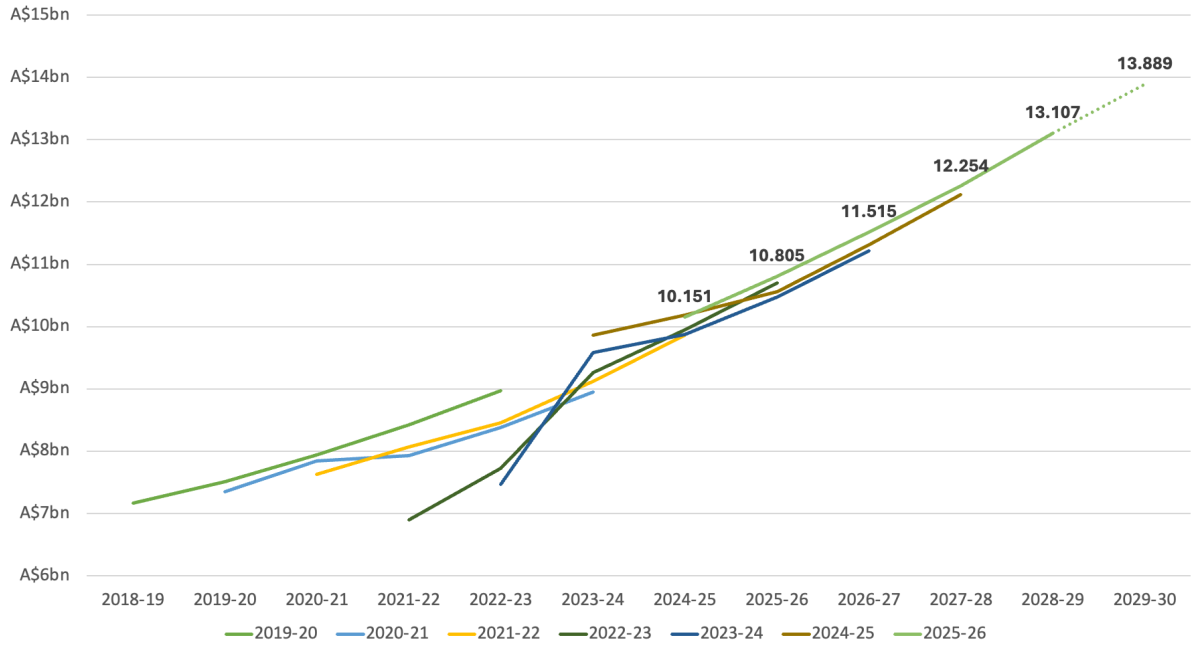
The MCA's submission to the Productivity Commission's Five Pillars of Productivity Inquiry urged the government not to reform the FTC Scheme, stating the operation of this scheme has always made economic sense and is vital for industries like mining that operate in remote, regional areas. The key arguments made by the MCA were that the FTC Scheme aligns with the principle of not taxing business inputs, allows Australia's export industries to compete in competitive global markets, and ensures fuel excise costs are limited to those using public roads.[33]

[33] PC, Responses to Pillar 1: Creating a More Dynamic and Resilient Economy, qr.98 Minerals Council of Australia, 23 June 2025

Section 4. Transition Tax Incentive Proposal

Under the current FTC Scheme, the federal government will provide almost **$48bn in forgone taxation** via the fossil fuel subsidy over the forward estimates. This is taxpayer-funded subsidisation of high-emission fossil fuel consumption via a budget measure that massively undermines the progress of Australia towards its climate targets and decarbonisation ambitions. Over the current forward estimates of the 2025-26 budget, CEF forecasts mining entities will receive 160% more industry assistance via the FTC Scheme than Australia's entire road transport industry, and 277% more fuel price assistance than Australia's entire agricultural sector – see Figure 4.1.

Figure 4.1: Budget Estimates for Fuel Tax Credit Scheme Expense



Source: Parliamentary Budget Office (2025)

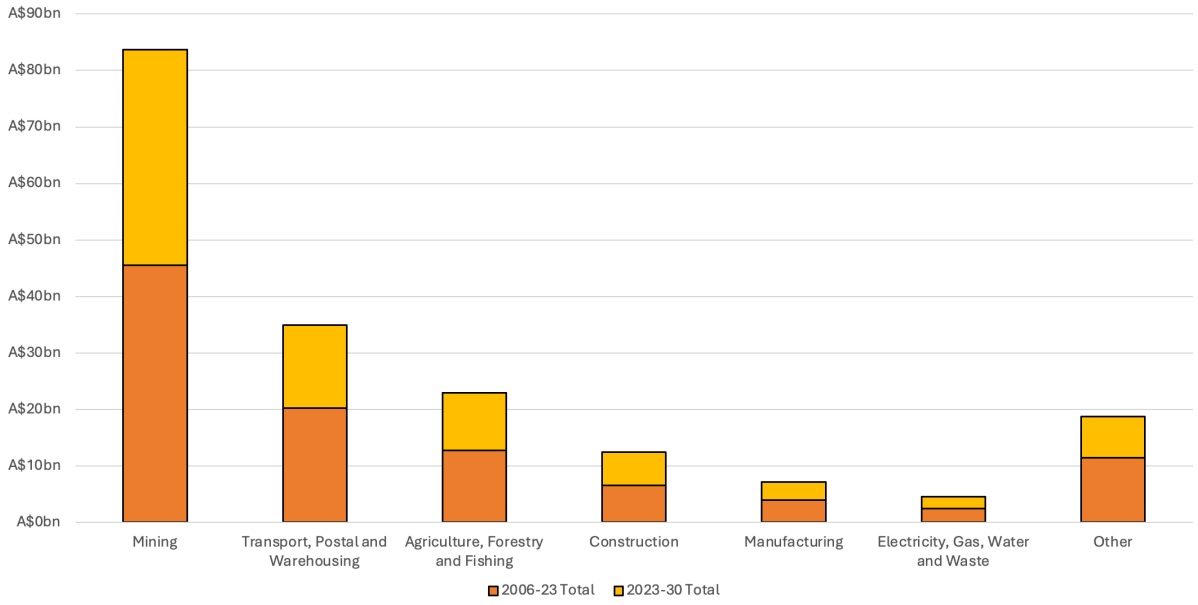
Since the introduction of the Fuel Tax Credit Act in 2006 to 2022-23, Australia has provided $102.7bn in tax concessions for the consumption of refined petroleum products. Of this, over $45.5bn was provided to the mining sector, while just $12.7bn has been credited to the entire agriculture and forestry industry.

Based on historical distributions, from 2023-24 to 2029-30, a further $81.6bn will be provided to industry in fossil fuel subsidies. Since 2005, the baseline in which Australia's emissions reductions progress is measured, the federal government will provide an estimated $184.3bn in fuel tax credits to FY30 under the Fuel Tax Act.

In comparison, AEMO's latest 2024 Integrated Systems Plan (ISP) determined the capital cost of Australia's transition to a decarbonised electricity system via an optimal development pathway to cost $122bn. Put simply, Australia will provide **50% more** in fossil fuel subsidies through the Scheme in the 24 years to 2030 than the cost of transitioning our grid to renewables by 2050.

Of this $184.3bn in fuel tax concessions by 2030, the historical distribution indicates the mining sector will receive almost $84bn, 2.4x the value of subsidies paid to the second largest sector beneficiary in transport, and over 3.6x the assistance provided to agriculture - see Figure 4.2. Reform of industry assistance to the mining sector is critically urgent to align future-facing export industries of Australia to compete in a decarbonised global economy.

Figure 4.2: Fuel Tax Credits Claimed by Economic Sector Since 2006



Source: Australian Taxation Office (2024)

Over the decade, including the extrapolation of the forward estimates based on Treasury figures' compounding annual growth rates (CAGR) to 2029-30, the mining sector will receive over $48bn in tax concessions for the use of diesel in their operations over the next 5 years. Adopting the FTC reforms outlined below could provide an **annual +$2bn fund for mining electrification and decarbonisation, and over $13.6bn by 2030** if the proposal were to be implemented in the current financial year - see Figure 4.3.

Climate Energy Finance (CEF) calls for the urgent reform of the FTC Scheme towards a 'cap-and-reinvest' fuel taxation model, introducing a **Transition Tax Incentive** (TTI) initiative to accelerate the electrification and decarbonisation of Australia's mining industry.

Figure 4.3: Value of FTC Scheme over Current Decade and Impact of TTI Proposal

Figures in A$m Sector	2020-25	2025-26f	2026-27f	2027-28f	2028-29f	2029-30e	Estimates	2025-30
FTCs - All Sectors	41,991	10,805	11,515	12,254	13,107	13,889	47,681	103,561
Transport	7,566	1,947	2,075	2,208	2,361	2,502	8,591	18,659
Agriculture	5,213	1,341	1,430	1,521	1,627	1,724	5,920	12,858
Mining	19,653	5,057	5,389	5,735	6,134	6,500	22,316	48,469
Coal Mining	5,728	1,474	1,571	1,672	1,788	1,895	6,504	14,126
Metal Ore Mining	7,722	1,987	2,118	2,254	2,410	2,554	8,769	19,045
Revenue-neutral scenario of TTI		**2,398**	**2,556**	**2,720**	**2,909**	**3,083**	**10,584**	**13,666**

Source: Company Accounts (2024, 2025); ATO (2025); CEF analysis

CEF proposes the introduction of a $50m pa cap, per consolidated corporate entity, to the FTC Scheme. FTC receipts above the $50m cap are returned as a conditional investment tax incentive, a **Transition Tax Incentive**, to the extent that a miner invests into defined investment classes that will enable the phase-out of fossil refined petroleum.

Consolidated entities would retain the value of the TTIs if a commensurate investment into decarbonisation capex has been made in the relative financial year, with eligible infrastructure and technology investments defined by a common sustainable finance taxonomy, including but not limited to enabling electrification infrastructure including transmission and distribution networks, charging networks, renewable energy generation and firming capacity, or electrified heavy mobile equipment procurement to replace diesel fleets.

The conversion from fuel tax credits to transition tax incentives would need to be administered in a way that ensures a net no loss to a corporate entity's income statement in each financial year. CEF urges that reforming the FTC to such a proposal must ensure that corporate profit & loss (P&L) statements are protected, as long as decarbonisation capex is being mobilised at an equal to or greater than value than the value of the fuel tax credits the group would have generated under the original FTC Scheme.

The TTI initiative would provide a major financial incentive to accelerate the deployment of decarbonisation capex without taxpayer cost, as the TTC proposal is, at worst case scenario, revenue-neutral for the federal government.

Based on internal analysis from corporate reporting of emissions and energy consumption data, CEF estimates the corporations that would be captured by the TTI proposal consumed an aggregate 5.9 billion litres of diesel in FY24, representing $2.9bn in forgone taxation via the FTC Scheme. From CEF's analysis, the introduction of **the TTI could have mobilised almost $2.2bn pa into decarbonisation in FY24** under a federal government revenue-neutral approach – see Figure 4.4. As fuel excises continue to rise through indexation, the annual value of the TTI proposal would rise materially.

Figure 4.4: Value of TTI Proposal from Top 15 Largest Beneficiaries

2023-24 Entity	Primary Commodity	Diesel Use (ML)	FTCs Paid ($m)	Effective TTI ($m)	YoY vs FY23
BHP	Iron Ore / Coal	1,278	627	577	31%
Rio Tinto*	Iron Ore	849	416	366	20%
Fortescue	Iron Ore	631	309	259	20%
Hancock Prospecting	Iron Ore	262	128	78	21%
Mineral Resources	Iron Ore	219	107	57	102%
Glencore	Coal	742	364	314	36%
Mitsubishi Development	Coal	293	144	94	22%
Peabody Energy	Coal	193	95	45	22%
Whitehaven Coal	Coal	201	99	49	71%
Yancoal	Coal	309	151	101	27%
Anglo American	Coal	185	90	40	20%
Stanmore Resources	Coal	186	91	41	45%
QCoal Group	Coal	131	64	14	-
Pacific National	Coal and Commodity Freight	284	139	89	14%
Aurizon	Coal and Commodity Freight	228	112	62	34%
Total		**5,991**	**2,938**	**2,188**	**43%**

**Rio Tinto figures are reported on calender year energy and emissions data, applied to financial year FTC rates.*
Note: FY24 effective FTC rate of 49 cents per litre.

Source: Company Accounts (2024, 2025); ATO (2025); CEF analysis

The FTC to TTI conversion would have to be structured so it boosts the profit & loss (P&L) in the year it is paid, so there is zero net P&L hit from the loss of fuel tax credits. This would also allow these 15 impacted mining companies to show their shareholders that there is no loss of earnings from embracing decarbonisation under this proposal.

To ensure there is no P&L loss in the respective financial year, CEF recommends the return of fuel tax credits up to $50m per consolidated group as per the current iteration of the FTC Scheme, with

additional receipts provided as a transition tax incentive under the same crediting mechanism established by the ATO. To implement the transition tax incentive, Australia's Treasury, Australian Taxation Office (ATO) and Department of Climate Change, Energy, Environment and Water (DCCEEW) would coordinate the classification of eligible assets under the TTI, requiring the reporting of annual reporting of the consolidated entities to demonstrate, and provide evidence, of their investments into decarbonisation capex in the respective compliance period.

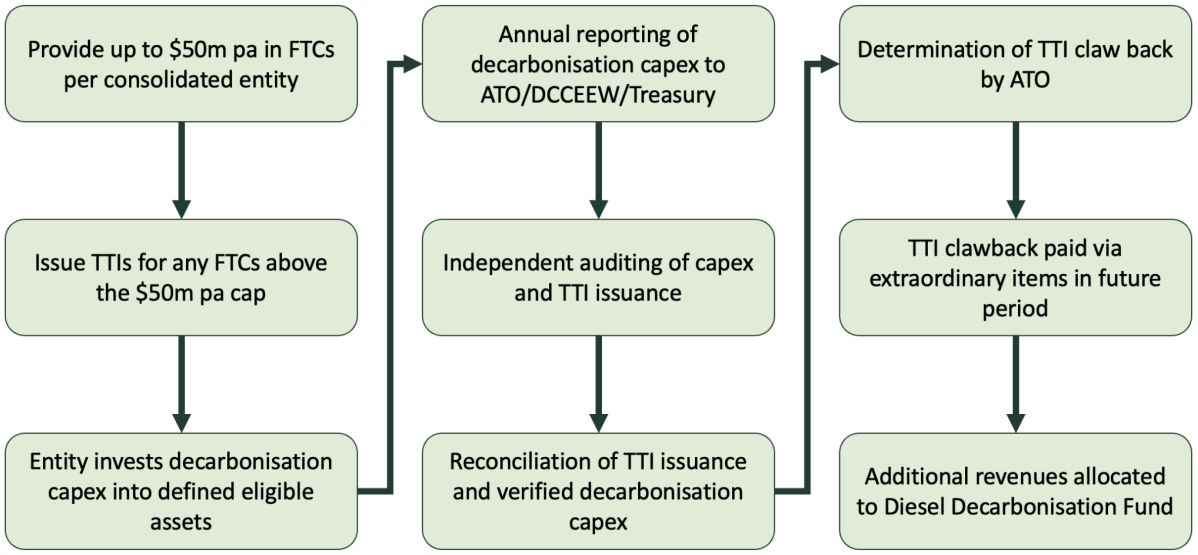
The introduction of the TTI proposal could be phased in over time to ease the transition from a diesel incentive to decarbonisation incentive. CEF recommends that if the TTI is not introduced to its full extent initially, that the Treasury introduce a banking period of TTIs in its first 3 years, such that the value of the TTI can be carried forward in the first two years and deployed in the third compliance year. This mechanism would allow captured entities to invest now under the TTI Scheme, but also provide entities the ability to generate investment pipelines for large-scale renewables and enabling infrastructure to deploy in future periods.

Alternatively, TTIs could be banked with an annual discount factor for every period the value is carried over, i.e. Treasury / ATO clawback a percentage of the initial TTI value not invested for each carry over period.

CEF recommends this annual reporting be audited by a compliance team from the respective governmental departments to verify investments made each financial year. If investments are deemed ineligible or evidence provided for investments made are deemed insufficient to maintain the value of the transition tax incentives, the value of ineligible tax incentives can be returned to the ATO as extraordinary items in a following year's financial statements.

The TTI would also be covered under assessable income to align with the design of the FTC Scheme. This structure would ensure that the crediting back of TTIs to the government do not impact the underlying earnings of the consolidated group in a future compliance year, as the TTIs corresponding to the current compliance period would still be issued. The TTI therefore incentivises material reduction in fossil fuel consumption to avoid negative impacts to the firm's short term underlying profitability and income statements, as well as retained earnings.

Figure 4.5: Example Process of TTI Implementation



Source: Climate Energy Finance (2025)

The TTI proposal would make the internal case for accelerated investment in electrification, grid and EV mine haulage retrofits immediately compelling, as opposed to marginal today with the distorted price signals sent by the FTC Scheme.

In addition, as the TTI is funded via fuel excise, the TTI would phase out as the investments into the defined asset classes would result in a real reduction of fossil diesel used in mining operations. Once sufficient energy infrastructure is operational to enable full electrification and/or decarbonisation, the TTI is self-terminating with no diesel consumption, and thus, no fuel excise paid.

CEF recognises the trend for Australian mining entities to prioritise energy decarbonisation through corporate power purchase agreements (PPAs) as opposed to internal ownership of renewable energy infrastructure assets. This has been characterised by the PPAs signed by Rio Tinto to decarbonise its Gladstone alumina and aluminium assets,[34] BHP Mitsubishi Alliance's (BMA) PPAs with CleanCo to decarbonise its existing electricity demand at its Queensland coal operations,[35] and BHP's PPA for its Olympic Dam copper assets in South Australia.[36]

CEF supports the inclusion of binding PPAs as eligible investment criteria provided the renewable energy asset passes the final investment decision in the corresponding compliance period. The initial concessional TTI banking period articulated above can enable captured entities to accelerate PPA partnerships with developers and accommodate longer lead times and due diligence in project development without limiting decarbonisation momentum of other captured entities. A binding PPA to be eligible would require the capital expenditure of the renewable energy asset to be equal to or greater than the value of the TTIs for the captured entity to retain the benefit.

CEF also recommends the additional revenues to the government through TTI clawback be ring-fenced and directed into a **Diesel Decarbonisation Fund** that provides budgetary assistance to mining firms that are not captured over the $50m cap to the FTC Scheme.

This mechanism can provide an economic incentive to decarbonise large-scale mining operations through the TTI, as well as provide an economic incentive to smaller mining entities without the loss of the current value of fuel tax credits. This would enable and support a whole-of-industry buy-in approach that provides additional support for smaller miners and entities as well as reduce budgetary assistance to the largest firms that benefit significantly from economies of scale.

In recent years, there has been increasing support for fuel tax credit reform from independent members of parliament, including the member for Wentworth Ms Allegra Spender, member for Curtin Ms Kate Chaney and ACT senator David Pocock.[37]

On 9 June 2025, the Australian Financial Review reported Fortescue launched a fresh campaign to reform the FTC Scheme to a **Transition Tax Incentive** approach.[38]

As currently designed, the FTC Scheme is a disincentive for investment into the decarbonisation of diesel-consuming assets and significantly reduces the effectiveness of climate-industry policies such as the Safeguard Mechanism. Without much needed reform, current policy settings position investment decisions as favouring the burning of diesel over decarbonisation and electrification.

Based on Fortescue analysis, a 50 cpl fuel tax credit applied to an average import price of A$1/litre of diesel, halves the post-tax internal rate of return for the investment into decarbonisation and significantly increases the payback period.[39]

[34] Rio Tinto, Rio Tinto and Edify Energy Sign Landmark Solar and Battery Agreement for Rio Tinto's Gladstone Operations, 13 March 2025
[35] BHP, BMA Set to Operate with 100% of Electricity Needs under Renewable Power Arrangements, 19 August 2024
[36] Austrade, Neoen to Supply BHP with Renewable Energy under PPA, 07 March 2024
[37] AFR, Crossbench Eyes Tax Credit Overhaul: Exclusive, 4 November 2024
[38] AFR, Forrest breaks with big miners to push for tax credit overhaul, 09 June 2025
[39] Fortescue, Incentivising Diesel Decarbonisation, 30 May 2025

This reform would instantaneously reshape one of Australia's worst climate and industry policies to become a major tailwind to electrification and accelerate the use of Australia's abundant and world-leading renewable energy resources to embed decarbonisation into value-added exports. A win-win-win, for the environment, for Australia's energy security and terms of trade, and for a future made in Australia.

The TTI Proposal Can Drastically Change Decarbonisation Investment Decisions

With the marginal cost of emissions abatement for Australia's industrial emitters low as a result of the market rates for ACCUs and SMCs to meet Safeguard Mechanism compliance, final investment decisions into electrification and decarbonisation are primarily a function of the economics between continued fossil fuel-based architecture and mine operation and that of building out the enabling renewable energy infrastructure required to electrify mining.

The levelised cost of electricity (LCOE) is the unit cost an electricity generating asset must recover over its economic life to meet all its costs including an acceptable return on investment. In determining decarbonisation investments, an LCOE of the firmed, integrated wind and solar generation can provide a comparative metric to the unit cost of energy for fossil fuel, i.e. diesel, in the cost of operating a mine.

The unit cost of diesel is in primary energy terms, the potential energy contained in its uncombusted form. However, upon combustion, most of this energy is lost to wasted heat and sound, with only a small percentage converted to usable kinetic or electrical energy. On average, this efficiency is ~ 33% for diesel engines. In comparison, the efficiency from electricity generation to energy delivered to an electric motor through a battery-electric system is ~ 80%. As a result, the energy required to power an EV for the same amount of work as a litre of diesel is ~ 4.37 kWh/L. This metric can then be used to determine the cost of electricity required to breakeven with the primary energy cost of diesel. The breakeven cases for cost of diesel with FTC subsidy and without the FTC subsidy are summarised below in Figure 4.6.

Figure 4.6: Investment Cost Difference with FTC Reform

Factor	FTC Subsidy	TTI Proposal
Cost of Diesel (A$/litre)	0.87	1.39
Final Usable Energy (kWh/L)	4.37	4.37
Firmed LCOE Required to Breakeven with Cost of Diesel for Electric Equipment (A$/MWh)	**199**	**318**

Over FY25, the average import price of diesel into Australia was $0.87/L. To breakeven for an electrified operation, the LCOE of firmed renewables would need to be A$199/MWh. The addition of the current FTC rate of 51.6 cpl would shift the breakeven value to $318/MWh.

In July 2025, the CSIRO GenCost 2024-25 report identified Australia's LCOE for firmed, integrated wind and solar to be ~ $77-130/MWh in 2024, the lowest cost low-emission technology to deploy. This figure is for connections to Australia's NEM. Historically, renewable energy deployments in the Pilbara have experienced a 100-120% premium to that of the East Coast based on CEF analysis.[40]

Applying a 100% premium on the latest LCOE determinations equates to $154-260/MWh. Under the current policy landscape, major consumers of diesel in the Pilbara have little to no incentive to invest into decarbonisation from an economic perspective. However, the TTI proposal would position the unit cost of electrification below that of the unit cost of fossil fuels in the Pilbara, in which the largest

[40] CEF, Superpowering-Up: Accelerating the Electrification and Decarbonisation of the Pilbara, 13 August 2024

consumers of diesel in Australia operate, creating a significant incentive to invest in decarbonisation and electrification technologies. This tailwind would continue to rise as capital costs of firming technologies fall and fuel excise continues to rise through indexation.

At the high-end of the Pilbara-premium-adjusted LCOE range of $260/MWh, this would translate to a **18% discount** to the cost of diesel based on current diesel prices.

Aligning Economic Incentives with National Interest Objectives

The opportunity cost – the value of the next-best alternative when a decision is made, the foregone benefit that would have been derived from an option other than the one that was chosen – for continuing the public subsidisation of fossil fuels to our mining sector poses an immense risk to the future economic security and prosperity of Australia.

The success of the Future Made in Australia's re-industrialisation package will be the alignment of economic incentives with the broader national interest objectives of Australia. In addition to introducing support measures including an effective, and increasing price on carbon, production-based tax incentives, and contracts-for-difference for strategic metal and critical mineral refining, we must see reforms to outdated, fossil fuel propagating policies of yesteryear.

Adopting a proposal such as the above to reinvest 100% of the additional revenue gained from the cap provides a mechanism to enable the critical capital required to deploy the necessary renewable energy capacity, and scaling common user infrastructure and renewable energy industrial hubs to establish green metals precincts in strategic regions of Australia. Leveraging economies of scale, coordinated development, and reduced environmental assessment timelines through reduced proposals that currently are subject to significant backlogs and delays to the regulatory processes that already limit investment into renewables.

If Australia's greatest export commodity by current volume, value and potential future value-add, iron ore, is to remain competitive in a global market increasingly impacted by re-industrialisation and climate policies of our trade partners, including the widening implementation of carbon pricing and subsequent carbon border adjustment mechanisms, we must electrify and decarbonise at speed and scale. Australia will not capture the future value of a world-leading green iron and green metals industry without decoupling our climate and energy policies from the influence of multinational fossil fuel cartels, and their lobbyists.

Section 5. Electrification and Decarbonisation of Ore Mining in Australia

Case Study: Fortescue

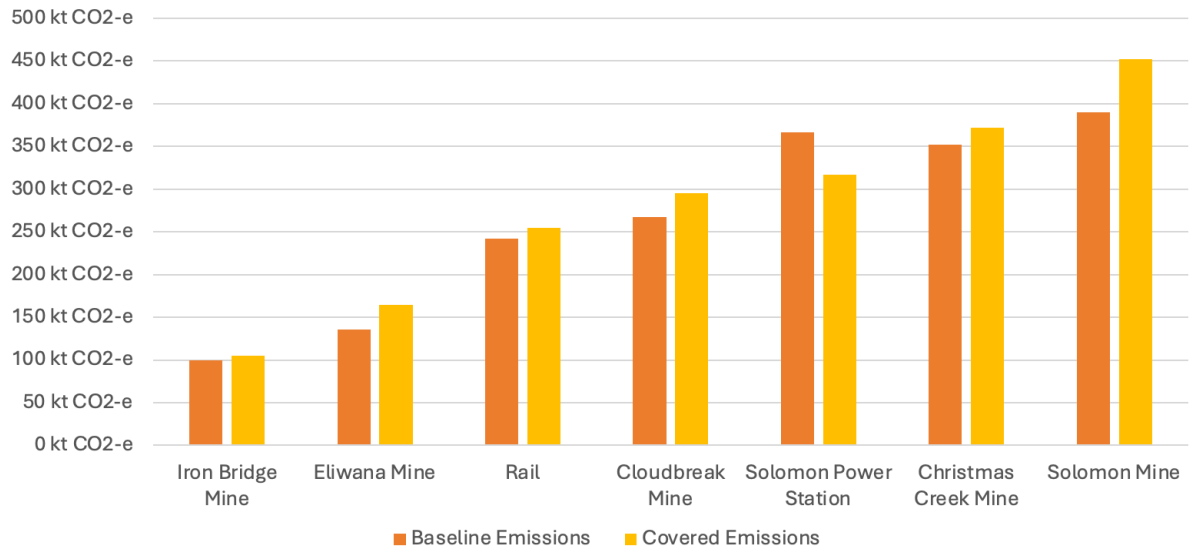
Across Australia's resource sector, Fortescue has become a global pioneer in its commitment to targeting real zero terrestrial Scope 1 and 2 emissions by 2030 in Australia, reduce emissions intensity from its Scope 3 processing of iron ore emissions by 7.5% relative to FY21, as well as reduce emissions intensity from iron ore shipping by 50% relative to FY21. Fortescue has also committed to achieving net zero Scope 3 emissions by 2040. Fortescue is also one of the few corporate leaders that have recognised the economic concessions that it received via the federal FTC Scheme, and has committed to dedicate equivalent resources to financing its decarbonisation plan.

Fortescue's capital allocation plan in September 2022 has unlocked US$6.2bn in decarbonisation capex by 2030 to decarbonise its Pilbara operations, including US$700-900m in Fortescue's latest capital guidance forecast to be deployed in FY25. This would represent a significant step change in the capital flows to emissions reduction realised in FY24, with the company deploying US$224m over the period.[41]

As of 2023, Fortescue no longer purchases voluntary carbon offsets for Scope 1-2 emissions, instead focusing efforts and capital towards the elimination of real emissions across its portfolio. However, for compliance under the Safeguard Mechanism, Fortescue will continue to purchase and relinquish offsets to the extent required by the legislation and its reducing emissions baselines.

In FY24, Fortescue's Pilbara iron ore facilities exceeded their cumulative baselines by 143,719 tCO_2-e – see Figure 5.1. At an average $35/unit ACCU price, this would have equated to an emissions penalty of $5m. In comparison, CEF analysis estimates Fortescue's FY24 diesel consumption for its domestic operations reached **631 million litres**. The FTC Scheme would have provided Fortescue with an implicit carbon subsidy of **$309m in FY24**, orders of magnitude higher than the penalty for exceeding their emissions baseline obligations under the Safeguard Mechanism.[42]

Figure 5.1: Fortescue Pilbara Facility Baselines over 100,000 tCO_2-e Benchmark



Source: Clean Energy Regulator (2025)

[41] Fortescue, 2025 Climate Transition Plan, 30 September 2024
[42] CER, Safeguard Mechanism Facility Baseline and Emissions Data, 15 April 2025

In the company's submission to the Productivity Commission's Five Pillars of Productivity Inquiry, Fortescue reiterated that the FTC Scheme, in its current structure, has been a key restraint to investment over the past decade.[43] The current Australian tax system does not currently provide sufficient incentive for major investment in new renewable or decarbonisation projects.

The introduction of new incentives, such as immediate write-offs, accelerated depreciation measures and/or investment tax allowances beyond those currently provided through capital allowances provisions which have not had a substantive review in recent years to reflect and align with emerging and growing areas of significant capital investment.

The introduction of the Transition Tax Incentive provides the investment tax concession for decarbonisation capex, transitioning the headwind carbon subsidy of fuel consumption credits to a tailwind to electrification and decarbonisation.

To decarbonise Fortescue's existing operations across the Pilbara, the company anticipates an additional 2-3 GW of generation and 4-5 GWh storage will be required.

In FY24, Fortescue completed the construction of its 100 MW North Star Junction solar farm near its Iron Bridge magnetite operations, producing more than 250 GWh pa, equivalent to 30% of the energy demand of Iron Bridge. This expanded on the renewable energy portfolio of Fortescue of the 60 MW Chichester solar farm commissioned in 2021.

Fortescue will require a significant step change in annual renewable energy deployment to reach its target of real zero terrestrial emissions by FY30, but has positioned itself as an Australian leader in decarbonisation efforts. Fortescue has also set up partnerships with leading technology providers in low-emission mining equipment and transport to accelerate their pathway to decarbonisation.

HME Electrification with Liebherr, Germany

In September 2024, Fortescue announced a significantly expanded partnership with global mining OEM Liebherr, to jointly develop a range of zero-emission mining solutions.[44] The value of the partnership is estimated at up to US$2.8bn (A$4.3bn), comprising the supply of machines by Liebherr and the battery systems developed by Fortescue Zero.

The phased supply of ~ 475 zero-emission machines commenced in October 2023, following the initial partnership signed in June 2022 between Liebherr and Fortescue for the supply of 120 zero-emission haul trucks. The US$2.8bn deal is expected to deliver ~ 360 autonomous battery-electric trucks, 55 battery-electric excavators and 60 battery electric dozers, representing approximately two thirds of Fortescue's terrestrial fleet. The electrification of Fortescue's mining fleet will abate 450 million litres of diesel annually, and reduce the group's Scope 1 emissions by 51%.

The autonomous battery-electric trucks will build upon Liebherr's T264 diesel-electric drivetrain platform, with an initial portion converted to zero-emission power trains to commence onsite validation by the end of 2025. Fortescue Zero's battery technology will be integrated into Liebherr's flagship PR776 dozers, and R9400E excavators. The first converted battery electric excavator was commissioned by Fortescue in December 2023, with Fortescue deploying 3 of the R9400E excavators for full operations in 2024.

HME Electrification with XCMG, China

In November 2024, Fortescue announced a partnership with China's XCMG for the purchase of 100 zero-emission HMEs, with a contract value of more than US$400m (A$600m). The partnership marked XCMG's largest contract outside of China, and will deliver electrified wheel loaders, wheel

[43] PC, Responses to Pillar 1: Creating a More Dynamic and Resilient Economy, qr.102 Fortescue, 18 June 2025
[44] Fortescue, Fortescue signs US$2.8bn green equipment partnership with Liebherr for zero-emission mining solutions, 25 September 2024

dozers, water carts, float prime movers and graders to Fortescue's Pilbara operations by 2030. The first phase of equipment of XCMG is expected to be deployed from 2026.[45]

Drill Electrification with Epiroc, Sweden

In April 2025, Fortescue announced a major contract with global mining OEM Epiroc for the supply of 50 autonomous battery-electric platform and contour drills to progressively phase-out its ageing diesel-powered fleet by 2030.[46] The partnership is valued at up to US$350m (A$535m) and will deliver fuel savings of 35 million litres of diesel annually.

The partnership to replace the group's drills followed site testing earlier in April 2025, when Fortescue took delivery of Epiroc's first Pit Viper 271E electric drill at its Solomon iron ore operations in the Pilbara.

Rail Decarbonisation

Fortescue's 54 locomotives consume ~ 82 million litres of diesel annually, accounting for ~11% of its domestic emissions profile. The adoption of zero-emission locomotives is a critical step for Fortescue to achieve its real zero by 2030 target. To achieve this, Fortescue has progressed several technology pathways in parallel, including both battery and green ammonia options. Trials and studies to date have confirmed that zero-emissions rail is technically feasible.

In September 2024, Fortescue Zero announced a collaboration with Downer Group to jointly design and develop the high efficiency battery-electric locomotive to be deployed across Fortescue's Pilbara iron ore operations.[47]

In June 2025, Fortescue Zero announced the prototype battery-electric locomotive had successfully made the 1,100km journey from Perth to the Pilbara to enter a critical yard testing phase in the Pilbara.[48]

[45] Fortescue, Fortescue awards US$400m contract to CXMG to supply zero-emissions mining equipment, 27 November 2024
[46] Fortescue, Fortescue signs multi-million-dollar agreement with Epiroc for electric drills, 16 April 2025
[47] Downer, Downer and Fortescue Zero to Jointly Design and Develop a Battery Electric Locomotive, 25 September 2024
[48] The Driven, Fortescue Takes Delivery of First Battery-Electric Locomotive as it Races to Real Zero, 17 June 2025

Case Study: Rio Tinto

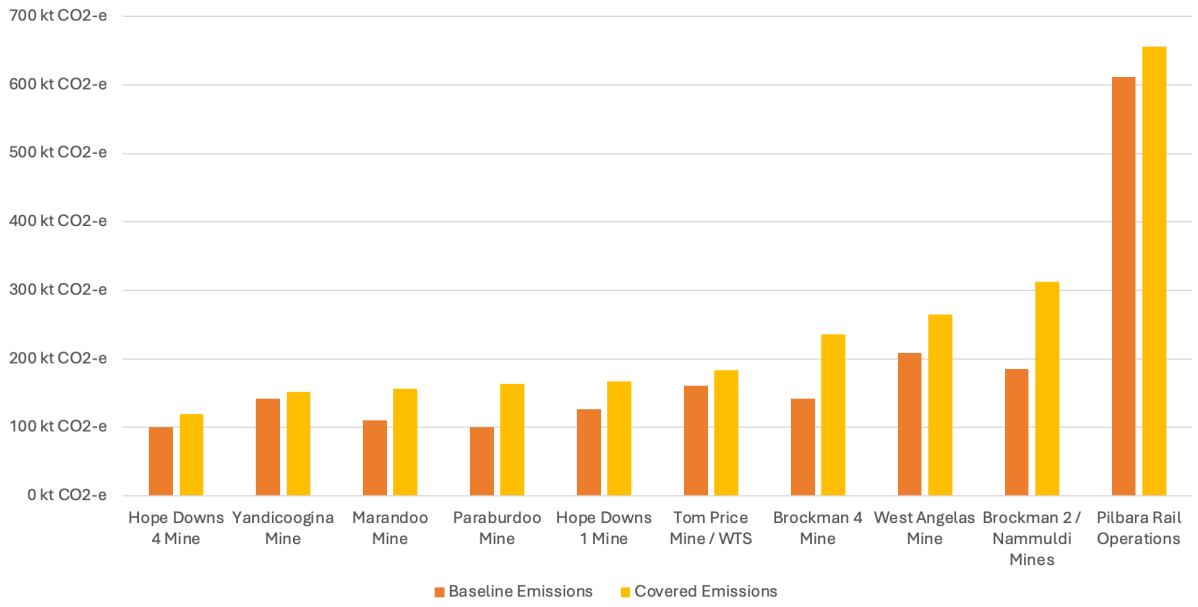
Rio Tinto has committed to achieving net zero by 2050, as well as interim targets of a 15% reduction by 2025 and 50% reduction by 2030, relative to 2018 levels. To achieve Rio Tinto's 2030 target, Rio's capital guidance has allocated $5-6bn into decarbonisation capex by the end of the decade. Rio Tinto will also utilise up to 10% of its 2018 emissions profile (~3.6 million) in carbon offsets to reach its emissions reduction targets.

In Rio Tinto's 2025 Climate Action Plan, the company now expects to use carbon credits from nature-based solutions to achieve its Scope 1 and 2 net emissions targets by 2030, **predominantly through the surrender of ACCUs** by its Australian operations for compliance with the Safeguard Mechanism.[49] In 2024, Rio Tinto finalised long-term ACCU offtake agreements for human-induced regeneration nature-based removal (majority) and savanna fire management nature-based avoidance (minority) project developers.

In 2024, despite producing 4.4 Mt CO_2-e emissions globally from its consumption of 1.6 billion litres of fossil diesel annually, Rio Tinto invested just A$64m into diesel decarbonisation capex and opex across its global operations, including the purchase of carbon credits.[50]

In the Safeguard Mechanism's 2023-24 compliance period, Rio Tinto exceeded its facility-level emissions baselines by more than 30% for 5 of its iron ore mines.[51] For all mines that exceed the emissions threshold of 100,000 tCO_2-e, all of Rio Tinto's Pilbara iron ore mines exceeded their production-adjusted baselines – see Figure 5.2. To meet Safeguard compliance, Rio Tinto surrendered 543,671 ACCUs across its iron ore portfolio alone. At an average spot price of $35, this is equivalent to $19m.

Figure 5.2: Rio Tinto Pilbara Facility Baselines over 100,000 tCO_2-e Benchmark



Source: Clean Energy Regulator (2025)

Climate Energy Finance analysis estimates Rio Tinto consumed **849 million litres** of diesel across its Pilbara iron ore operations in 2023-24. At a weighted-average FTC rate of 49 cpl over the period, Rio Tinto is estimated to have received **$416m in fuel tax credits**.

[49] Rio Tinto, 2025 Climate Action Plan, 20 February 2025
[50] Rio Tinto, 2025 Climate Action Plan, 20 February 2025
[51] Brockman 2, Brockman 4, Hope Downs 1, Marandoo, and Paraburdoo iron ore operations.

For comparison, Rio Tinto received marginal carbon emission subsidies almost **22x** that of the marginal carbon price paid for exceeding baseline targets for all of its iron ore mining operations above the Safeguard Mechanism threshold.

As reported in Rio Tinto's 2025 Climate Action Plan, the vast majority of its planned Scope 1-2 emissions reductions will be via the transition of its electricity consumption to renewable sources across its aluminium operations, achieved via a combination of on-balance sheet capital investments and large-scale PPAs across the east coast of Australia. Rio Tinto have made substantial leaps forward in the first half of the decade to this achieve, including:

- 2.7 GW in combined future wind and solar PPAs across Queensland, expected to supply 80% of Boyne smelter's annual electricity demand and reduce its Scope 1-2 emissions by 70% (5.6 Mtpa CO_2-e), via:
  - 600 MWac 20-year PPA with Edify Energy's Smoky Creek and Guthrie's Gap solar farms.[52]
  - 80% PPA with Windlab's 1.4 GW Bungaban wins farm over 25-year term.[53]
  - 1.1 GW PPA with European Energy Australia's Upper Calliope solar farm over a 25-year term.[54]
- 600 MW / 2,400 MWh future BESS capacity from PPA with Edify Energy's Smoky Creek and Guthrie's Gap Solar Power Stations over a 20-year term. This will provide 30% of the firming requirements to repower the Boyne smelter.

However, decarbonisation capex into Rio Tinto's Pilbara iron ore operations remains incredibly limited relative to its scale as the largest iron ore producer in Australia. Since 2018, in which Rio Tinto's emissions are benchmarked, **diesel emissions have continued to rise**, even into 2025. Without a significant reform in the economic case for repowering diesel-intensive industries with electrified and decarbonised alternatives, Rio Tinto's growth portfolio poses a significant risk to Australia's ability to meet its climate targets set, and future interim targets that are anticipated to see a step change in ambition.

Rio Tinto's development pipeline in the Pilbara extends well into the future, with new mines and infrastructure projects planned across its Western Range, West Angelas, Hope Downs, Greater Nammuldi and Brockman operations. From 2022-25, Rio Tinto invested US$8.5bn (A$13.2bn) into the Pilbara. From 2025-27, Rio Tinto expects to invest more than US$13.3bn (A$20.7bn) into new mines, plant and equipment in the Pilbara. Combined, Rio Tinto expects to deploy US$21.8bn (A$33.9bn) in the six years to 2027 into sustaining and developmental capex in the region.[55]

As part of Rio Tinto's capital allocation plan, the company is investigating the Rhodes Ridge proposal, which has the potential to become the largest iron ore mine ever developed in Australia, producing more than 100 Mtpa. In February 2025, Japan's Mitsui acquired a 40% stake in the Rhodes Ridge joint venture from VOC Group Ltd (25%) and AMB Holdings (15%)[56] for a combined US$5.3bn (A$8.3bn).[57] Mitsui expects the first ore produced from the project by 2030.[58]

It is clear Rio Tinto expects the Pilbara to remain a significant region in the global seaborne iron ore market for decades to come, and for Pilbara ores to integrate into an increasingly decarbonised global and Asian steel value chain.

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[52] Rio Tinto, Rio Tinto and Edify Energy Sign Landmark Solar and Battery Agreement for Rio Tinto's Gladstone Operations, 13 March 2025
[53] Rio Tinto, Rio Tinto Signs Australia's Biggest Renewable Power Deal as it Works to Repower its Gladstone Operations, 21 February 2024
[54] Rio Tinto, Rio Tinto to Drive Development of Australia's Largest Solar Farm at Gladstone, 24 January 2024
[55] Rio Tinto, Rio Tinto 2025 AGM - Transcript, 01 May 2025
[56] VOC Group and AMB Holdings are private entities owned by Australia's Wright and Bennet families.
[57] Mitsui, Acquisition of Interest in Rhodes Ridge Iron Ore Project in Australia, 19 February 2025
[58] Mitsui, Acquisition of Interest in Rhodes Ridge Iron Ore Project in Australia - Slides, 19 February 2025

In Rio Tinto's 2024 Industry Association Disclosure reporting, the company made clear one of its key pillars for industry association advocacy is the support for market mechanisms such as **carbon pricing**.[59] The purpose of these mechanisms being to stimulate innovation and cost-effective emissions mitigation whilst minimising competitiveness distortions within and across sectors. In addition, absent a carbon pricing mechanism, a key principle of Rio Tinto's self-reported requirement for industry association advocacy is support for policy tools and interventions that tackle emissions reductions and simultaneously achieve objectives related to industrial policy. These include, but are not limited to:

- Grant funding, **tax incentives and investment incentives** to support research and development, innovation and first-of-a-kind projects.
- Product standards and procurement obligations that **drive deployment of pre-commercial technology**.

The tailwind provided by the Transition Tax Incentive proposal drives investment into the deployment of low-emission technologies that currently are underutilised compared to the legacy diesel-based mining equipment producers. The TTI is the economic reform required to restructure investment incentives into decarbonised and electrified equipment.

Further, in Rio Tinto's submission to the PC's Five Pillars of Productivity Inquiry (Pillar 5), it reiterated that a market-based price on carbon is the most effective way to incentivise the private sector to make low-carbon investments and drive down emissions.[60] Carbon pricing is the most effective incentive for businesses to reduce emissions, but may not be sufficient for hard-to-abate parts of industrial decarbonisation.

Currently, the FTC Scheme undermines the industrial market-based carbon pricing mechanism of Australia, the Safeguard Mechanism, by orders of magnitude greater than the marginal cost of compliance. As articulated in Section 3, the implicit carbon subsidy is over 5x that of the marginal cost of abatement in ACCUs.

To accelerate Australia's pathway for industrial emissions reduction, the integration of the net zero sectoral decarbonisation plans into Australia's climate-industry policy, greater ambition post-2030 under the Safeguard Mechanism, and reform to one of the largest diesel consumption subsidies in the world must be done in an orchestrated manner.

Electricity Decarbonisation and Investment Pipeline in the Pilbara

From Rio Tinto's 2021 Climate Action Plan, the company aimed to install 1 GW of wind and solar capacity in the Pilbara, financed through Rio's capital. However, Rio Tinto's progress in decarbonising and scaling its electricity generation portfolio in the Pilbara remains limited, with significant delays in construction and commissioning of smaller-scale, early-stage solar projects.

The latest Climate Action Plan by Rio Tinto in 2025 reports Rio Tinto have delayed the planned deployment of battery-electric haul trucks to beyond 2030. This has seen Rio pivot to the future displacement of 80% of its methane gas consumption for stationary power generation, which is estimated to require the deployment of 600-700MW of renewable energy generation capacity.[61]

The decarbonisation of Rio Tinto's diesel-based mobile mining equipment would require multiples of Rio Tinto's current guidance for renewable energy deployment to decarbonise its existing Scope 2 energy requirements.

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[59] Rio Tinto, 2024 Industry Association Disclosure, 20 February 2025
[60] PC, Responses to Pillar 5: Investing in Cheaper, Cleaner Energy and the Net Zero Transformation, qr.61 Rio Tinto, 6 June 2025
[61] Rio Tinto, 2025 Climate Action Plan, 20 February 2025

HME Electrification

On 27 May 2024, Rio Tinto announced a collaborative partnership with iron ore competitor BHP to test large battery-electric haul truck technology in the Pilbara to accelerate the potential for its future potential. The partnership will see the iron ore producers work directly with leading mining OEMs Caterpillar and Komatsu to conduct independent trials of their battery-electric trucks, including the testing of battery, static and dynamic charging systems.[62]

The trials saw two Cat 793 haul trucks trialled in the second half of 2024, and will see two Komatsu 930 haul trucks tested from 2026 across mine sites in the Pilbara.

In **Mongolia**, Rio Tinto have partnered with China's State Power Investment Corporation (SPIC) for battery swapping technology throughout its Oyu Tolgoi open pit copper operations. The technology - 91 tonne trucks equipped with 800kWh batteries, automated battery swapping and charging operations – are already operational in mining operations across China.

Renewable Diesel Trials, USA and Australia

In Rio's **United States** Kennecott copper operations, renewable diesel trials commenced in January 2023, following 2022 trials in its borate operations in California.

By October 2024, Rio Tinto announced the full transition from fossil diesel to renewable diesel for all heavy mining equipment at its Kennecott copper operations. Kennecott's 97 haul trucks and mobile machinery at its mine, concentrator, smelter, refinery and tailings operations are now fuelled entirely by renewable diesel. The transition is expected to reduce the operation's Scope 1 emissions by 450,000 tpa, as well as decrease particulate emissions from tailpipes by 40%.[63]

The initial focus of renewable diesel transitions in the US were aided by California's leading Low-Carbon Fuel Standard (LCFS), which created a market-based mechanism to reduce emissions intensities of liquid fuels through a credit-and-deficit trading scheme.[64] A key lesson in the prioritisation of markets for priority decarbonisation expenditure is the flow of capital following ambitious regulatory reforms that incentivise uptake of low-carbon alternatives.

In **Australia**, Rio Tinto announced the first renewable diesel trials across its Pilbara iron ore operations in February 2025, deployed across its ports, railways and mobile mining equipment fleets. The trial was achieved through a partnership with global renewable diesel producer Neste and Australian fuel supplier Vivia Energy, shipped from Singapore to Rio's port operations in Dampier.

The trial consumed 10 million litres of renewable diesel produced from used cooking oil, blended at a 1:4 ratio with fossil diesel (20% renewable diesel). The 4-week trial reduced Rio's Scope 1 emissions by 27,000 tonnes of direct CO_2-e emissions.[65]

Despite the current focus on renewable diesel, Rio Tinto remains clear that the **ultimate long-term solution for repowering its mobile equipment is direct battery-electrification**.

Australian Carbon Neutral Feedstock for Drop-in Renewable Diesel

On 18 September 2024, Rio Tinto announced the purchase of 3,000 Ha of cleared land near Townsville, Queensland, to establish Pongamia seed farms to produce renewable diesel feedstocks for its mining operations in Australia.[66] The progressive blending-in of renewable diesel into Rio's

[62] Rio Tinto, Rio Tinto and BHP Collaborate on Battery-electric Haul Trucks in the Pilbara, 27 May 2024
[63] Rio Tinto, Rio Tinto Transitions to Renewable Diesel at Kennecott, 29 October 2024
[64] RMI, Understanding California's Low Carbon Fuel Standards Regulation, 04 October 2023
[65] Rio Tinto, Rio Tinto Conducts First Renewable Diesel Trial Across Pilbara Iron Ore Operations, 26 February 2025
[66] Rio Tinto, Rio Tinto Launches Biofuel Crop Farming Trial for Renewable Diesel Production in Australia, 18 September 2024

fossil diesel feedstock could provide a pathway to its compliance obligations under the tightening baselines of the Safeguard Mechanism for its terrestrial iron ore operations.

The purchase of Queensland land followed smaller-scale trials at Rio Tinto's Gove operations in the Northern Territory to assess their response to low soil quality, heat and other climatic conditions in Northern Australia. Rio has already planted 8,000 pongamia trees near its Gove Peninsula bauxite operations, and has begun planting 750,000 trees at the Queensland site.[67]

A liquid market for sustainable feedstock remains a key bottleneck for broader adoption. As Rio Tinto's largest consumer of fossil diesel, developing a sustainable supply chain for its Pilbara iron ore operations would be critical for the decarbonisation pathway to compete economically with battery-electrification in the long-term.

To assist this transition pathway, in 2024, Rio Tinto launched a proposal to the Emissions Reduction Assurance Committee (ERAC) to develop a new ACCU methodology through DCCEEW's interim proponent-led method development for generating carbon credits under the Carbon Credits (Carbon Farming Initiative) Act 2011. The successful development of a new ACCU methodology would further improve the economics of Rio Tinto's drop-in renewable diesel pathway through the generation of ACCUs.

However, during the first Expression of Interest (EOI) round of proponent-led method developments (ending 12 July 2024), Rio Tinto was unsuccessful in the prioritisation of its 'Sequestration of Carbon from Oil Seed Tries' (EOI2024-29) methodology.[68]

The proposal was not prioritised on the basis of insufficient credible evidence to support the claims of the carbon sequestration potential associated with pongamia plantations. In addition, the ERAC highlighted the real potential for adverse outcomes associated with scaling these activities, including the risk for land conversion, competition for land resources and invasiveness of pongamia trees.

[67] ABC, Mining Giant Rio Tinto Growing Native Pongamia Trees for Biofuel Potential, 03 June 2025
[68] DCCEEW, Proponent-led Method Development 2024: Expressions of Interest Assessment Summaries, 29 October 2024

Case Study: BHP

BHP has committed to achieving net zero operational GHG emissions by 2050, with an interim target of 30% reduction by FY30, relative to a FY20 baseline. As of FY24, BHP has achieved a 32% reduction in Scope 1-2 emissions from FY20, meaning BHP has no further emissions reductions requirements to meet its interim target for FY30.

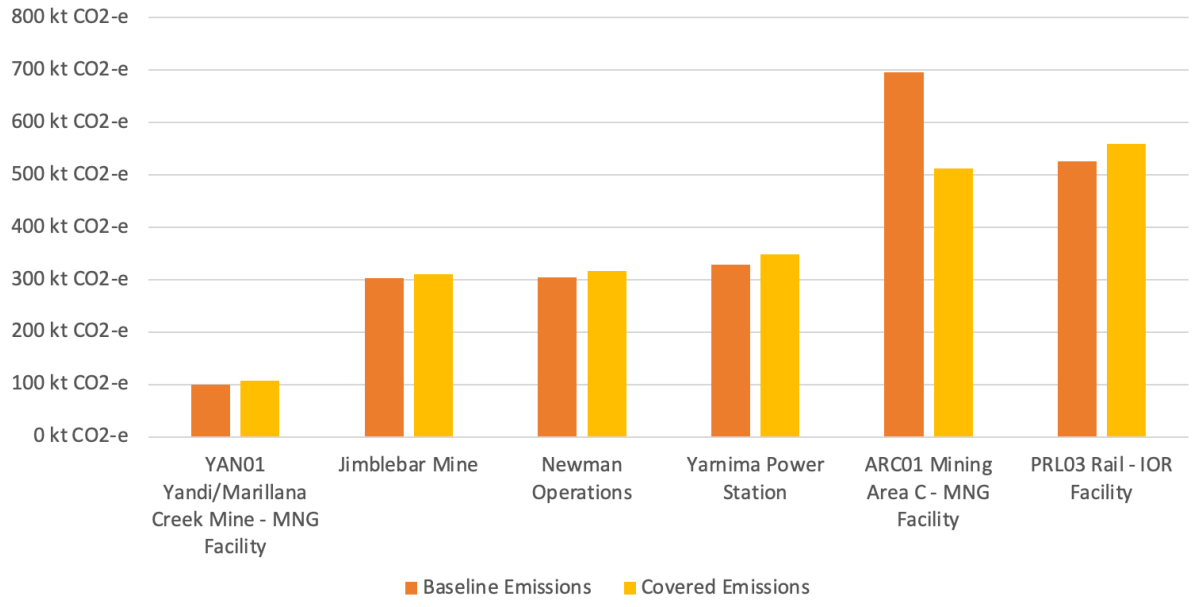
The largest source of operational GHG emissions remains diesel for BHP, accounting for 63% of its global FY24 Scope 1-2 emissions profile of 9.2 Mt CO_2-e. The largest source of abatement has come from the decarbonisation of BHP's electricity demand, driven primarily by the decarbonisation of BHP's Chilean copper assets through long-term renewable energy PPAs.

To FY30, BHP's capital allocation to decarbonisation opex and capex is up to US$4bn (nominal terms), including capex and lease commitments that were previously classified as capital expenditure. Between 2023 and 2024, BHP shifted its projected emissions trajectory upward, decreasing the degree of diesel abatement as a result of increased uncertainty in the commercial readiness of technology and diesel displacement options.

Across its WA operations, BHP's facilities that exceeded emissions baselines aggregated to 79,375 tCO2-e - see Figure 5.3. At an average ACCU price of $35, this equates to a marginal emissions penalty of $2.8m for FY24. In comparison, BHP's equity diesel consumption for its WAIO division was 599 million litres in FY24 according to CEF analysis. At the weighted-average FTC rate of 49 cpl in FY24, this would amount to a carbon subsidy for its iron ore operations of **$293.5m**, or **109 times greater** of its marginal cost of excess emissions for iron ore.

Over BHP's Australian portfolio, including its equity ownership in BMA coal operations, NSW Energy Coal, SA Copper, and Nickel West, BHP consumed a **1,278 million litres**. BHP is by far the largest beneficiary of the FTC Scheme, with an estimated annual return of **$627m** in FY24 via the Scheme.

Figure 5.3: BHP Pilbara Facility Baselines over 100,000 tCO_2-e Benchmark



Source: Clean Energy Regulator (2025)

HME Electrification Trials with OEMs, Australia

BHP maintains the direct battery-electrification of mining equipment is the most optimal path forward to displacing diesel consumption across its operations.

BHP has signed multiple contracts to trial zero emissions technology over the decade. In August 2021, BHP established a partnership with Caterpillar to deploy full-electric haul trucks under trial conditions from 2024, and progressing deploying them at the back end of the decade if proved successful.[69] In May 2023, BHP began testing a prototype full-electric haul truck, built on a Caterpillar 793F frame.[70]

Over 2024, BHP commenced operating trials with Caterpillar on battery-electric haul trucks, and will commence operating trials with Komatsu battery-electric haul trucks from ~ 2026. BHP has partnered with Caterpillar, Komatsu and Rio Tinto to trial two Cat 793 haul trucks and two Komatsu 930 haul trucks.[71]

In 2025, BHP will also begin operating trials with Progress Rail (a Caterpillar co.) and Wabtec for electric locomotives. The decarbonisation partnership with Wabtec commenced in January 2022 when BHP ordered two FLXdrive battery-electric locomotives with energy capacities of 7 MWh in each locomotive.[72] Similarly, BHP purchased two battery-electric locomotives to conduct trials across its WA iron ore network from Progress Rail.

BHP currently uses four diesel-electric locomotives comprising 270 cars carrying 38,000 tonnes of iron ore. A full transition to battery-electric locomotives would reduce BHP's WA iron ore diesel-related emissions by ~ 30% annually.[73]

HME Electrification with XCMG, China

On 24 June 2025, BHP announced a research partnership with XCMG Mining Equipment Co., one of the world's largest and fastest growing mining OEMs for the delivery of mining fleet solutions across BHP's global operations.[74]

BHP highlighted the partnership with XCMG would also provide a diversification of its supplier place with a globally competitive OEM leader that can support evolving fleet, automation, and decarbonisation requirements.

HME Electrification with CATL and BYD, China

On 14 July 2025, BHP announced the signing of two MoUs with China's world-leading battery electrification pioneers CATL and BYD. The collaborative partnership with BYD subsidiary FinDreams Battery Co (FDB) will see the joint investigation of battery powertrain solutions for heavy mining equipment and locomotives, alongside the development of flash-charging infrastructure. Beyond HME electrification, BHP will explore the integration of BYD's commercial and light EVs into BHP's mining fleets. [75]

The partnership with CATL is expected to cover similar collaborative testing and development to that of the BYD partnership, as well as extend to stationary battery energy storage systems and battery recycling options across BHP's operations.[76]

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[69] BHP, BHP and Caterpillar to Accelerate Development of Zero-Emissions Mining Trucks, 31 August 2021
[70] SMH, Monster Movers: BHP Tests Electric Trucks the Size of Two-Storey Houses, 29 May 2023
[71] BHP, BHP and Rio Tinto Collaborate on Battery-Electric Haul Truck Trials in the Pilbara, 27 May 2024
[72] Wabtec, BHP Group Orders Wabtec FLXdrive Battery Locomotives, 17 January 2022
[73] Progress Rail, BHP Orders Four Battery-Electric Locomotives for WAIO Rail Network, 17 January 2022
[74] BHP, Building our Supply Chain Resilience with XCMG, 24 June 2025
[75] BHP, BHP Explores Opportunities with BYD in Battery Electrification, 14 July 2025
[76] BHP, BHP Explores Opportunities with CATL in Battery Technology and Electrification, 14 July 2025

Electricity Decarbonisation at BMA Coal Operations, Australia

In August 2024, BHP entered into a new 7-year PPA from FY27 with QLD publicly-owned gen-tailer CleanCo, expanding on its previous PPA signed in 2023. Combined, the PPAs provide 100% of the current electricity needs for BMA's operations from renewable energy.[77]

[77] BHP, BMA Set to Operate with 100% of Electricity Needs under Renewable Power Arrangements, 19 August 2024

Supporting Material. Electrification Progress in Mining OEMs

Australia's mining industry and representative industry groups have consistently voiced concerns that the technology to electrify mobile mining equipment has not reached commercially-proven scale to deploy in Australian operations at an appropriate risk-adjusted return.

CEF urges policymakers to recognise the rapid technology shifts currently underway, both from a far greater than expected deflation of battery prices – owed to the leadership of China's cleantech sector – and the integration of said technology into the platforms provided by the leading mining equipment OEMs that dominate Australia's mining sector.

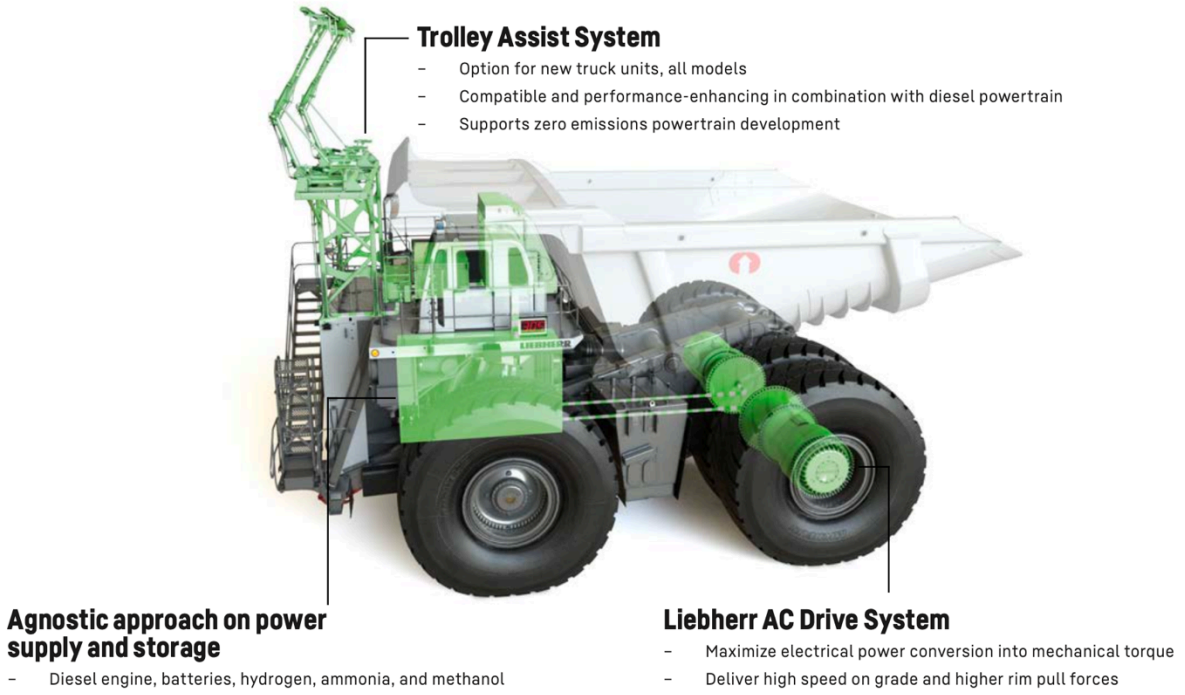
Australian policy must not wait for decarbonised, electrified technologies to be economically-competitive with their diesel powertrain counterparts in a regulatory environment that systematically externalises the impact of GHG emissions. Australia must reform its tax settings and economic incentives with its broader national interest objectives of becoming a clean energy superpower. To do this, Australia must reform one of the largest fossil fuel consumption subsidies in the world, the FTC Scheme. This will provide the market signal from Australian mining majors to global OEM leaders to accelerate the integration and scale of battery-electric equipment.

Liebherr

Liebherr is a world-leading, German-Swiss multinational equipment manufacturer, specialising in mining and construction industries. By 2030, Liebherr aims to offer fossil fuel free solutions for all Liebherr Mining products and equipment.

Liebherr's electric drivetrain systems are 'power-agnostic', with the ability to connect to any form of energy system and powertrain. As a result, Liebherr's mining equipment can be retrofitted with future technologies, including zero-emission battery-electric systems or low-carbon liquid fuels, e.g. renewable diesel or hydrogen fuel cells – see Figure SM1

Figure SM1: Technology-agnostic Capability of Electric Drivetrains



Mining operations that have recently undergone a fleet replacement can still benefit from an accelerated transition to decarbonisation through the retrofit of zero-emission drives, trolley-assists, etc.

In January 2022, Fortescue acquired UK-based battery technology developer, Williams Advanced Engineering (WAE), now Fortescue Zero, to develop zero emissions systems in rail, heavy mining equipment and mobile haul fleets.[78] In June 2023, Fortescue announced a significant expansion of its battery and electric powertrain operations, constructing a state-of-the-art facility in Oxfordshire, UK, creating 120 more jobs under WAE.[79] The new facility is purpose-built to rapidly scale manufacturing of heavy industry, electric and zero-emission powertrain systems, automating assembly of battery modules and packs, and assembly of power conversion and power system units.

In June 2022, Fortescue announced a partnership with Liebherr to develop a supply chain of green mining haul trucks, integrating the platforms of Liebherr and zero emission power systems developed by Fortescue Zero.[80] The partnership also has the opportunity to extend beyond Fortescue's operations, becoming a key zero emissions power technology provider to Liebherr.

Through this partnership, Liebherr and Fortescue Zero jointly developed the T 264 battery-electric haul truck. The current iteration is equipped with a 3.2 MW battery developed by Fortescue, powering an electric drivetrain manufactured and assembled at Liebherr's Biberach, Germany's factory. The partnership has developed a static robotic charger with a 6 MW capacity, capable of charging the capacity of the T 264 haul truck in under an hour.[81]

The T 264 Electric is equipped with dynamic charging options, with the ability to connect to overhead power lines as a result of its powertrain-agnostic design, as well as the ability to connect to a 'Liebherr Power Rail' – a lateral dynamic charging system that reduces technical challenges to installation and maintenance.

The T 264 features Autonomous Haulage Solution (AHS) capability, equipped with an energy management system that monitors truck fleet energy levels in real time to coordinate static recharging of heavy mobile equipment. AHS technologies are also able to optimise routes and speeds of haul trucks to reduce fuel and energy consumption to ensure operations run as efficiently as possible.

Liebherr's trolley-assist system testing has shown incredible results in improving mining productivity. Liebherr's flagship ultra-class T284 haul truck (605t GVW) was 1.8x faster using trolley assist compared to diesel electric-drive on a 10% grade at Liebherr's testing facility.[82] Using trolley assist, Liebherr's ultra-class trucks reduced CO_2 emissions by up to 70% compared to unassisted diesel.[83]

Over a 1km track at 10% incline, trolley assist reduced fuel consumption from 50 litres to just 2.5 litres, a 95% reduction. Over the same track, Liebherr's heavy-class T264 (416t GVW) decreased fuel consumption from 37 litres to 2.3 litres, a 94% decline.[84]

XCMG China

Founded in 1943 as Huaxing Iron Works, Xuzhou Construction Machinery Group (XCMG) is a Chinese multinational original heavy equipment machinery manufacturer based in Xuzhou, China. XCMG is now the leading mining and construction equipment producer in China and the third largest OEM globally, behind Caterpillar and Komatsu, surpassing Liebherr in 2021.

[78] FMG, Acquisition of UK-Based Williams Advanced Engineering, 24 January 2022
[79] WAE, Fortescue Expand Production of Batteries and Electric Powertrains in the UK, 20 June 2023
[80] FMG, Partnership with Liebherr to Supply Green Mining Haul Trucks, 15 June 2022
[81] Liebherr, 4 Key Technologies on the T264 Battery Electric You Can See at Bauma 2025, 08 April 2025
[82] Liebherr, T284 Technical Brochure
[83] Note: Emissions reduction of 35-70%, based on 1-3 km trolley line (representing 25-80% of standard cycle)
[84] Liebherr, T264 Technical Brochure

XCMG now operates in 183 countries with 6 international research centres across China, the US, Germany and Brazil, 14 manufacturing bases, over 2,000 service outlets and 46 large spare part centres, and employs 6,000 technical engineers. XCMG has made significant strides to challenge the current market duopoly in Australia, establishing a depot in Melbourne and centre in Karratha, WA.

XCMG is increasingly outward-focussed in its sales and distribution networks. In 2024, overseas revenue reached US$5.73bn, a 12% yoy increase and accounted for over 45% of total revenue (US$12.6bn).[85]

XCMG offers an extensive portfolio of electric drivetrain mobile mining equipment, and continues to expand its low-emission powertrain options. As a rapidly growing OEM with a world-class manufacturing base across China, there are significant economies of scale that XCMG can leverage in integrating China's world-leading battery technology to provide cost-competitive battery-electric equipment to that of diesel-electric alternatives.

Australia's leading mining OEMs are already partnering with XCMG, demonstrating the viability of China's technology deployed in the Australian context, and XCMG has established an office in Perth to further accelerate its Australian collaborations and market penetration.

HME Electrification with BHP

On 24 June 2025, BHP announced a partnership with XCMG Mining Equipment Co., one of the world's largest and fastest growing mining OEMs for the delivery of mining fleet solutions across BHP's global operations.[86]

BHP highlighted the partnership with XCMG would also provide a diversification of its supplier place with a globally competitive OEM leader that can support evolving fleet, automation, and decarbonisation requirements.

HME Electrification with Fortescue

In November 2024, Fortescue announced a partnership with China's XCMG for the purchase of 100 zero-emission HMEs, with a contract value of more than US$400m (A$462m). The partnership marked XCMG's largest contract outside of China, and will deliver electrified wheel loaders, wheel dozers, water carts, float prime movers and graders to Fortescue's Pilbara operations by 2030. The first phase of equipment of XCMG is expected to be deployed from 2026.[87]

HME Electrification with Rio Tinto

In August 2024, XCMG announced a global cooperation framework with Rio Tinto in Conakry, the capital for Guinea. XCMG successfully won the bid for Rio Tinto's involvement in the globally-significant iron ore mine of Simandou, Guinea, in partnership with a number of Chinese state-owned enterprises. The contract will deliver dozens of XDE240 230 tonne diesel-electric drivetrain haul trucks as well as mining graders, with the total contract amounting to US$110m.[88]

Komatsu

In 2021, Komatsu formed the Greenhouse Gas (GHG) Alliance to advance the development of zero-emission mining equipment with Australia's largest miners, including Rio Tinto and BHP.

[85] XCMG, Empowering New Industrialisation, XCMG Machinery's 2024 Annual Report Highlights High-Quality Development, 13 May 2025
[86] BHP, Building our Supply Chain Resilience with XCMG, 24 June 2025
[87] Fortescue, Fortescue awards US$400m contract to CXMG to supply zero-emissions mining equipment, 27 November 2024
[88] International Mining, XCMG Signs Landmark Mining Equipment Deal with Rio Tinto for Simandou, 15 August 2024.

Komatsu has shifted its focus to building power-agnostic mining haul trucks, following the direction of Liebherr. The GHG Alliance is critical to achieving Komatsu's target of a 50% reduction in Scope 3 emissions by 2030 relative to 2010, and complete carbon neutrality across operational and value chain emissions by 2050.

In May 2025, Komatsu successfully tested autonomous power-agnostic electric-drive haul trucks connected to dynamic trolley lines, a significant milestone in the broader adoption of decarbonised mining equipment.[89]

Building on this, July 2025 saw Komatsu, in collaboration with Boliden, commission and start field trials of diesel-electric trolley-assisted haul trucks in its ultra-class division. While the current models are powered via diesel engines, the electric drivetrains are power-agnostic, allowing the equipment to be retrofitted with battery powertrains, or deployed on direct electric systems to bypass the diesel powertrain for phases of a mining cycle.[90]

EPCA

Electric Power Conversions Australia (EPCA) is an Australian-owned mining equipment electrification firm operating in WA. In May 2024, EPCA successfully completed a battery electric retrofit of a Caterpillar 777D diesel haul truck, the EPCA E-777D. The E-777D is engineered to produce 14% more power than its diesel counterpart, equipped with fast-charging infrastructure to charge in 50 minutes with an 8 hour runtime on standard mining cycle testing.

The EPCA retrofit keeps 80% of the original structure while replacing the diesel powertrain components with a battery electric powertrain. The E-777D is equipped with a 1.1 MWh high-density lithium-ion battery system, capable of producing 850kW of power with a 100 tonne payload capacity. On average cost factors, the electrification of the haul truck can generate ~ 54% operational cost savings compared to an equivalent diesel truck.

As outlined below, the introduction of CEF's Transition Tax Credit Initiative, in which the cost of fuel excise is placed onto the miner, can increase annual operational savings by 62% through electrification from the additional fuel charge - see Figure SM2.

Figure SM2: Investment Comparison of EPCA Electrification With and Without FTC

	Investment Scenario	
Factor	**Diesel at A$1/L**	**Diesel at A$1.5/L**
Annual Operating Hours	6,000	6,000
Analysis Period (years)	5	5
Total Savings (A$)	1,521,850	2,781,850
Annual Operational Savings (A$)	404,370	656,370
Break-Even Point (year)	2	1

Source: EPCA (2025)
Note: Additional assumptions in footnote.[91]

In September 2024, EPCA conducted site testing of the E-777D at Bakers Hill sand mine. With a 17% incline ramp and turnback, the sand mine emulates the conditions and setup of a bauxite mine in

[89] Komatsu, Komatsu Achieves Autonomous Trolley Milestone with Battery-Ready Electric Drive Truck, 22 May 2025
[90] Komatsu, Komatsu Commissions First Diesel Trolley Power Agnostic Truck, 23 July 2025
[91] Maintenance cost A$106/hr for all cases; 84L/hr diesel consumption; A$2.8m diesel-electric purchase price, A$135/MWh electricity cost; 123kWh/hr electricity consumption, A$3.3m battery-electric purchase price.

terms of depth and incline. On the 17% incline, the E-777D consumed 252 kWh of energy and regenerated 35 kWh (15%) in capacity on the decline.[92]

EPCA has collaborated with WA-based integrated energy solution provider UON Pty Ltd to implement the SMART (Scalable, Modular, Automated, Renewable, Temperature controlled) CELL DC Fast Charger, capable of integrating into existing grids or be powered directly by off-grid renewable energy generation.

Caterpillar

Caterpillar is the largest mining equipment OEM supplying Australia, and is the partner of choice for BHP. The current iteration of Caterpillar's battery-electric mining trucks have been deployed at select customer sites for testing and validation, with Caterpillar commissioning and testing seven Cat 793 XE Early Learner battery electric trucks at its Tucson Proving Ground facility in Green Valley, Arizona in 2024.[93]

On 27 May 2024, Rio Tinto announced a collaborative partnership with iron ore competitor BHP to test large battery-electric haul truck technology in the Pilbara to accelerate the potential for its future potential. The partnership will see the iron ore producers work directly with leading mining OEMs Caterpillar and Komatsu to conduct independent trials of their battery-electric trucks, including the testing of battery, static and dynamic charging systems.[94]

The trials saw two Cat 793 haul trucks trialled in the second half of 2024, and will see two Komatsu 930 haul trucks tested from 2026 across mine sites in the Pilbara.

3ME Technology

Established in 2008, 3ME Technology is an Australian advanced systems integrator and electrification partner for off-road vehicles in mining, defence, aerospace and marine sectors. 3ME provides turnkey solutions for lithium-ion batteries, EV traction systems and advanced remote data acquisition, designed to deliver end-to-end electrification from prototype to production, as well as assist customers with technology testing and validation.[95]

Headquartered in Newcastle, NSW, 3ME operates a manufacturing facility with 14MW annual production capability.[96] 3ME has completed a range of integrations of full battery-electric and hybrid-electric solutions. 3ME has developed the BladeVOLT battery system, a modular high energy-density battery system for use in underground and surface mining operations, easily scaled from 0.7kWh to over 1MWh.

3ME's partners include Rio Tinto, Roy Hill, South32 and Hitachi. In 2023, 3ME commenced a partnership with a Tier One global miner to commission Australia's first high-kW battery testing facility. In May 2022, Rio Tinto, in partnership with BHP and Vale, announced 3ME as part of the selection of 8 technology innovators to commercialise effective solutions for charging large electric haul trucks in mining.[97]

In October 2021, 3ME Technology was awarded a $5m grant from the Clean Energy Finance Corporation, as well as a $15m convertible note from the Australian Business Growth Fund. Aided by

[92] International Mining, EPCA Demonstrating Real-World Battery Haulage Business Case at Bakers Hill Mine, 23 September 2024
[93] Caterpillar, 2024 Sustainability Report, 2024
[94] Rio Tinto, Rio Tinto and BHP Collaborate on Battery-electric Haul Trucks in the Pilbara, 27 May 2024
[95] ABC, Lithium Battery Manufacturers Race to Develop Low-Emission Heavy Equipment for Mining, 15 February 2022
[96] 3ME, Services and Capability Statement, June 2024
[97] Rio Tinto, Mining Giants Back 8 Winning Ideas in Global Charge On Innovation Challenge to Decarbonise Mining, 12 May 2022

this capital support, 3ME has commenced design of BladeHAUL, a battery-powered transport trailer designed to provide clean emissions logistics transport solutions for mining. With up to 1MWh of battery capacity, this fast-charging powered trailer will be remote controlled and semi-autonomous ready and can also provide remote mining operations with additional battery-electric power, e.g. for use in electric drill rig operations.

BluVein

In August 2025, ARENA supported the first-of-its-kind dynamic charging technology with a $9m grant to BlueVein to trial its 'hammer and rail' dynamic charger for heavy haulage battery-electric mining vehicles, facilitating electric powering and charging in motion.[98]

BluVein will develop and trial a 40-60 tonne prototype truck integrating BlueVein's 1MW charger (BluVein1) for underground mining use, before expanding the development of its technology to use for ultra-class heavy surface haulage trucking, with the BlueVeinXL 8MW hammer and rail. BluVeinXL is technology-agnostic and location-agnostic, deployed as a side-mounted dynamic charging system that eliminates the need for overhead wires in traditional trolley-assist applications.

There is increasing interest from industry to integrate BluVein's technology into Australian operations. In March 2024, BluVein signed an MoU with Hitachi Energy to accelerate the electrification of heavy haul mining fleets, combining Hitachi Energy's advanced power electronics and digital charging technologies with BluVein's e-rail charging technology to deliver direct electric power to haul trucks of up to 400 tonnes while transporting materials.[99]

In April 2022, BluVein entered into an MoU with Epiroc on BluVein's underground solutions (BluVein1) to test the viability of the rail system.[100] This followed a similar BHP Ventures announcement months prior in October 2021, adding to the list of mine operators including Northern Star Resources, Newcrest Mining, Vale, Glencore, Agnico Eagle, AngloGold Ashanti and OZ Minerals (now acquired by BHP).[101]

[98] ARENA, First of its Kind Charging Solution for Heavy Mining Vehicles, 14 August 2025
[99] Hitachi Energy, Hitachi Energy and BluVein Accelerate the Electrification of Heavy Haul Mining Fleets, 05 March 2024
[100] Epiroc, Epiroc and BluVein enter into MoU to Speed up the Mining Industry's Shift to the Mine of the Future, 22 April 2022
[101] BluVein, BHP Ventures Backs BluVein's Next-Gen Trolley-Charging Project, 12 October 2021

Supporting Material. Global Momentum in Mobile Mine Equipment Electrification

Autonomous Battery Electrification at Huaneng Yimin Coal Mine, China

May 2025 saw XCMG deliver 100 battery-electric autonomous mining trucks at Huaneng Timin open-pit coal mine in Inner Mongolia, China. This marks the world's first mine site to operate a fleet of 100 zero-emission autonomous haul trucks. The trucks will displace over 15,000 tonnes of diesel consumption and eliminate 48,000 tpa CO_2-e from the mine's operational emissions.[102]

The 'Huaneng Ruichi' trucks have a payload of 90 tonnes. A key milestone of this development is the integration of battery-electric solutions in the harsh weather conditions of the Inner Mongolia autonomous region, with temperatures dropping to -40ºC. The transition to battery-electric trucks deliver a 120% improvement of the operational energy efficiency compared to their diesel counterparts.[103]

Trolley Assist Electrification at Collahuasi, Chile

June 2025 saw Chile's Collahuasi copper mine, the third largest copper mine in the world, install overhead trolley-assist electrification across its operations. Collahuasi is owned by Anglo American (44%), Glencore (44%) and Mitsui subsidiary Japan Collahuasi Resources B.V. (12%).

The installation marks the first-of-a-kind deployment of this technology in South America, designed and supplied entirely by Liebherr Mining, with civil works and installation provided by the Collahuasi joint venture partners.[104] The pilot consists of a 1km trolley line, powering four Liebherr T 284 haul trucks. The pilot would reduce GHG emissions by 4-5 ktCO_2-e per annum, a fraction of the mine's annual 560-570 ktCO_2-e emissions. However, the deployment of such technology at an altitude of 4,700m in extreme climatic conditions demonstrates a major advancement into the future viability of trolley-assist electrification in broader mining applications and jurisdictions.[105]

Vale HME Battery Electrification Partnership with Caterpillar, Brazil

In April 2024, Vale and Caterpillar signed an agreement to test battery-electric haul trucks, as well as conduct studies on ethanol-powered trucks across Vale's Brazilian iron ore operations. The partnership aims to realise Vale's goal to reduce Scope 1 and 2 emissions by 33% by 2030. Across Vale's operations, diesel emissions account for 15% of its direct CO2-e emissions, with haul trucks the largest consumer of diesel.[106] Testing will commence with the deployment of a 240 tonne Caterpillar battery-electric truck at its Minas Gerais operations.

Vale's director of Engineering for Mine and Plant Operations highlighted "there have been significant advances in the development of battery-electric truck technology in recent years and these innovations will play an important role in bringing our net emissions to zero by 2050."

Vale HME Low-emission Fuel Blending with Cummins, Brazil

June 2025 saw Vale announced a partnership with diesel engine OEM Cummins had successfully commissioned a new ethanol fuel test cell, in partnership with Japanese leading truck OEM

[102] XCMG, 100 Autonomous, All-Electric Mining Trucks Officially Begin Operations at Huaneng Yimin Mine, 30 May 2025
[103] International Mining, Fleet of 100 Autonomous Electric Mining Trucks Deployed at Yimin Mine, 15 May 2025
[104] International Mining, Liebherr Trucks Make Historic Trolley Connection at Collahuasi, 26 June 2025
[105] Liebherr via LinkedIn, Gonzalo Garcia Perez, Managing Director Mining Chile & Peru, July 2025
[106] Vale, Vale and Caterpillar Sign Agreement to Test Battery Electric Trucks and Conduct Ethanol Studies, 30 April 2024

Komatsu.[107] The fuel cell will integrate into the diesel-electric drivetrain system, retrofitting the existing diesel fleet of Komatsu haul trucks to a dual-fuel program. The retrofit will be able to use up to 70% ethanol, potentially lowering the CO2 emissions footprint by up to 70%.

Testing is expected to run until 2026 before field tests begin at Komatsu facilities. Ethanol as an alternative to fossil diesel is widely adopted across Brazil, with an established supply network.

BHP Trolley Assist Electrification in Copper, Chile

In June 2024, BHP reiterated its focus on the prioritisation of diesel decarbonisation at its Chilean copper assists. Across its Escondida and Spence operations, BHP has deployed ~ 200 haul trucks, consuming ~ 350 million litres of diesel annually, accounting for ~ 80% of its Scope 1 emissions profile.

BHP has continued its study into the deployment of trolley-assisted haul trucks across its copper operations, to reduce diesel intensity in the interim but also as a key enabler for future rollout of battery-electric haul trucks. BHP's VP of Operational Decarbonisation Daniel Heal highlighted the approach to trolley-assist will be in three stages.

- From FY24 to FY30, BHP will progressively replace its current mechanical drive haul trucks with electric haul trucks.
- Trolley-assist infrastructure will then be able to power the electric drivetrain, reducing diesel consumption in the diesel powertrain haul trucks.
- From FY30-FY40, BHP will expand the trolley infrastructure to assist a transition from diesel-electric to battery-electric haul trucks. This will allow the energy to go straight to charging the truck's batteries while operating, reducing the time that the truck would need to stop to be charged. Once trolley and battery electric trucks are proven, it is planning a widespread adoption across its operated assets in Chile.

In July 2024, BHP requested a permit to build a US$250m electric trolley system at its Escondida copper operations to Chile's environmental regulator.[108] The project included the construction of a new electrical substation and transmission lines both inside and around the Escondida Norte pit.

BHP Electricity Decarbonisation Across Copper Operations, Chile

BHP's Chilean copper operations produce 27% of the nation's copper, and 7% of global copper. In FY20, BHP's Escondida and Spence operations produced 4.1 and 0.9 Mtpa CO2-e, with Scope 2 purchased electricity accounting for 79% and 61% respectively. BHP's mammoth electricity consumption translates to ~ 9% of Chile's total power demand.

In FY22, BHP's two major 3 TWh pa renewable PPAs with Enel and Colbun commenced, signing long-term contracts for 15 and 10 years respectively.[109] In FY24, BHP triggered expansion options with the PPAs, expanding annual supply to 3.3 TWh each, with the Colbun PPA expansion applied from February 2025. The PPAs also include an additional 10% intra-annual flexible power supply, each supplying up to an additional 300 GWh pa. Combined, the +7 TWh PPAs have resulted in a 100% decarbonised electricity demand at BHP's Chilean operations, lowering operational emissions intensity by 75% and setting up the mines for an accelerated transition to diesel electrification.

In April 2025, BHP announced the intention to move forward its investment plan to deploy US$13bn in growth capex across its Chilean operations over the next decade.[110]

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[107] Vale, Vale, Cummins and Komatsu Advance Joint Dual-Fuel Program to Develop Large Truck Engine Powered by Both Ethanol and Diesel, 05 June 2025

[108] BHP, Escondida Starts Environmental Processing to Have Transportation System Based on an Electric Trolley, 04 July 2024

[109] BHP, BHP ESG and Sustainability Databook 2024, 27 August 2024

[110] BHP, Alejandro Tapia, President Escondida, Address the Challenges and Opportunities Chile Face, 14 April 2025

BHP Energy Transfer Technology with Caterpillar, Global

In September 2024, BHP announced plans to trial Caterpillar's Dynamic Energy Transfer (DET) system on battery-electric and diesel-electric mining trucks across BHP's global operations. The DET system can transfer energy to electric drivetrains in mining machinery while they are operating around a mine site, as well as charge an electric haul truck's batteries while moving.[111]

The planned trials are the result of two years of developmental collaboration between BHP and Caterpillar, with studies on BHP's Cat 793 fleet at Jimblebar iron ore operations in the Pilbara and Cat 798 fleet at Escondida Chilean copper operations.

[111] BHP, BHP First Customer to Announce Plans to Trial Innovative Energy Transfer Technology from Caterpillar, 26 September 2024