CLIMATE ENERGY FINANCE

Fuel Tax Credit Scheme and Heavy Haulage Electric Vehicle Manufacturing in Australia

Australia's mining sector should become a global leader in electrification of mine equipment, developing onshore battery, recycling and EV manufacturing supply chains and embodying decarbonisation in our commodity exports as a key competitive advantage

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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, and is philanthropically funded.

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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 founding 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.

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Contents

Contents 3
Key Findings 4
Executive Summary 4
Section 1. Australian Subsidisation of Petroleum Imports 6
Section 1.1. Australian Diesel Taxation 9
Section 1.2. Fuel Taxation and Fuel Tax Credit Reforms 10
Section 2. The Fuel Tax Credit Scheme 12
Section 2.1 A Massive Headwind to Australia's Climate Goals 15
Section 2.1.1. Failure to Acknowledge Fuel Tax Credits as Industry Assistance 17
Section 2.1.2. Bodies that Classify Fuel Tax Credits as Budgetary Assistance 19
Section 2.1.3. Australia's Failure to Phase Down Fossil Fuel Subsidies 20
Section 3. Proposal to Cap the Fuel Tax Credit Scheme 22
Section 3.1. The Inflation Reduction Act 26
Section 3.2. The Manufacturing Opportunity from Electrification 28
Liebherr 30
Komatsu 32
Caterpillar 32
Section 3.3. Electrifying Australian Mining is a Massive Investment Opportunity 33
Fortescue Metals Group 37
BHP 41
Rio Tinto 46
Appendix 48

Key Findings

1. Beyond unpriced CO_2 emissions, the Fuel Tax Credit Scheme (FTCS) is by far the largest fossil fuel subsidy in Australia. Petroleum – of which diesel is the main component – accounted for 88% of the $12.4bn of Federal budgetary assistance to the fossil fuel industry in 2021, making Australia one of the G20's largest providers of subsidies for fossil fuels. The May 2023 budget forecasts the Scheme to continue growing from >$9.5bn in 2023-24 to >$11.2bn in 2026-27 as diesel imports rise.
2. Over FY24-FY30, mining sector FTCS subsidies will total a staggering $37bn. This cost to the Australian taxpayer is unconscionable, and the continuation of the rebate in its current form is both inconsistent with Australia's emissions reduction commitments, and a major headwind to electrification of the mining sector's heavy haulage fleet.
3. Australia should cap the Federal diesel FTCS subsidy for the mining sector at $50m annually per consolidated group, meaning only 8 mining firms would be impacted in FY23: Fortescue Metals Group, Rio Tinto, Hancock Prospecting, BHP, Glencore, Peabody, Yancoal and Anglo American. As fuel taxation is indexed over time, it is likely more mining firms will meet the threshold in the future. There would be zero impact on the agricultural sector, nor any inflationary impact on freight.
4. CEF's new modelling detailed in this report demonstrates that an FTCS cap of $50m annually per consolidated group **would raise >$14bn in revenue over FY24-FY30**.
5. Climate Energy Finance proposes that 100% of the tax revenue gained from the FTCS cap be directed into a special purpose fund within the National Reconstruction Fund. Revenues in the special purpose fund should be invested to scale domestic manufacturing and adoption of battery and electric vehicle (EV) zero-emission technology across Australia's mining sector, electrifying Australian mining industry transport and driving embodied decarbonisation into our bulk commodity exports. Support could take the form of subsidy programs and production-based tax credits.

Executive Summary

Australia imported 29bn litres of diesel in FY2023 at a cost to our economy of A$33bn, a rise of 197% in just two years despite volumes growing just 32%.

The Fuel Tax Credit Scheme accounted for over 88% of the $12.4bn in Australian government fossil fuel industry budgetary assistance and tax rebates in 2021, making Australia one of the largest providers of subsidies of fossil fuels in the G20. In FY21 45% of the FTCS went to the mining sector, four times as much as went to our agricultural sector.

The FTCS is the 18th largest Government expense program in 2023-24.

The May 2023 budget forecasts the FTCS to continue growing through the 4 year budget period, rising from over $9.5bn in 2023-24 to exceed $11.2bn in 2026-27 as diesel imports rise, a compound annual growth rate (CAGR) of 9.7%.

Over FY24-FY30, the mining sector will get FTCS subsidies totaling a staggering $37bn. Since implementation of the Fuel Tax Act in 2006, Australia has generated over $147bn in cumulative fuel taxation to FY22. However, over the same period, the Federal Government has provided over $95bn in fuel tax credits, i.e., foregone revenues.

Australia is essentially subsidising high emissions, expensive imported diesel fuels as a $9.5-11.2bn annual headwind against electrification and decarbonisation of transport.

Heavy off-road vehicles used in mining receive a rebate on customs duties of 48.8 cents per litre. Fuel excise in Australia goes into general treasury receipts, and is not in any way linked to road funding, contrary to fossil fuel industry misinformation, with the formal link between fuel excise and road funding ending in 1992.

Emissions implications

Australia has committed to a 43% reduction in carbon emissions by 2030, and we need to target >75% emissions reduction by 2035 to start to align with the science. Mining accounts for 21% of Australia's total emissions in 2021, and has played a central role in undermining our progressive emissions reduction goals, rising by 65% since 2005. The growth in emissions is a result of steadily increasing use of imported diesel in mining equipment.

Non-road diesel engines are now the largest unregulated source of air pollution, meaning Australia's negligence on decarbonisation of the sector puts our climate goals at risk and places us many decades behind our US and EU peers.

Despite the political rhetoric, Australia continues to abrogate its Paris Agreement obligations by massively subsidising expensive imported high emissions fossil fuels.

The opportunity

At >US$800bn, the US Inflation Reduction Act (IRA) is the largest subsidy program in world history and has catapulted the US into the global energy transition race, pulling onshore an unprecedented boom in public and private investment into mining, refining, manufacturing and deployments of zero-emissions technologies of the future. Australia needs an IRA response commensurate with the massive scale of its export opportunities.

Many commentators have suggested Australia has no opportunity to build a world-class onshore battery and EV manufacturing industry. CEF completely disagrees. Electrifying Australia's mining large-scale haul fleet would require the manufacturing of a conservative **estimate of ~5.4-6.9 GWh pa of new battery capacity**. The Future Batteries Industries CRC forecast $16.9bn in gross value added by 2030 from Australia developing diversified battery industries. This would generate a further $55bn in GDP and create 61,400 direct new jobs.

Australia could exit 2030 with the world's first EV mine haulage industry, turbocharged with $14bn of tax funding recouped via our proposed cap on the FTC Scheme to incentivise the world's most advanced battery and haulage vehicle manufacturers – **Liebherr**, **Komatsu** and **Caterpillar** – to leverage Australia's world leading mining sector. This would drive "embodied decarbonisation" into our bulk commodity exports, a first, tangible step before the even bigger gains to be had from our potential in the production of green iron.

Electrifying the Australian mining industry is a massive opportunity for Australia to move toward global leadership in the energy transition, incentivising our world leading mining corporates to work credibly and collaboratively at scale to deliver on the Paris Agreement.

By embodying decarbonisation on our world-leading mining exports – we are #1 globally in iron ore, coking coal and lithium, and #2 in thermal coal – Australia can assist our key trade partners to deliver on their decarbonisation objectives, even as we improve our energy security, reduce our fossil fuel import reliance and dilute our exposure to the hyperinflation of fossil fuel commodities.

Section 1. Australian Subsidisation of Petroleum Imports

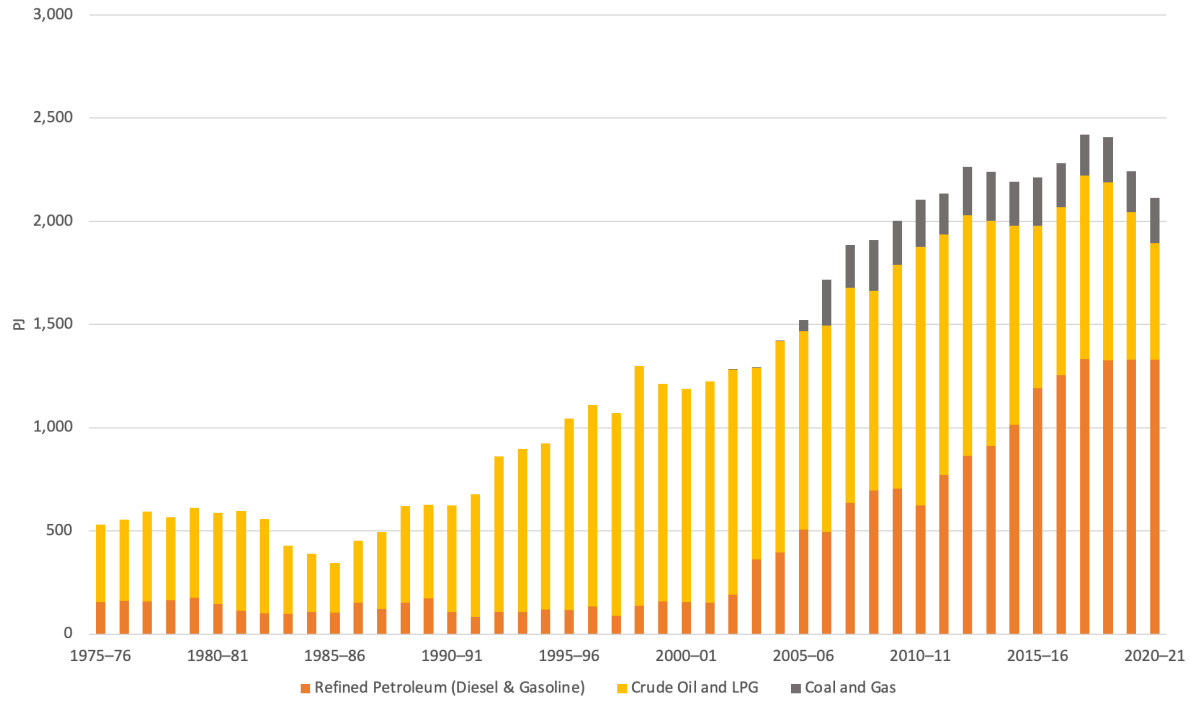
Australia imported 29bn litres of diesel in FY2023 at a cost to our economy of A$33bn, a rise of 197% in just two years despite volumes growing just 32%. With the Fuel Tax Credit Scheme, refined petroleum accounted for over 88% of the $12.4bn Australian government fossil fuel industry budgetary assistance and tax rebates in 2021, placing Australia as one of the largest providers of subsidiaries of fossil fuels in G20.

World oil demand reached record highs in June, exceeding 103 mb/d (million barrels per day), with August on track to set another peak in 2023.[1] Over the same period, oil supply from the OPEC+ alliance fell by 1.2 mb/d to a near 2-year low in July as Saudi Arabia deliberately cut production. Ongoing supplier cartel collusion has resulted in continued fossil fuel hyperinflation globally, the core driver of Australia's cost of living crisis of 2023.

Record demand and continued market tightening led to fossil fuel consumption subsidies skyrocketing globally in 2022, with the IEA estimating they exceeded US$1 trillion for the first time in history.[2] Oil consumption subsidies increased by over 85% in 2022.

Despite the accelerated adoption of electrified transport, the IEA estimates diesel used in transport will continue to grow at a CAGR of 0.4% globally, increasing daily demand by 620,000 barrels in 2028 relative to 2022.[3] Asia Pacific will represent 90% of the world's total growth in oil demand, with diesel growing at 2% per annum.

Figure: Australian Annual Energy Imports by Fuel Type (PJ)



Source: Australian Energy Statistics, CEF Calculations

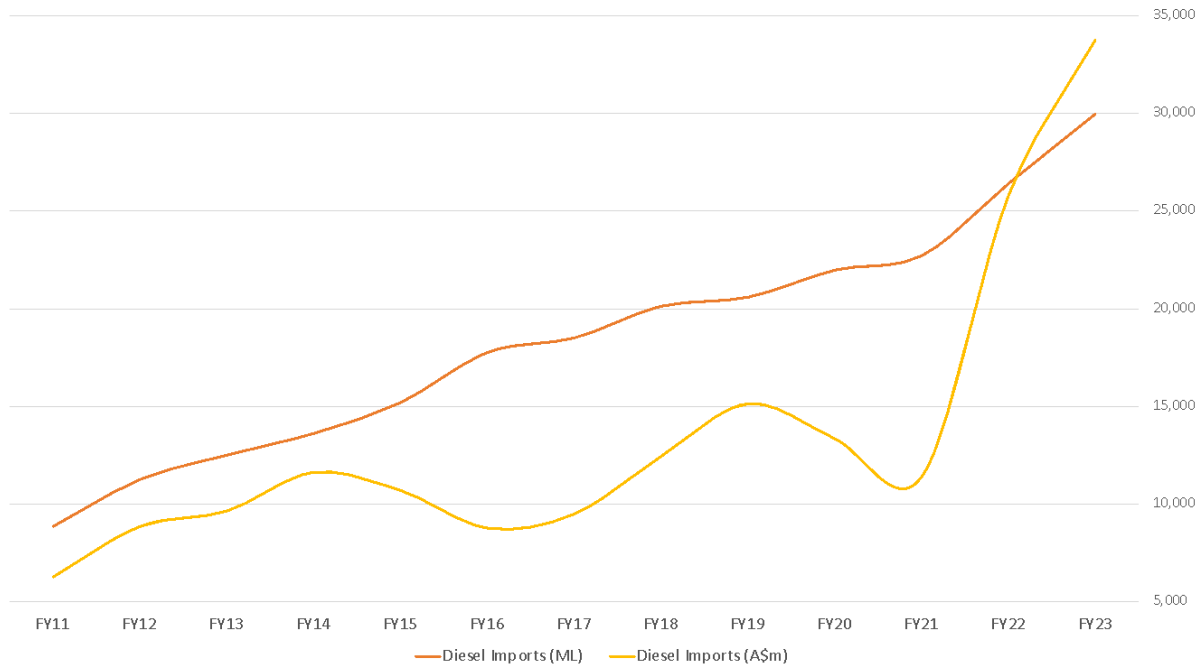
Crude oil and refined petroleum products account for the majority of energy imports in Australia, with refined petroleum rapidly outpacing the growth of coal, gas and crude oil

[1] IEA, Oil Market Report, August 2023
[2] IEA, The Global Energy Crises Pushed Fossil Fuel Subsidies to an All-time High, 16 February 2023
[3] IEA, Oil 2023, 14 June 2023

imports over the last two decades.[4] In FY21, refined petroleum products accounted for 63% of energy imports, followed by crude oil and LPG (27%), methane gas (10%) and coal (1%) on a petajoule basis.[5]

In Australia, diesel is the largest component of refined petroleum imports, accounting for over 60% in FY23.[6] In FY23, Australia imported over 29 billion litres of diesel. Tightening supply-demand dynamics within the global refined petroleum market has resulted in Australian diesel imports exceeding $33bn in FY23, rising 197% from FY21, despite import volumes increasing by only 32% over the same period.

Figure: Australian Diesel Imports by Value and Volume



Source: Australian Petroleum Statistics, CEF Calculations

To minimise the negative impact of volatile and inflationary fossil fuel use in Australian manufacturing, transportation, agriculture and resources sectors, the Federal Government has subsidised Australia's fossil fuel consumption industry for decades, shielding firms from the burden placed upon Australian individual taxpayers.

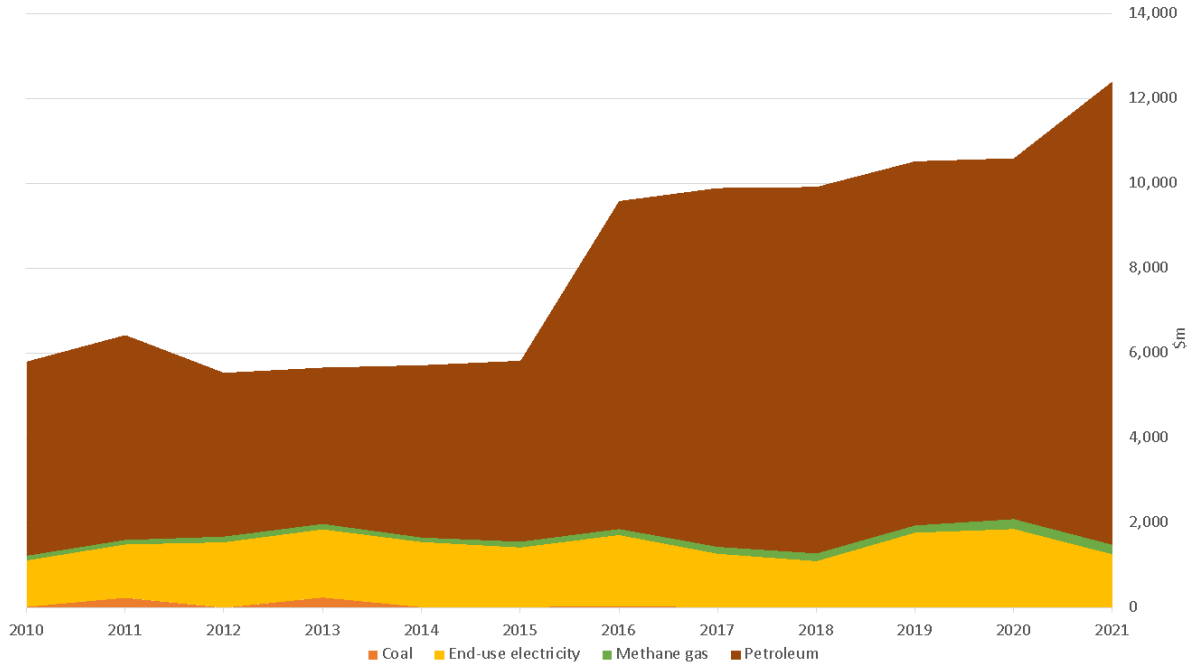
The OECD estimated Australian Government support to fossil fuels exceeded $12.4bn in 2021, growing 17% from 2020. The OECD estimates $1.68bn (13.5%) was provided to the fossil fuel industry via direct government transfers, declining by 23% in 2021.

Tax concessions via rebates are the largest component of public support of fossil fuels in Australia, primarily for the consumption of diesel. Over 86% of support was given in the form of Federal tax expenditures. Total tax expenditure support to fossil fuels rose 26% in 2021 to over $10.7bn. The largest fossil fuel support mechanism in Australia is the **Fuel Tax Credit Scheme**, subsidising the use of primarily imported high emissions petroleum products in Australian industry.

[4] DCCEEW, Australian Energy Update 2022, 2 September 2022
[5] DCCEEW, Australia Energy Update 2022 Report, 2 September 2022
[6] DCCEEW, Australian Petroleum Statistics 2023, May 2023

With the Fuel Tax Credit Scheme, refined petroleum accounted for over 88% of fossil fuel industry budgetary assistance and tax rebates in 2021.[7] Public subsidisation of refined petroleum (diesel and gasoline) consumption grew 28% in 2021.

Figure: Australian Government Total Fossil Fuel Support



Source: OECD Inventory of Fossil Fuel Support Measures, CEF Calculations

The Australia Institute's annual fossil fuel subsidies report highlighted a total of $11bn of budgetary outlays were provided to the fossil fuel industry, through direct transfers and tax concessions in 2022-23.[8] Tax concessions accounted for 84% of total government support, facilitated largely by the Fuel Tax Credit Scheme.

Of the G20 member nations, Australia is one of the largest contributors of budgetary support via tax expenditures to the fossil fuel industry. 84% of Australia's total support across 2017-19 to fossil fuels were via foregone taxation, with the federal government supplying an array of measures including capex deductions for mining and petroleum, reduced fuel excise rates, fuel tax credits and tax offset schemes.[9]

[7] OECD, Inventory of Support Measures for Fossil Fuels, 10 March 2023
[8] Australia Institute, Fossil Fuel Subsidies in Australia 2023, 4 May 2023
[9] IISD, Doubling Back and Doubling Down: G20 Scorecard on Fossil Fuel Funding, 9 November 2020

Section 1.1. Australian Diesel Taxation

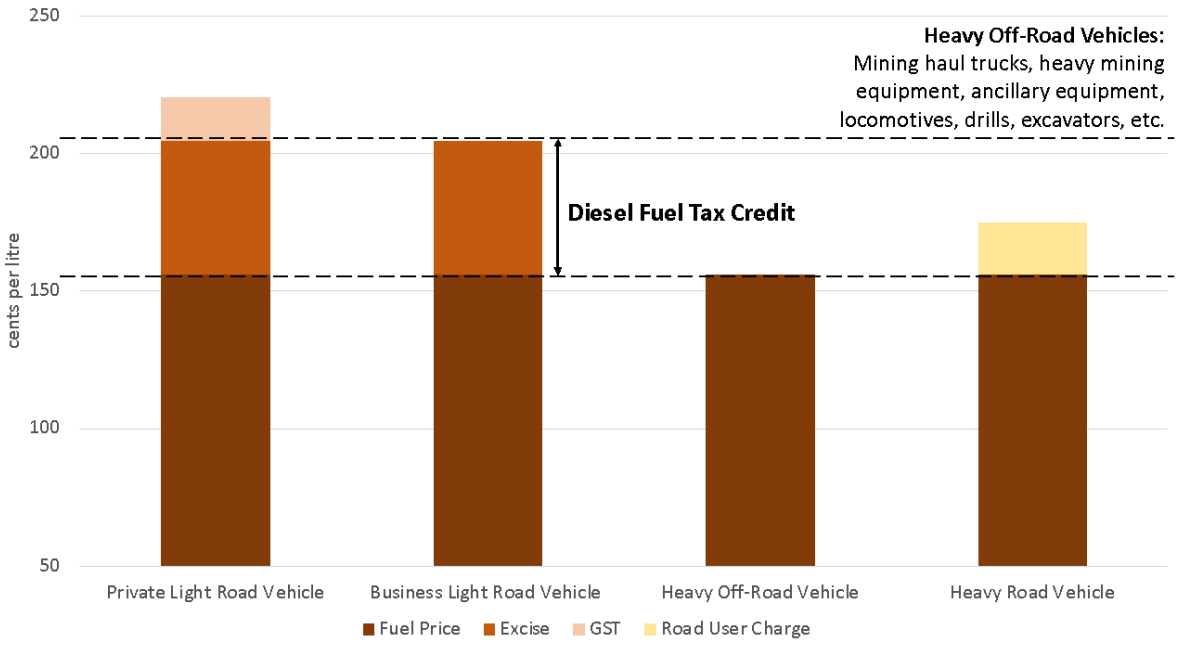
Heavy off-road vehicles receive a rebate of customs duties of 48.8 cents per litre. Fuel excise and customs duty in Australia goes into general treasury receipts, and is not in any way linked to road funding, contrary to fossil fuel lobbyist spin.

In Australia, liquid fuels (i.e. 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). From August 2023, diesel and petrol excise and customs duties are at 48.8 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 28.8 cpl, creating an effective tax break of 20 cpl as of August 2023.

Figure: Cost Breakdown of Imported Diesel by Vehicle Use



Source: Australian Petroleum Statistics, CEF Calculations

Section 1.2. Fuel Taxation and Fuel Tax Credit Reforms

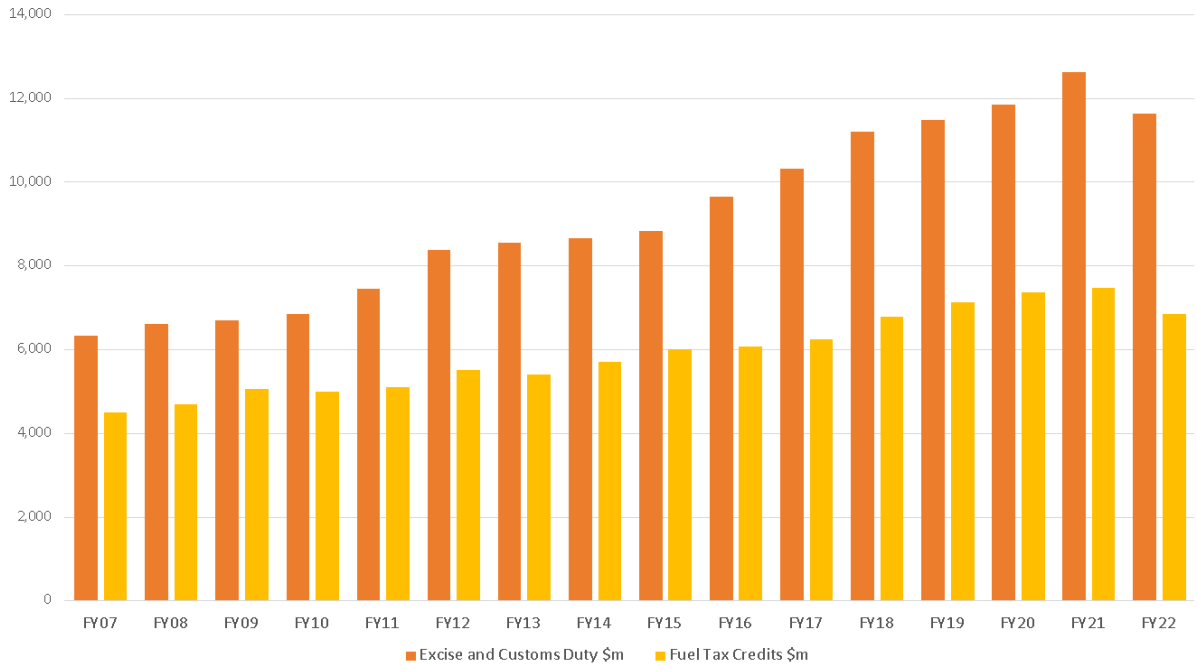
The formal link between fuel taxation and road funding ended in 1992. In 2006, the Australian Government established the Fuel Tax Act 2006. Since implementation, Australia has generated over $147bn in cumulative fuel taxation to FY22. Over the same period, the Federal Government has provided over $95bn in fuel tax credits.

In Australia, fuel tax has applied to diesel since 1957, extending the original tax system beyond petrol for on-road use only. The original purpose of the excise and customs duty regimes was to fund road development and infrastructure. The system was extended as diesel vehicles reached equivalency with petrol vehicles on Australian roads.

In 1982, the Australian Government reformed fuel taxation with the Australian Bicentennial Road Development Trust Fund Act, a program to provide funds for the construction of roads. As such, all refined petroleum products were taxed via excise and customs duty on imports.[10]

As part of the 1982 reform, the Federal Government established the **Diesel Fuel Rebate Scheme** (Diesel Fuel Tax Amendment Bill No.1 1982), a tax credit system for agriculture, mining, forestry and fishing industries.[11] The purpose of the Scheme was to provide tax credits for consumers of diesel used in off-road activity, eliminating the on-road fuel taxation of diesel and petrol. This established a formal link between fuel taxation and road infrastructure funding.

Figure: Total Diesel Excise and Duty Revenue and Fuel Tax Credit Expenditure



Source: ATO Australian Taxation Statistics Excise – Table 4, CEF Calculations

[10] AustLII, Australian Bicentennial Road Development Trust Fund Act 1982, 20 December 1982

[11] Australia Parliament House, Diesel Fuel Tax Amendment Bill 1982 Explanatory Memorandum, 1982

However, the formal link between fuel excise and road funding ended in 1992.[12] 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. Australian Government road spending has **not followed movements** in fuel taxation for the past 15-years.

In 2006, the Australian Government established the Fuel Tax Act 2006, a single fuel tax credit system.[13] The Fuel Tax Act and Fuel Tax Credit Scheme are the current form of fuel excise and tax credits. Since their implementation from 1 July 2006, Australia has generated over $147bn in cumulative fuel taxation to FY22. Over the same period, the Federal Government has provided over $95bn in fuel tax credits.[14]

[12] Parliamentary Budget Office, Fuel Taxation in Australia, 21 September 2022
[13] Australia Parliament House, Fuel Tax Bill 2006, 26 June 2006
[14] ATO, Taxation Statistics Excise – Table 4, 7 August 2022

Section 2. The Fuel Tax Credit Scheme

The Fuel Tax Credit Scheme (FTC) is now the 18th largest expense program for the Federal Government in 2023-24. The May 2023 budget forecasts the FTC Scheme to continue growing through the budget period, rising from over $9.5bn in 2023-24 to exceed $11.2bn in 2026-27 as diesel imports rise (a CAGR of 9.7%). In FY21 45% of the FTCS went to the mining sector, four times as much as went to our agricultural sector. The mining sector will get FTCS subsidies totaling $37bn over FY24-FY30, making it the largest fossil fuel subsidy in Australia.

Figure: Excerpt of Federal Budget 2023-24 – Table 6.3.1. Fuel Tax Credits Scheme Expense

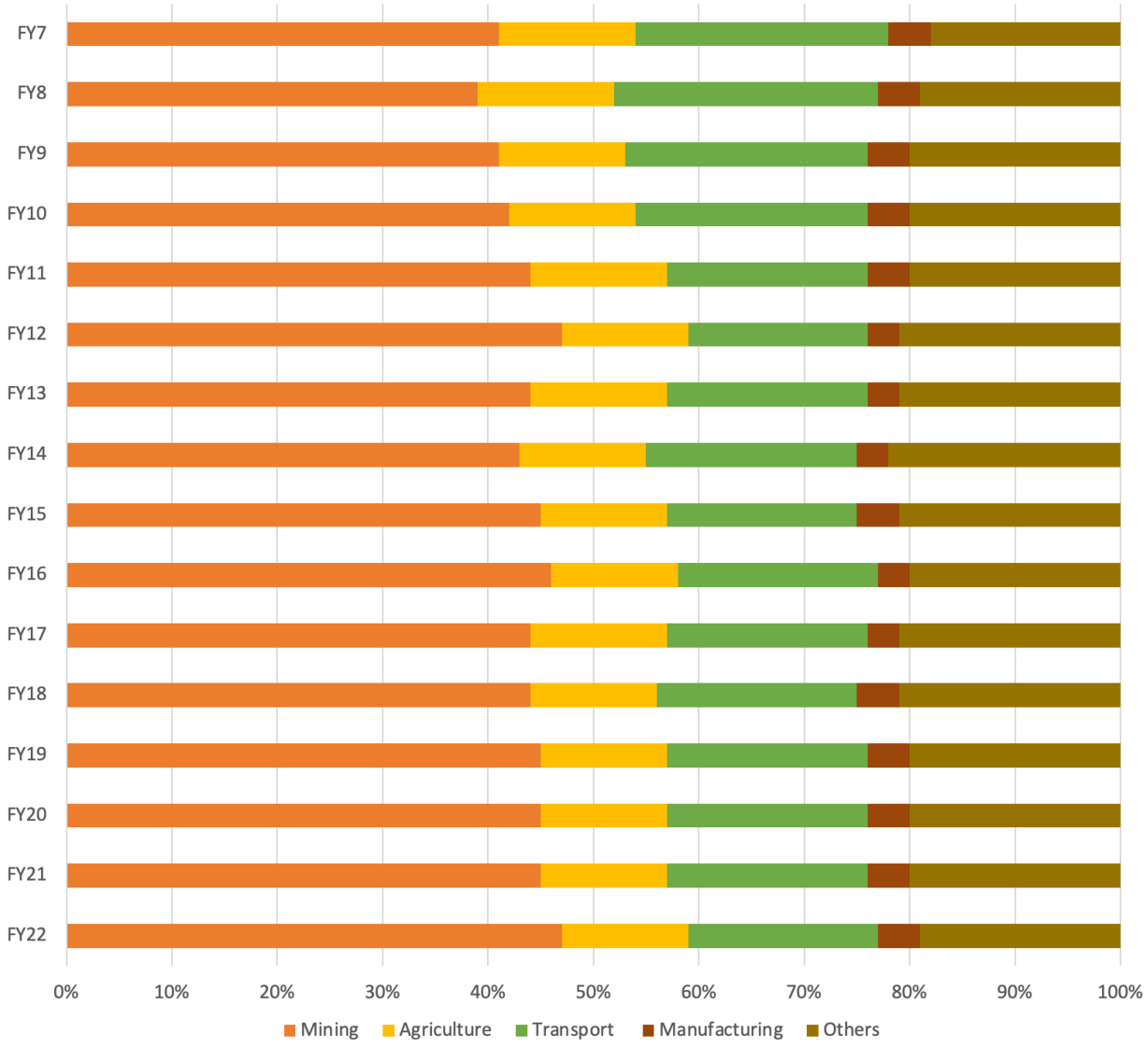
		Estimates				
		2022-23	2023-24	2024-25	2025-26	2026-27
Program(a)	**Function**	$m	$m	$m	$m	$m
Revenue assistance to the States and Territories	Other purposes	88,021	92,470	96,345	101,782	105,261
Support for Seniors	SSW	54,873	59,192	61,684	64,590	67,322
National Disability Insurance Scheme(b)	SSW	36,654	41,922	46,765	51,852	55,936
Aged Care Services	SSW	26,900	32,668	35,894	37,988	39,854
Medical Benefits	Health	28,245	30,413	32,242	34,114	35,975
Assistance to the States for Healthcare Services	Health	25,658	28,392	30,456	32,215	34,296
Commonwealth Debt Management	Other purposes	22,152	22,611	23,890	26,224	29,077
Financial Support for People with Disability	SSW	19,392	21,043	21,800	22,608	23,046
Support for Families (c)	SSW	-	18,323	19,276	19,955	20,355
Pharmaceutical Benefits	Health	18,733	18,218	18,121	18,300	18,319
Non-Government Schools National Support	Education	16,646	17,441	18,131	18,681	19,260
Job Seeker Income Support	SSW	13,867	13,830	15,483	15,999	15,915
Child Care Subsidy	SSW	10,626	12,716	13,474	14,160	14,958
Financial Support for Carers	SSW	10,570	11,539	12,238	12,923	13,369
Government Schools National Support	Education	10,264	10,845	11,266	11,676	12,108
National Partnership Payments - Road Transport	Transport and communication	7,109	9,801	10,065	9,542	8,778
Public Sector Superannuation - Benefits(d)	Other purposes; General public services	9,392	9,668	9,691	10,061	10,179
Fuel Tax Credits Scheme	Fuel and energy	7,466	9,583	9,874	10,473	11,218
Defence Force Superannuation - Benefits(d)	Other purposes; General public services	9,730	9,482	9,920	10,416	10,950
Air Force Capabilities	Defence	8,430	8,846	9,399	9,520	10,164
Sub-total		**424,727**	**479,006**	**506,016**	**533,080**	**556,342**
Other programs		220,061	205,079	209,366	210,244	215,437
Total expenses		**644,788**	**684,085**	**715,382**	**743,324**	**771,779**

Source: Australia Budget 2023-24 – Budget Paper No.1

The Fuel Tax Credit Scheme (FTC) is now the 18th largest expense program for the Federal Government in 2023-24, and the largest expenditure under its Fuel and Energy sub-function.[15] Administered through the Australian Taxation Office (ATO), the FTCS is expected to cost over $9.5bn in 2023-24 in foregone taxation. The May budget forecasts the FTCS to continue growing through the budget period, exceeding $11.2bn in 2026-27 as diesel imports rise.

In FY21, a total of $7.5bn was paid under the FTCS. According to annual statistical data by the ATO, the mining industry represented over 45% of all receipts, totalling $3.4bn.[16] Of that, ~$1bn (14% of all credits) was paid to coal mining firms and ~ $1.3bn (17% of all credits) to metal ore mining firms.

Figure: Historical Distribution of Fuel Tax Credits Since 2006 Act



Source: ATO Australian Taxation Statistics Excise – Table 4, CEF Calculations

[15] Aus Gov, Budget 2023-24 Budget Paper No.1, 9 May 2023
[16] ATO, Taxation Statistics Excise – Table 4, 7 August 2022

More budgetary assistance via diesel consumption tax exemption was provided to coal mining in FY21 than the entire agriculture, forestry and fishing industries combined. Metal ore miners, dominated by iron ore, alongside coal miners, received greater fuel tax breaks than agriculture, forestry, fishing, road transport, post and warehousing combined in FY21.

The mining industry is by far the largest beneficiary of the FTC Scheme, and has maintained its top position since the inception of the 2006 Fuel Tax Act. In FY22, mining accounted for over 47% of all receipts from the FTC Scheme.

Applying historical distributions of the FTC Scheme across industry, sub-industries and Federal Budget forecasts, CEF estimates in FY24, over $4.3bn in foregone taxation will be provided to the mining industry, with over $1.7bn to Australia's coal industry. Across the forecast period, over $18.5bn in budgetary assistance via foregone taxation will be provided to Australia's mining industry, in large to bulk commodity miners across coal and iron ore.

Figure: Estimated Fuel Tax Credit Expense to Mining 2023-2027

	Actual	Estimates					
	FY22	FY23	FY24	FY25	FY26	FY27	FY24-FY27
	$m	$m	$m	$m	$m	$m	$m
Fuel Tax Credits Scheme	7,058	7,466	9,583	9,874	10,473	11,218	**41,148**
to Mining	3,176	3,360	4,312	4,443	4,713	5,048	**18,517**
to Coal Mining	988	1,045	1,342	1,382	1,466	1,571	**5,761**
to Metal Ore Mining	1,200	1,269	1,629	1,679	1,780	1,907	**6,995**

Source: CEF Calculations from ATO Historical Statistics and Budget Forecasts

Source: Australia Budget 2023-24, ATO Taxation Statistics

The Federal budget's forecasted FTC Scheme growth translates to a CAGR of 9.7% from FY22 to FY27. Applying this to the category breakdown provided by the ATO and assuming historical share of mining, coal mining and metal ore mining remains constant (given its stability since 2006), the FTC Scheme will cost over $14.8bn in foregone taxation by FY30. Of this, over $6.6bn will be to continue the subsidisation of diesel in mining. From the current budget period through to FY30, cumulative FTCS budget expense will reach over $81bn, with over $36bn to the mining industry, and a **cumulative $25bn** to Australia's coal and iron ore miners.

Figure: Cumulative Fuel Tax Credit Expense to Mining FY24-FY30

	Estimates					
	FY27	FY28	FY29	FY30	FY28-30	FY24-FY30
	$m	$m	$m	$m	$m	$m
Fuel Tax Credits Scheme	11,218	12,307	13,502	14,813	**40,623**	**81,771**
to Mining	5,048	5,538	6,076	6,666	**18,280**	**36,797**
to Coal Mining	1,571	1,723	1,890	2,074	**5,687**	**11,448**
to Metal Ore Mining	1,907	2,092	2,295	2,518	**6,906**	**13,901**

Source: CEF Calculations from ATO Historical Statistics and Budget Forecasts

Source: Australia Budget 2023-24, ATO Taxation Statistics

With nearly $37bn in cumulative foregone taxation for diesel consumption in the mining industry, it is the largest fossil fuel subsidy in Australia. While it is designed to improve export competitiveness of Australia's minerals and smelter firms from the inflationary and volatile nature of diesel imports, it is a massive impost on the budget, and a headwind to Australia's climate goals and the decarbonisation of the bulk commodities sector.

Section 2.1 A Massive Headwind to Australia's Climate Goals

Australia has committed to a 43% emissions reduction by 2030 target. Mining accounts for 21% of Australia's total emissions in 2021, and has played a central role in undermining our climate goals, with sector emissions rising by 65% since 2005. Non-road diesel engines are now the largest unregulated source of air pollution, meaning Australia's negligence puts us many decades behind our US and EU peers.

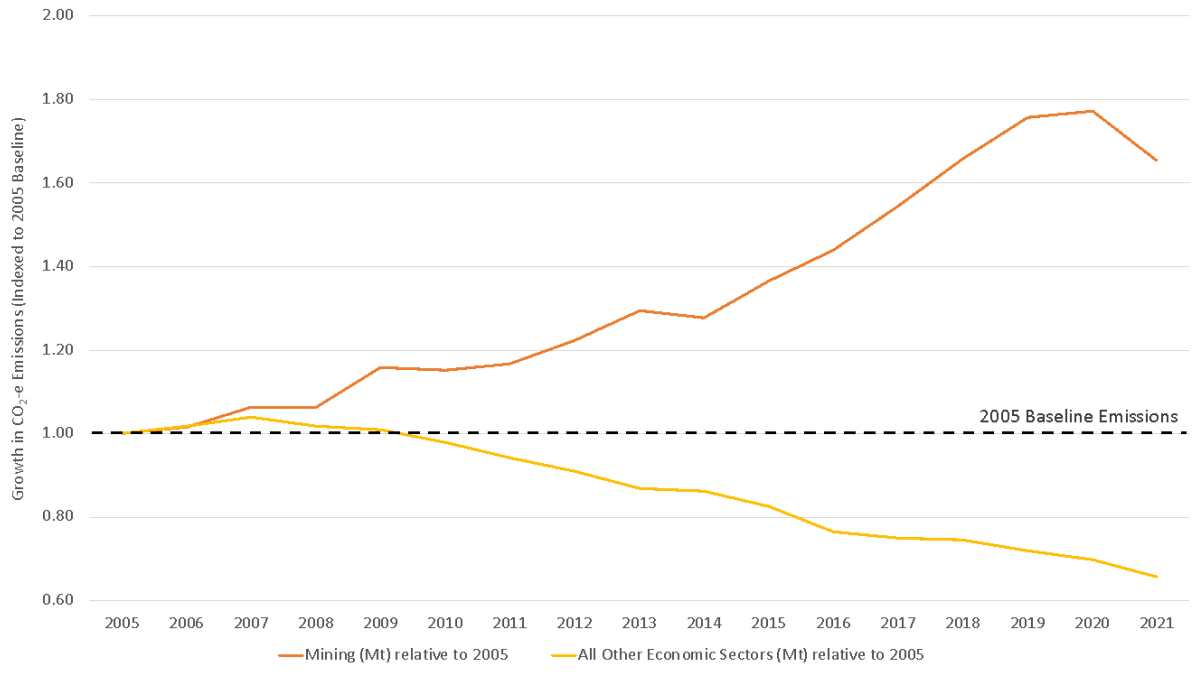
Australia has committed to achieving net zero emissions by 2050, and has established an interim target to reduce greenhouse emissions by 43% relative to 2005 by 2030.[17] This is a significant step-up in ambition from its previous target of 26-28% emissions reduction by 2030.

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.[18]

In 2021, Australia's total CO_2-e emissions from all economic sectors (ANZSIC) declined by 25% relative to 2005, with the largest abated sectors including agriculture, forestry and fishing (-64%), commercial services (-64%), and electricity and gas (-21%).[19]

In comparison, over the same period, CO_2-e emissions from Australian mining have increased by 65%. In 2021, mining is the second-largest economic sector contributing to Australia's emissions profile (behind electricity, gas and water), accounting for 21% of total emissions, up from 10% in 2005.

Figure: Growth in Mining Emissions compared to Rest of Economy since 2005



Source: DCCEEW National Inventory by Economic Sector, CEF Calculations

[17] AOFM, Australian Government Climate Change Commitments, Policies and Programs, November 2022
[18] UNFCCC, Australia's Nationally Determined Contribution, June 2022
[19] DCCEEW, National Inventory by Economic Sector, 2021

The mining industry's growth in absolute emissions and share of emissions represents a key obstacle in realising Australia's climate targets, and is is a result of steadily increasing use of imported diesel in haul trucks, heavy mining equipment (HME), locomotives, ancillary equipment and stationary power via diesel generators. Mining was responsible for the release of 100 Mt of CO_2-e emissions in 2021.[20]

Australia's Department of Climate Change, Energy, Environment and Water (DCCEEW) commissioned a market analysis and cost-benefit analysis on the introduction of noxious emissions standards for non-road diesel engines. The assessments were presented to the Minister for the Environment and Water, Tanya Plibersek, in mid-2022, providing an in-depth analysis from the culmination of 10-years of work.[21]

According to the impact assessment, non-road diesel engines are now the largest unregulated source of air pollution in Australia. 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.

As a consequence of the absence of emissions standards, the particulate matter pollution of the approximate 700,000 non-road diesel engines in Australia is almost double that of the 20.1 million registered on-road vehicles across all types in Australia.

There are currently ~77,000 non-road diesel engines operating in Australia's mining sector, of which ~ 8,700 are big engines (560kW and above). Despite mining accounting for only 12% of all non-road diesel engine stock, mining accounted for ~60% of total fuel use by non-road diesel engines in 2018.[22]

A core conclusion of the impact assessment was that non-road diesel engine emissions will continue to be a problem in the absence of government intervention. The analysis identified Australia's negligence in failing to take up emissions standards as a clear **market failure**.

The assessment recommended that government intervention was necessary given the failure of the market to progressively introduce higher emission standards and fuel-efficient engines. Government intervention is necessary to provide an impetus for industry to adopt horizon technology that will eliminate diesel emissions altogether.

[20] DCCEEW, National Inventory by Economic Sector, 2021
[21] DCCEEW, Non-Road Diesel Engines: Noxious Emissions Standards Impact Assessment, May 2023
[22] DCCEEW, Cost-Benefit Analysis of non-road Diesel Engine Emissions Standards, July 2022

Section 2.1.1. Failure to Acknowledge Fuel Tax Credits as Industry Assistance

Fossil fuel lobbyists have perpetuated a total market failure for decades, conniving with the Federal government's Productivity Commission and Treasury to ignore the IEA and OECD guidelines, with the direct ongoing outcome that Australia is subsidising heavy-emissions, expensive imported diesel fuels as a $9.5-11.2bn annual headwind against electrification and decarbonisation.

Australia's persistent subsidisation of fossil fuel consumption has been a major pricing support mechanism for the use of diesel in mining, primarily since the introduction of fuel tax credits. 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.

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.

The Productivity Commission 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 Commission's Annual Trade and Assistance Review (TAR) reviews of budgetary assistance across industry, measuring the budgetary outlays and tax concessions.

The Productivity Commission's TARs have made it clear both the Australian Treasury and the Commission do not consider the Fuel Tax Credit Scheme as industry assistance.[23] The argument is that Australia's Tax Baseline and Variation Statement does not classify FTCs as tax expenditure, but rather a general expense within the Commonwealth budget, thus taking its operation beyond the purview of the tax system.

The latest TAR 2021-22 did not include a single reference to the Fuel Tax Credit Scheme, diesel consumption tax credits or the word 'diesel'.[24] The Commission's estimates for budgetary assistance are categorised as:

> **Budgetary Outlays** – grants, subsidies, loans, guarantees or funding for organisations to perform commercially beneficial services through direct transfers and indirect assistance through organisations i.e. CSIRO.
>
> **Tax Concessions** – assistance by way of differential tax treatment that provides benefits to some businesses but not others. Differential treatment includes concessions based on company size, industry or sector specific concessions, or locations.

The characterisation of Fuel Tax Credits as non-industry specific expense exempts it from inclusion in assessments of budgetary assistance to key beneficiaries, including mining, agriculture and road transport industries.

As a result, the Commission estimates total budgetary assistance to the mining industry at **$472m**, largely as a result of refundable and non-refundable R&D Tax Incentives. The estimate **omits over $3bn** in direct tax breaks to the mining industry in FY22 via the FTCS.

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[23] Productivity Commission, Trade and Assistance Review 2020-21, 5 August 2022
[24] Productivity Commission, Trade and Assistance Review 2021-22, 20 July 2023

Yet, by contrast, as Climate Energy Finance wrote 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.[25] As the climate crisis grows, and against the backdrop of profound geopolitical shifts in government intervention, Australia can ill-afford an 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.

Fossil fuel industry lobby group the Minerals Council of Australia (MCA) has publicly supported Treasury and the Productivity Commission's failure to categorise the FTC Scheme as a subsidy and a component of budgetary assistance. It rejected the Australia Institute's 'Fossil Fuel Subsidies in Australia' report of March 2022, which correctly included the FTCS in its estimate that the Federal government provided $11.6bn in support to fossil fuel industries in 2021-22,[26] claiming that the use of FTCs in subsidy estimates is a wrong and misleading characterisation.[27] The MCA is supported by Australia's largest coal and iron ore miners including BHP, Rio Tinto, Hancock Prospecting, Anglo American, Glencore, Peabody Energy and Yancoal Australia.

In contrast, Allianz Economic Research identified Australia, alongside Venezuela, the Middle East and North Africa (MENA), as regions with exceptionally high fossil fuel subsidies.[28] Allianz highlighted that the presence and persistence of subsidies for fossil fuels is a product of large domestic fossil fuel industries that wield embedded political and lobbying power enabling them to exert influence over economic decisions on energy policy.

As Allianz found, fossil fuel subsidies account for 0.5% of global GDP, almost the exact size of the funding gap required to comply with the Paris Accord. However, subsidies persist as a consequence of poor disclosure on their amount, 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.[29] As the largest beneficiary of the FTCS, the mining industry has continued to advocate that diesel consumption subsidies are key for the industry to remain competitive in global resource markets.

The cost of Australian diesel imports exceeded $33bn in FY23, rising 197% from FY21, despite import volumes increasing by only 32% over the same period.[30]

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, 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.

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[25] AFR, It's Time to Power Up from a Petrostate to an Electrostate, 1 August 2023
[26] Australia Institute, Fossil Fuel Subsidies in Australia (2021-22), 28 March 2022
[27] MCA, Fuel Tax Credit is Not a Subsidy, 28 March 2022
[28] Allianz, Abolishing Fuel Subsidies in a Green and Just Transition, 19 May 2021
[29] Allianz, Abolishing Fuel Subsidies in a Green and Just Transition, 19 May 2021
[30] DCCEEW, Australian Petroleum Statistics 2023, May 2023

The **International Energy Agency's** (IEA) Fossil Fuels Consumption Subsidies 2022 report calls for structural reform of energy subsidies, as opposed to continued emergency relief responding to the hyperinflation of fossil fuel commodity prices.[31]

As part of the key policy reform recommendations of its 2023 Australian energy policy review, the IEA states it vital for Australia to strengthen efforts to reduce oil consumption, particularly in the mining and transport sectors, which are the main drivers of oil demand growth.[32] The IEA recommended Australia promote the reduction in diesel consumption within the mining sector by developing a plan to electrify ancillary equipment in the mining process.

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.[33]

Section 2.1.2. Bodies that Classify Fuel Tax Credits as Budgetary Assistance

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.[34] 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.

Using the correct definition of Fuel Tax Credits as fossil fuel support, the OECD estimated $12.4bn in 2021 was provided to the fossil fuel industry by Australian governments, largely to consumers ($9.2bn). Petroleum, of which diesel is the largest component used in Australia, accounted for 88% of all fossil fuel support in 2021.[35]

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[31] IEA, Fossil Fuels Consumption Subsidies 2022, February 2023
[32] IEA, Australia 2023 Energy Policy Review, April 2023
[33] IEA, The Global Energy Crises Pushed Fossil Fuel Subsidies to an All-time High, 16 February 2023
[34] OECD, Fossil Fuels Methodology – Glossary
[35] OECD, Inventory of Support Measures for Fossil Fuels, 10 March 2023

The OECD identifies that fossil fuel subsidies cause 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 job training.

Supporting the OECD's methodology, the **IEA** recognises the FTCS as a form of budgetary assistance in its 2023 Australia Energy Policy Review.[36] 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 Institute for Sustainable Development**'s (IISD) G20 Scorecard on fossil fuel funding highlighted the growth and bias in public support measures for fossil fuel consumption.[37] The Scorecard revealed Australia has been moving in the wrong direction to realise its climate ambitions, increasing support to fossil fuels through 2017-2019 by 30% relative to 2014-2016, predominantly through the rise in tax credits and exemptions.

The tax system for fossil fuel production and consumption are fraught with inefficiencies. According to the IISD, in FY18, 9 of the 10 largest fossil fuel producers in Australia paid **zero** corporate income tax, despite $7.5bn in budgetary assistance for fossil fuel use, primarily imported diesel. Under the Petroleum Resources Rent Tax (PRRT) arrangements, existing and new LNG projects are not expected to pay any tax for decades.[38]

Section 2.1.3. Australia's Failure to Phase Down Fossil Fuel Subsidies

Despite the political rhetoric, Australia continues to abrogate its Paris Agreement obligations by continuing to massively subsidise expensive, imported high-emissions fossil fuels.

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.[39]

In 2010, Australia announced it did not subsidise fossil fuels within the scope of the G20 commitment.[40] However, following a Freedom of Information request on Australia's submission to the G20,[41] it was revealed that 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.[42] 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

[36] IEA, Australia 2023 Energy Policy Review, April 2023
[37] IISD, Doubling Back and Doubling Down: G20 Scorecard on Fossil Fuel Funding, 9 November 2020
[38] IISD, G20 Scorecard Australia, 9 November 2020
[39] OECD, Inventory of Support Measures for Fossil Fuels – Introduction, 10 March 2023
[40] AFR, Commonwealth Denies Fossil Support, 30 June 2010
[41] Treasury, G20 Commitments on Fossil Fuel Subsidies Freedom of Information, 27 June 2012
[42] Treasury, G20 Commitment on Fossil Fuel Subsidies: SOP and Australia's Response

G20 fossil fuel subsidies commitment, notwithstanding the Government's claims to the G20 forum that no such subsidies existed.[43]

By exploiting various loopholes, changing definitions, and disputing whether certain subsidies were 'inefficient', bureaucrats whittled down the 17 subsidies to just 3 that fall under the G20 commitment: statutory formula for evaluating fringe benefit tax car benefits, excise exemption for gaseous transport fuels (LPG, LNG and CNG) used for non-business purposes, and statutory caps on the effective life of certain depreciating assets.

As part of the submission, the government argued the effective rate of assistance provided to the mining sector, one of the largest domestic consumers of fossil fuels, was negligible, citing the Productivity Commission's TAR FY09 identifying $420m total budgetary assistance to mining, $310m of which were via tax concessions.[44] This is despite the ~ **$2bn paid in fuel tax credits to mining** in FY09.[45]

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.[46]

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." [47]

[43] AFR, Swan Under Pressure over Fossil Fuels, 28 February 2011
[44] Productivity Commission, Trade and Assistance Review 2008-09, 22 June 2010
[45] ATO, Taxation Statistics Excise – Table 4, 7 August 2022
[46] AFR, Swan Under Pressure over Fossil Fuels, 28 February 2011
[47] United Nations, Antonio Guterres Remarks at 2019 Climate Action Summit, 23 September 2019

Section 3. Proposal to Cap the Fuel Tax Credit Scheme

Australia should cap the Fuel Tax Credit subsidy at $50m annually per group, meaning only 8 mining firms would be impacted. There would be zero impact on our agricultural sector, nor any inflationary impact on transport. This would raise $14bn in new taxes over FY24-FY30. Climate Energy Finance proposes 100% of tax revenue gained from the FTC cap be directed into a special purpose NRF fund designed to scale domestic manufacturing and adoption of battery and EV zero-emission technology across Australia's mining sector.

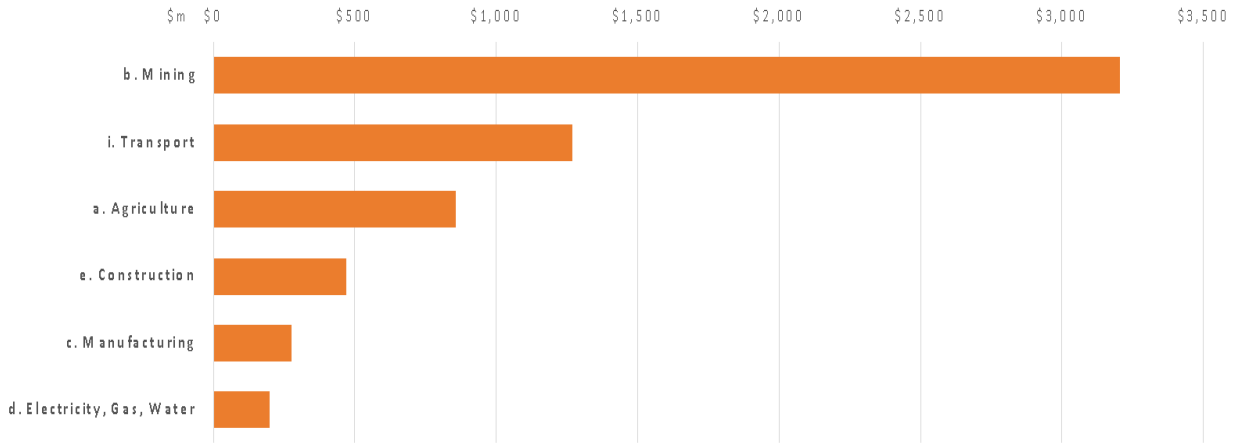
Climate Energy Finance sees it as imperative that the Federal Government reform the Fuel Tax Credit Scheme, aligning its capital allocation with the nation's climate goals and leveraging its competitiveness in renewable energy generation to electrify mining and manufacturing.

Phasing out fossil fuel subsidies is fundamental to achieving the clean energy transition. CEF is proposing the introduction of a $50m cap to the Fuel Tax Credit Scheme per year, per consolidated group to do this.

The cost of the FTCS to the economy

Mining is by far the largest beneficiary of the FTCS, with more than double the credits paid to the sector than the second largest diesel-use sector, road transport.

Figure: Fuel Tax Credits Paid in FY22 to Top 6 Economic Sectors



Source: ATO Australian Taxation Statistics Excise – Table 4, CEF Calculations

As part of this analysis, the Fuel Tax Credits paid to Australia's top 8 mining firms were estimated over 2022, on an equity basis. The following summary quantifies the FTCS paid for use of diesel in direct operations in Australia, excluding diesel used in offshore operations within the consolidated groups (i.e. BHP and Rio Tinto's Escondida copper mine in Chile).

Diesel use was calculated using direct company publications from publicly listed firms including Fortescue, Rio Tinto and BHP. For private firms and other firms with operations in Australia, diesel consumption was calculated using diesel intensities of BHP within each commodity and applying this to the reported domestic emissions from diesel sources.

Using company accounts, ATO statistical data and BP conversion figures, the top 8 mining firms received upwards of **$1.6bn** in fuel tax credits, at the discounted rate of 38.1c/L during the temporary fuel excise reduction across FY22. This is more than the entire sum of fuel tax

credits paid to industries including agriculture, transport, construction, manufacturing and electricity generating firms.

Figure: 2022 FTCS to Top 8 Bulk Commodity Miners

2022 - Equity basis	Commodity	Production Mt	Diesel Consumption ML	FTC Rate $/L	FTC Received A$
Fortescue	Iron Ore	189.0	635	0.381	241,768,956
Rio Tinto	Iron Ore	272.9	698	0.381	265,770,732
Hancock Prospecting	Iron Ore	93.4	249	0.381	94,873,523
BHP	Iron Ore	285.3	594	0.381	226,408,838
	Copper	0.2	62	0.381	23,464,934
	Nickel	0.1	164	0.381	62,303,447
	Coking Coal	58.0	362	0.381	138,064,966
	Thermal Coal	14.2	140	0.381	53,402,954
Glencore	Thermal Coal	73.9	731	0.381	278,470,104
Peabody Energy	Thermal Coal	20.9	207	0.381	78,755,415
Yancoal	Thermal Coal	30.7	304	0.381	115,683,792
Anglo American	Coking Coal	15.0	94	0.381	35,681,849
				Total FTC of Top 8 Bulk Commodity Miners:	**1,614,649,510**
				Total Estimated FTC from Iron Ore Mining:	**828,822,049**
				Total Estimated FTC from Coal Mining:	**700,059,080**

Source: Company Accounts, CEF Calculations

To further quantify the skewed distribution of the current FTC Scheme, 8 mining companies, of the 1,645 mining entities that lodged claims in FY22, received approximately 89% more in tax credits than the sum of 85,000 entities registered as agricultural firms. Likewise, the top 8 miners received ~27% more in tax credits than the combined 36,000 registered entities across transport, postal and warehousing industries in FY22.

CEF's proposal to cap the Fuel Tax Credit Scheme to $50m per year per consolidated group would thus only affect 7 companies, with Anglo American likely to exceed the threshold in the coming years as fuel excise rates are ratcheted up in line with CPI.

Figure: Estimated Fuel Tax Credit Savings over Budget Forecast Period from Cap

	Actual	Estimates					
	FY22 $m	FY23 $m	FY24 $m	FY25 $m	FY26 $m	FY27 $m	**FY24-FY27 $m**
Fuel Tax Credits Scheme	7,058	7,466	9,583	9,874	10,473	11,218	**41,148**
to Mining	3,176	3,360	4,312	4,443	4,713	5,048	**18,517**
to Coal Mining	988	1,045	1,342	1,382	1,466	1,571	**5,761**
to Metal Ore Mining	1,200	1,269	1,629	1,679	1,780	1,907	**6,995**
Revenue from $50m Cap	1,229	1,300	1,669	1,719	1,824	1,953	**7,165**

Source: CEF Calculations from ATO Historical Statistics and Budget Forecasts

Source: Australia Budget 2023-24, ATO Taxation Statistics

A $50m cap to the Scheme would not affect a single company in all other economic sectors, supporting the government's original intention that the Scheme alleviate inflationary pressures and protect domestic manufacturing, agriculture, transport and construction.

Using CEF's modelling of diesel use within the mining sector and FTCS projections from the Australian budget forecast period, additional revenue gained from fuel excise on firms that exceed $50m would translate to a cumulative $7bn through to FY27.

The compounding annual growth rate (CAGR) of the FTC Scheme translated to a cumulative cost of $25bn to Australia's economy in foregone taxation to just the coal and metal ore mining industry. Using the same CAGR of 9.7% in budget modelling from FY22 to FY27, the cumulative savings from the proposed cap would translate to a **cumulative $14.2bn** from FY24 to FY30, significantly reducing the $25bn otherwise paid to bulk commodity producers across WA and QLD.

Figure: Estimated Fuel Tax Credit Savings to FY30 from Cap

	Estimates					
	FY27	FY28	FY29	FY30	**FY28-30**	**FY24-FY30**
	$m	$m	$m	$m	**$m**	**$m**
Fuel Tax Credits Scheme	11,218	12,307	13,502	14,813	**40,623**	**81,771**
to Mining	5,048	5,538	6,076	6,666	**18,280**	**36,797**
to Coal Mining	1,571	1,723	1,890	2,074	**5,687**	**11,448**
to Metal Ore Mining	1,907	2,092	2,295	2,518	**6,906**	**13,901**
Revenue from $50m Cap	1,953	2,143	2,351	2,579	7,074	**14,239**

Source: CEF Calculations from ATO Historical Statistics and Budget Forecasts

Source: Australia Budget 2023-24, ATO Taxation Statistics

To put into perspective, the Australian Government has allocated over $36.8bn in tax expenditure to FY30 to subsidise the continued use of high-cost imported diesel in Australian mining.

The role of the National Reconstruction Fund

Australia's flagship **National Reconstruction Fund** (NRF), designed to support, diversify and transform Australia's industry and economy to secure future prosperity and drive sustainable economic growth, was established in April 2023.[48] The NRF has a financial capacity of $15bn, with $8bn allocated to the following areas:

- Up to $3bn for renewables and low emissions technologies
- $1.5bn for medical manufacturing
- $1bn for value-adding in resources
- $1bn for critical technologies
- $1bn for advanced manufacturing
- $500m for value-adding in agriculture, forestry, fisheries, food and fibre.

The Australian Government has, through the life of the fund, allocated a combined $5bn in loans, equity investments and guarantees to transform Australia's energy supply by scaling renewable energy generation, transitioning the economy to low-emission technologies, and supporting value-adding onshore and the rebuilding of advanced manufacturing domestically.

However, the persistence of Australia's largest fossil fuel subsidy contradicts the NRF's goals, and significantly undermines the capacity of the Federal government to decarbonise Australia's economy. More than double the funding of the NRF is allocated to subsidise the continued use of diesel in Australia's mining industry to FY30.

Climate Energy Finance proposes the additional revenue gained from the Fuel Tax Credit cap be directed into a special purpose fund within the NRF designed to scale domestic

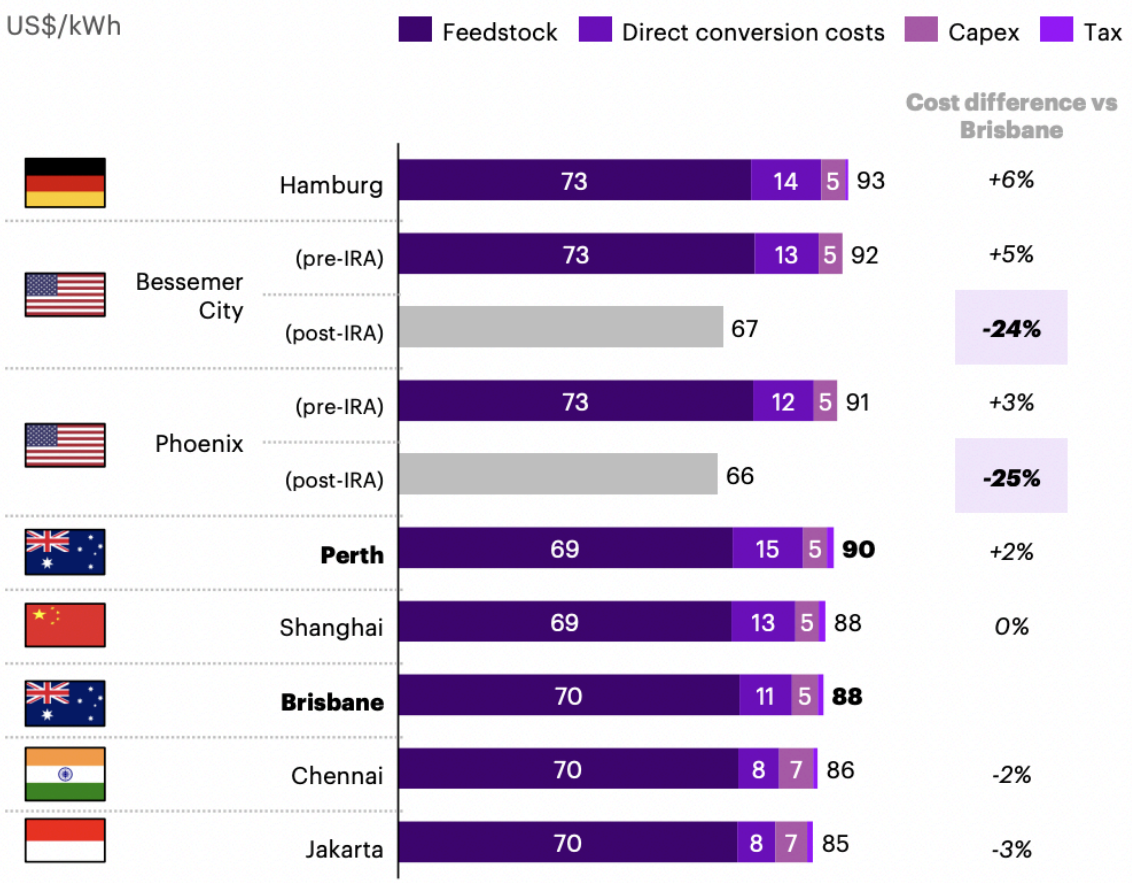
[48] Australia Parliament, National Reconstruction Fund Corporation Bill 2023, 11 April 2023

manufacturing and the adoption of **zero-emission** technology across Australia's mining sector.

Onshoring battery assembly and full-electric haul truck assembly in Australia is a momentous opportunity to value-add Australian manufacturing, integrate our world-leading resources with downstream capacity in battery technology, and accelerate the abatement of 29 billion litres of diesel imports each year, which is now a significant headwind to achieving Australia's climate goals.

The Future Battery Industries Cooperative Research Centre (FBICRC) highlights Australia's long-term potential to be a highly competitive region for battery pack production, comparable to key trade partners China (Shanghai), Indonesia (Jakarta), India (Chennai) and the US. The FBICRC estimates Australia can produce lithium-ion battery packs for US$88/kWh in Brisbane, and US$90/kWh in Perth.[49]

Figure: Australian Potential Production Costs for Packs:



Source: FBICRC Charging Ahead Report 2023

However, the US Inflation Reduction Act (IRA) has provided a significant long-term cost advantage for onshore battery pack assembly, generating savings of ~ 25% compared to Brisbane, compared to a 3% premium pre-IRA.

[49] FBICRC, Charging Ahead Report, 8 March 2023

Section 3.1. The Inflation Reduction Act

At >US$800bn, the US IRA is the largest subsidy program in world history and has catapulted the US into the global energy transition race, pulling onshore an unprecedented boom in public and private investment into mining, refining, manufacturing and deployments of zero emissions technologies of the future. We need a response to the US IRA commensurate with the massive scale of the export opportunities for Australia.

The US IRA has turbocharged investment into electric vehicles and associated battery supply chain manufacturing. The US$369bn subsidy, grant and tax credit package, in conjunction with the expanded US$400bn Department of Energy (DoE) Loan Program Office (LPO), has catalysed over US$50bn into battery manufacturing onshore since August 2022.[50]

The IRA has shown the power of policies with both push and pull mechanisms, incentivising both demand and supply sides of electrified transport.

The IRA introduced the **Clean Vehicle Tax Credit**, Section 30D of the Internal Revenue Code. Section 30D classifies midstream battery products as within the scope of critical minerals, categorised as constituent materials. The value-add processing of critical minerals into hydroxides, sulphates, precursor materials, as well as products further downstream in battery production including cathode active materials (CAM), metals for solid electrodes, electrolytes, foils and additives, is eligible to receive half the Clean Vehicle Tax Credit if manufactured in countries with which the US has free trade agreements (FTA). Australia currently has a comprehensive FTA with the US, as does South Korea.

Section 30D provides a US$7,500 maximum credit per EV to consumers, conditional on meeting critical mineral and battery component requirements.[51] Consumers are eligible, from 1 January 2023, to receive a tax credit of US$3,750 if 40% or more of the critical mineral components of an EV are extracted and processed either onshore or in a country with which the US has an FTA. The requirement will increase 10% annually until 80% of the extraction and processing demands meet the criteria by 2026. Consumers can receive a further US$3,750 credit if 50% or more of the battery component manufacturing and assembly occurs in North America. This requirement will tighten by 10% annually until 100% of battery production and assembly is onshore by 2028.

The IRA also introduced the **Advanced Manufacturing Production Tax Credit** (AMPTC) (Section 45X of the Internal Revenue Code) which applies to energy and advanced technology manufacturing, including solar energy components, wind energy components, power inverters and battery components.[52]

The AMPTC grants battery manufacturers with domestic operations a tax credit of $35/kWh for battery cells and a further $10/kWh for battery modules assembled and sold in the US from 2023. The production tax credits will phase out from 31 December 2029, reducing eligible components to 75% of production in 2030, 50% by 2031, 25% by 2032 and 0% by 2033.

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[50] Bloomberg, How the World is Spending $1.1 Trillion on Climate Technology, 24 April 2023
[51] Bloomberg Tax, Sec.30D. Clean Vehicle Credit
[52] Bloomberg Tax, Sec.45X. Advanced Manufacturing Production Credit

The success of the IRA and LPO initiatives as engines for economic growth is evident in Morgan Stanley's assessment that 'Bidenomics' is driving an unprecedented economic surge.[53] A boom in large-scale infrastructure and an domestic investment rebound, led by manufacturing, crowded in over US$500bn of new private sector investment in under one year from the introduction of the IRA, creating 100,000 new jobs while actively embedding fair labour standards in emerging clean industries.[54]

As former chief scientist Alan Finkel has argued, it is critical for Australia to transition from a petrostate to a leading electrostate, and to do this we need bold policy reform and an ambitious domestic response to the massive national interest public subsidy programs implemented by our key trade partners and competitors, including, principally, the IRA.[55]

Climate Energy Finance, alongside the Climate Capital Forum, has called for a focused, sizable and urgent domestic response to the IRA, in the form of a $100bn investment of strategic national interest public capital to crowd in the $200-300bn of private investment required to seize the significant investment, employment, manufacturing and export value-add opportunities of the transition.

This should be funded by Australia's established nation-building and energy transition instrumentalities including the National Reconstruction Fund.

Capping the Fuel Tax Credit Scheme to $50m per year per consolidated group would generate **over $14bn in cumulative budget savings** from the top 7-8 iron ore and coal miners alone through FY30, effectively doubling the size of the National Reconstruction Fund. The additional revenue gained from tax credit reform should be directed into a financial incentive package designed to onshore domestic manufacturing of zero-emission haul trucks and battery assembly.

This transition from overreliance on imported fossil fuels provides a once-in-a-century opportunity for Australia to scale domestic capabilities in vehicle manufacturing, supplying one of the largest mining jurisdictions in the world. The fund should be implemented via a number of fiscal incentives including production linked tax incentives, and equity and debt facilities for original equipment manufacturers (OEMs) onshoring electric-transport manufacturing.

[53] CNBC, Morgan Stanley Credits Bidenomics for Much Stronger than Expected GDP Growth, 24 July 2023
[54] CEF, Epic Fail: The Productivity Commission's Arguments Against Public Investment in Australia, 25 July 2023
[55] AFR, How Australia can Become a Value-Adding Renewables Superpower, 1 March 2023

Section 3.2. The Manufacturing Opportunity from Electrification

Many commentators have suggested Australia has no opportunity to build a world-class onshore battery and EV manufacturing industry. CEF completely disagrees. Australia could exit 2030 with the world's first EV mine haulage industry, turbocharged with $14bn of tax funding to incentivise the world's most advanced battery and haulage vehicle manufacturers (Liebherr, Komatsu and Caterpillar) to leverage Australia's world leading mining sector and drive embodied decarbonisation into our bulk commodity exports even before we consider the even bigger gains from green iron.

In FY22, the mining industry received over $3.1bn in Fuel Tax Credits, translating to ~8.2 billion litres of diesel fuel consumed annually.[56] BHP is the largest miner in Australia, with diversified operations across iron ore, coal, copper, nickel. Across its entire domestic operations, haul trucks account for ~53% of Australian diesel consumption.

Based on Climate Energy Finance's calculations, Australia's mining industry operates between 3,850-4,920 large-scale mining haul trucks[57], deployed largely in iron ore and coal mines across WA and QLD. Fortescue Metals Group's prototype full-electric haul truck, developed in partnership with recently acquired Williams Advanced Engineering, holds 1,400kWh of battery storage.[58]

The 240-tonne payload trucks are the smaller-scale side of Australia's market, with most mines operating trucks with payloads between 220-400-tonne. Using a 1.4MWh energy storage assumption, electrifying Australia's mining large-scale haul fleet would require the manufacturing of a conservative estimate of **~5.4-6.9 GWh of new battery capacity each year**, powered by firmed renewable energy to embody decarbonisation in the manufacturing process.[59]

Haul trucks are only one small aspect of decarbonising Australia's Scope 1 emissions. The electrification of Heavy Mining Equipment (HME), such as excavators and dozers, also provides a significant boost to the annual battery demands of the mining industry as it transitions to net zero. The electrification of rail systems, both in urban areas and extended networks connecting mining to ports in the Pilbara, NSW and QLD, provide further baseline demand for onshoring an Australian battery industry.

Electric vehicle battery pack assembly for mining equipment provides a consistent demand base for developing Australia's first mobility-oriented battery industry. This is a stepping stone to onshoring Australia's heavy road transport electrified powertrain industry. Combined with demand for lithium-ion batteries used in stationary storage in off-grid and remote power plants in mining, aggregate demand can underpin world-class scale battery assembly in Australia.

Electrification of Australia's large-scale mining industry will catalyse development and deployment of zero-emission technologies to small-scale mining firms and economic sectors (e.g. agriculture and road transport) that are increasingly susceptible to fossil fuel hyperinflation risk given their overdependence on imported diesel.

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[56] ATO, Taxation Statistics Excise – Table 4, 7 August 2022

[57] Note: Assuming fuel consumption of 125-160L/hr, operating at 80% utilisation rate throughout the year, extrapolating BHP's data to mining sector

[58] New Atlas, Fortescue Looks Toward Greener Mining with 240-tonne Electric Truck, 16 January 2023

[59] Assuming ~ 1 year battery life given demand placed on battery in standard mining conditions

The FBICRC forecast **$16.9bn in gross value added** by 2030 from Australia developing diversified battery industries. This would generate a further $55.2bn in GDP and create 61,400 direct new jobs.[60]

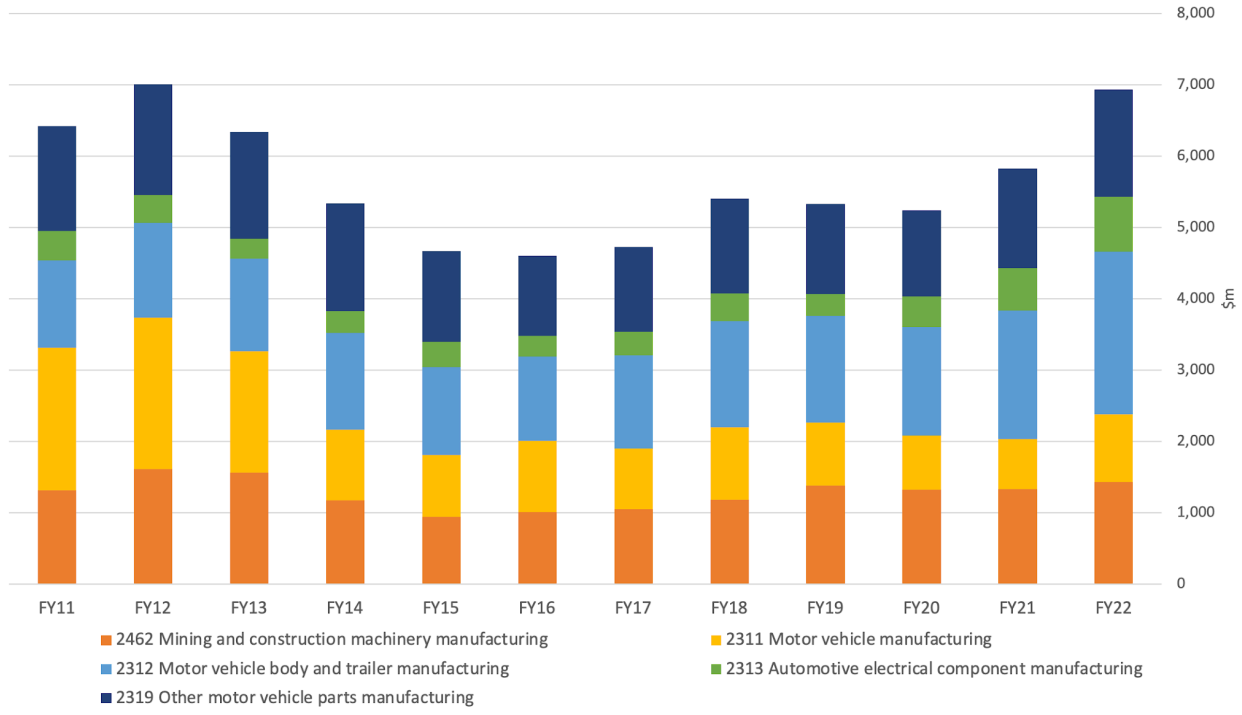
Onshoring mining equipment and heavy vehicle manufacturing will not require a complete reindustrialisation, but instead a revitalisation of a stagnated industry in mining machinery manufacturing.

In FY22, Motor vehicle and motor vehicle part manufacturing (ANZSIC industry subsection - Manufacturing 231) totalled $5.5bn in industry value-add, up 22% from FY21. Growth in recent years has primarily been in automotive electrical component manufacturing, up 29% in FY22. Mining machinery manufacturing (Industry subsection - manufacturing 2462), is comparatively slower, growing 8% in FY22 to a $1.4bn value-add.[61]

In terms of employment, total motor vehicle and part manufacturing industries employed 36,950 people in FY22, an expansion of the industry's workforce by 10% from FY21. Mining machinery manufacturing grew its workforce by 8% over the same period, reaching 9,300 employees across Australia.[62]

Shaping a domestic investment environment to onshore major electrified haulage manufacturing will require partnerships with leading OEMs of equipment used in Australia's mining industry, specifically Liebherr, Komatsu and Caterpillar.

Figure: Australian Vehicle Manufacturing Gross Value-Add



Source: Australian Bureau of Statistics, CEF Calculations

Australia's off-road diesel engine emissions are largely a product of ultra-class and heavy class haul trucks used in bulk commodity mining operations across WA and QLD. In 2018,

[60] FBICRC, Charging Ahead Report, 23 March 2023
[61] ABS, Australian Industry Statistics, 26 May 2023
[62] ABS, Australian Industry Statistics, 26 May 2023

over 82% of all non-road diesel engines used in industrial surface mining were rated at 560kW or higher.[63] Australia's most common models of haul trucks from the top 3 OEMs range from 1,490kW to upwards of 2,980kW in ultra-class models (payloads exceeding 300 tonnes).

Liebherr

Liebherr is a world-leading, German-Swiss multinational equipment manufacturer, specialising in mining and construction industries. In FY22, Liebherr generated €12.6bn in revenue, with mining equipment accounting for €1.2bn of group sales.

Australia is the largest market for Liebherr's mining equipment division. Whilst Asia and Oceania account for 15% of total consolidated group sales, in mining, Asia and Oceania account for over 57% of global sales.[64]

Since the mid 1990s, Liebherr has manufactured its large haul trucks and mining equipment in Newport News, Virginia USA. Trucks are partly assembled, tested and certified in the US, before being shipped to Australia where complete assembly is carried out on-site. Liebherr's secondary mining manufacturing facility is in Colmar, Alsace, France. Colmar's facilities specialise in the manufacture of hydraulic excavators for open-cast mining.

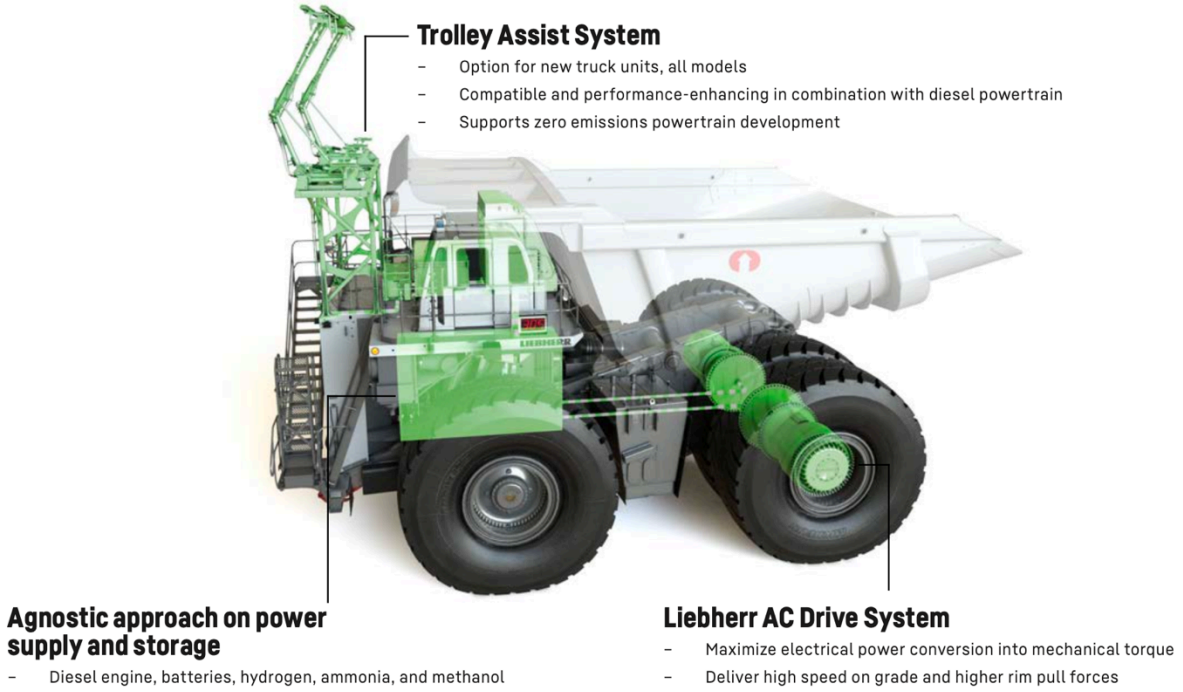
Despite primary manufacturing in the US, Liebherr has a strong and long-term presence in Australia for remanufacturing, mining truck bucket manufacturing, maintenance and repair / part services:

- Australian headquarters in **Adelaide** houses a 30,000m^2 re-manufacturing facility and distribution centre. Adelaide is one of only 12 global re-manufacturing hubs across Liebherr's 140 locations in 50 countries.
- Australia's re-man facilities have an established domestic capability to install, maintain and update diesel engines, electronic control systems, hydraulic motors, electric motors, wheel drives and suspension systems for Australia's mining industry.[65] The Adelaide complex also houses a 3,500m^2 production and major mining bucket manufacture and repair facility.
- Liebherr **Mt Thorley, NSW,** is the centre for maintenance, construction, repair and technical support for Hunter Valley's coal region, equipped with a 1,600m^2 parts warehouse.
- Liebherr's **Redcliffe, WA**, facility is the centre for its Australian mining machinery, housing a state-of-the-art 5,000m^2 parts and 3,000m^2 services workshop. Redcliffe is supported by Liebherr Newman, a mining equipment storage facility.

Liebherr has committed to providing low-emission haulage solutions to its customer network. A primary differentiation to Caterpillar and Komatsu, was Liebherr's early adoption of power agnostic designs in haul trucks. From 2022, all haul trucks have been compatible with trolley assist systems, and designed to be retrofitted with electric and battery technologies as they become commercially available, exchanging the diesel engines without requiring complete model replacement.

[63] DCCEEW, Cost-Benefit Analysis of non-road Diesel Engine Emissions Standards, July 2022
[64] Liebherr, Annual Report 2022
[65] Liebherr, Remanufacturing Program

Figure: Liebherr Electric-Drivetrain and Agnostic Powertrain Design



Source: Liebherr T274 Technical Brochure

Liebherr's T264, T274 and T284 models are electric-drive haul trucks, fitted with diesel powertrains. Liebherr has designed and manufactured its electric drivetrain system for decades, providing significant advancements in fuel efficiency and productivity. Liebherr's electric-drive system with power-agnostic chassis provides Australian miners the ability to work independently, developing their own battery technology to accelerate adoption of electric haulage and be first-movers in diesel abatement.

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.[66] Using trolley assist, Liebherr's ultra-class trucks reduced CO_2 emissions by up to 70% compared to unassisted diesel.[67]

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.[68]

[66] Liebherr, T284 Technical Brochure
[67] Note: Emissions reduction of 35-70%, based on 1-3 km trolley line (representing 25-80% of standard cycle)
[68] Liebherr, T264 Technical Brochure

Komatsu

Komatsu RDTs (Rigid Dump Trucks) have pioneered the Ultra-Class trolley systems and autonomous operations in the mining industry, with innovative suspension, transmission and electric-drive technology. The Komatsu 930E is the best-selling off-highway, ultra-class, rigid frame, two-axle, diesel-electric drivetrain haul truck in the world.[69]

Komatsu's haul trucks are manufactured in Peoria, Illinois USA. Peoria is one of 60 'mother plants' globally – manufacturing facilities with product development functions and core sites for production, assembly and distribution of heavy machinery.

Australia is home to all three mother plants in Oceania, with a specialised focus on mining, construction and utility equipment assembly, maintenance, remanufacturing and distribution.[70] These plants are in the Hunter Valley and Moss Vale, NSW; and Rockhampton, QLD.

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.[71] Through the Alliance, Komatsu 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.

Caterpillar

Caterpillar is the largest mining equipment OEM in Australia. Caterpillar has manufacturing hubs across NSW, QLD and WA. Hastings Deering is the authorised Caterpillar dealer for QLD, NT, Papua New Guinea, Solomon Islands and New Caledonia. Hastings Deering now operates 23 centres with over 3,000 employees.[72]

Seven Group Holdings (SGH) wholly owns and operates WesTrac Australia, one of the largest authorised Caterpillar equipment dealers in the world, and the sole dealer for Western Australia, ACT and NSW. WesTrac has more than 4,000 employees across its operations, providing services, repair, part sourcing and manufacturing to Australia's mining and construction industries. In FY21, SGH committed to net zero Scope 1 and Scope 2 emissions by 2040, with an interim target of 30% reduction by 2026, and 50% by 2030, relative to 2020.[73]

In November 2022, Caterpillar successfully completed its first demonstration of the all battery electric 793.[74]

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[69] Mojo Motor Industries, Electric Drive v Mechanical-Diesel Dump Trucks
[70] Komatsu, List of Locations by Region, 31 March 2023
[71] Komatsu, Collaborative Customer Alliance to Advance Zero-Emission Equipment Solutions, 11 August 2021
[72] Hastings Deering, About Hastings Deering
[73] SGH, Sustainability Report, 2022
[74] Caterpillar, Successfully Demonstrates First Battery Electric Large Mining Truck, 22 November 2022; The West, WesTrac to play key role in lower emissions after Caterpillar trials first battery electric truck, 23 November 2022

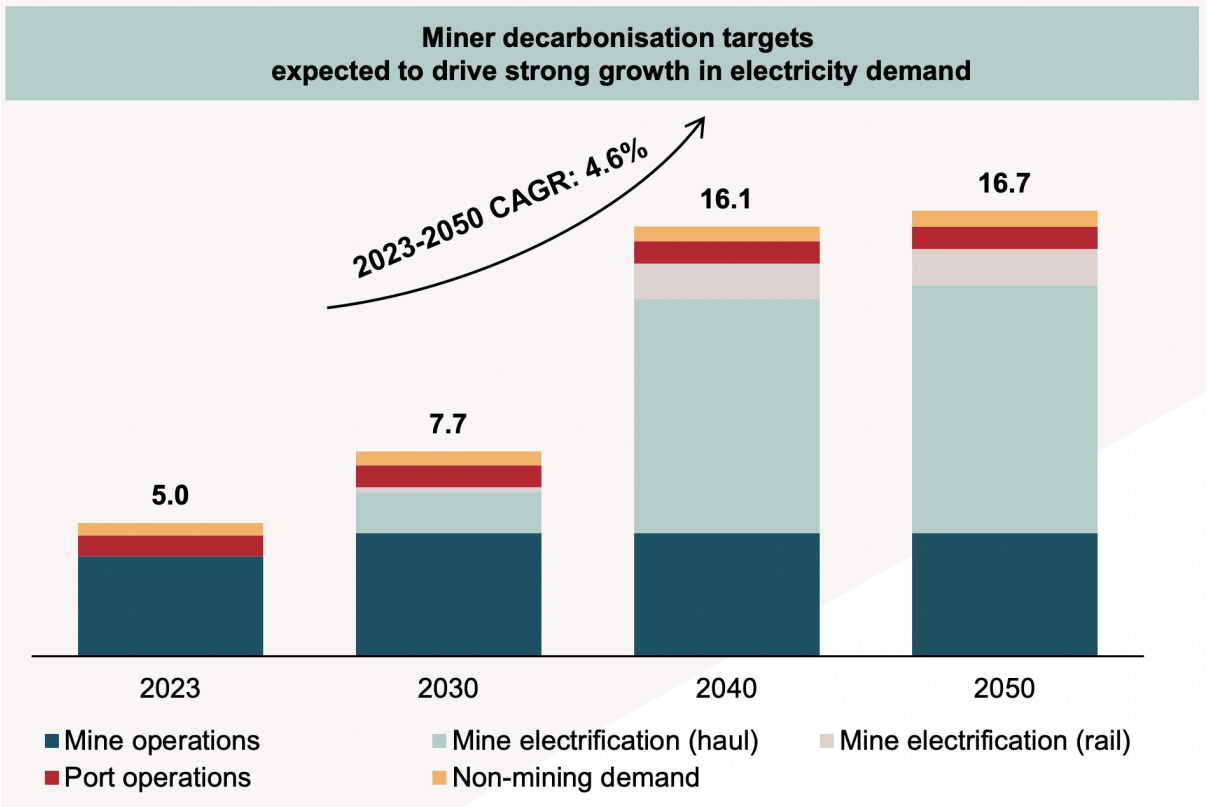
Section 3.3. Electrifying Australian Mining is a Massive Investment Opportunity

Electrifying the Australian mining industry is a massive opportunity to advance Australia's progress towards global leadership in the energy transition, and in working credibly and at scale to deliver on the Paris Agreement. By embodying decarbonisation on our world leading mining exports (we are #1 in iron ore, coking coal and lithium, and #2 in thermal coal), Australia can help our key trade partners deliver on their decarbonisation objectives, even as we improve our energy security, reduce our fossil fuel import reliance and dilute our exposure to the hyperinflation of fossil fuel commodities.

Electrifying Australia's non-road diesel fleet across remote regions will require a significant uptick in renewable energy generation and transmission. In 2023, ~2,500 million litres of diesel will be consumed across the Pilbara in haulage and heavy mining equipment. The electrification of ore transport is estimated to contribute over 55% of relative electricity demand in the Pilbara by 2050.[75]

Australian energy suppliers, state governments, international OEMs, and miners are beginning to comprehend the significant demand and investment opportunity as a result of electrification. Mining fleets, which currently operate on imported diesel, account for the vast majority of the operational energy demand in iron ore and coal mining. The transition to electrified haulage and mining equipment will translate to significant growth in electricity demand.

Figure: Mining Decarbonisation to Drive Growth in Electricity Demand (TWh)



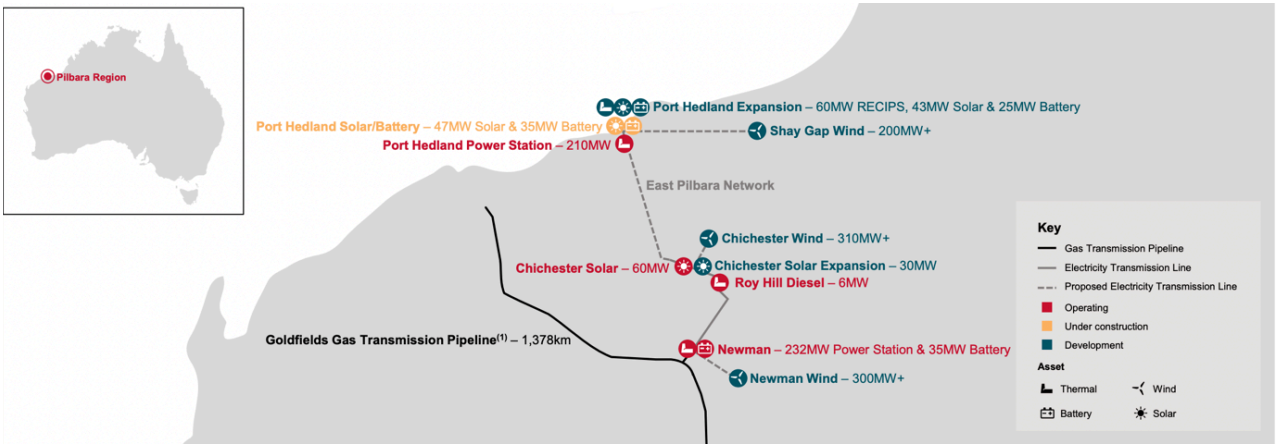
Source: APA using Boston Consulting Group Analysis

[75] APA, Acquisition of Alinta Energy Pilbara and Equity Raising, 23 August 2023

On 29 August 2023, the Federal Government announced a $3bn **Rewiring the Nation** deal to power the next stage of Western Australia's energy system with secure renewable energy.[76] The Federal government will administer the deal through the Clean Energy Finance Corporation (CEFC), providing $3bn in concessional loans and equity investments to construct and upgrade transmission across the North West Interconnected System (NWIS) and the South West Interconnected System (SWIS).

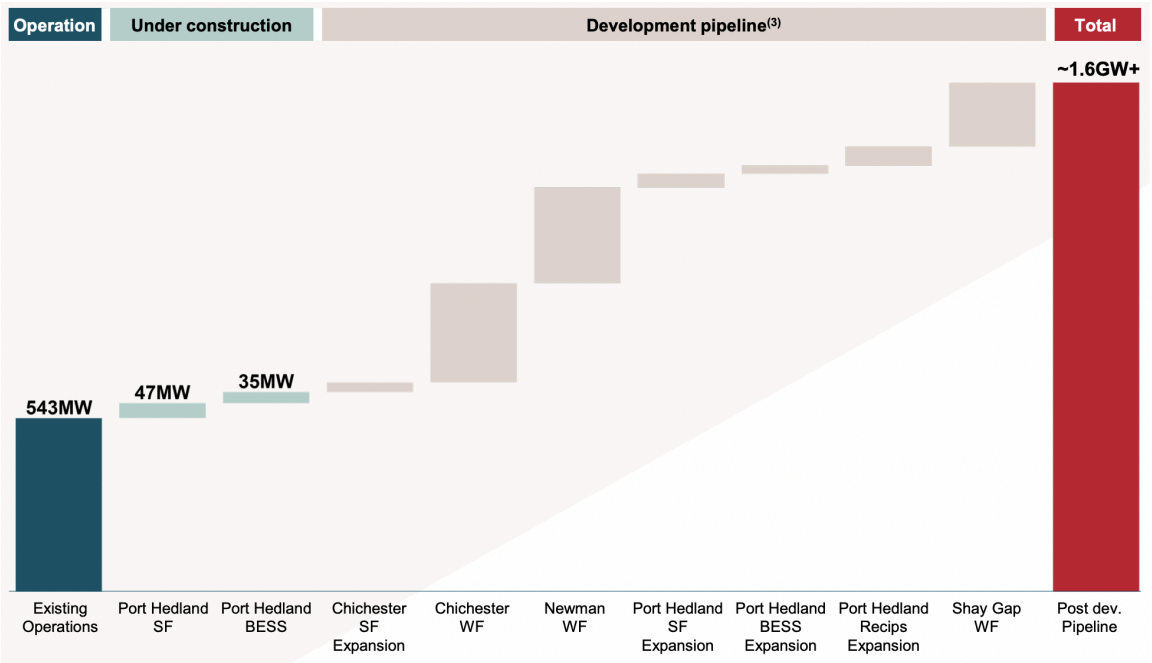
On 23 August 2023, APA announced its $1.7bn strategic acquisition of Alinta Energy Pilbara, providing the group a significant platform for growth in energy generation and transmission as WA's mining industry begins to decarbonise.[77]

Figure: Alinta Energy Pilbara Energy Generation and Transmission Investment Pipeline



Source: APA Acquisition of Alinta Energy Pilbara

Figure: Breakdown of Renewable Energy Generation Investment Pipeline



Source: APA Acquisition of Alinta Energy Pilbara

[76] Australia Government, $3bn Rewiring the Nation Deal to Power WA Jobs and Growth, 29 August 2023

[77] APA, Acquisition of Alinta Energy Pilbara and Equity Raising, 23 August 2023

APA identifies the Pilbara energy region as a $15bn+ market opportunity for renewables and infrastructure, representing the largest market within the broader ~$25bn+ remote-grid market across Australia.[78] The acquisition adds 60MW of operational solar and 35MW of operational battery storage to APA's portfolio, with a +$3bn renewable-centred development pipeline of more than 1GW of wind, solar and battery storage.

FMG Pilbara Energy Connect

As part of Fortescue Metals Group (FMG)'s US$6.2bn capital allocation of FY23-FY30 to reach real-zero emissions in its operations in the Pilbara, US$3.2bn will be directed into scaling renewable energy generation, battery storage and building associated infrastructure. To electrify energy demand, FMG will deploy 2-3GW of renewable generation and battery storage, construct an interconnected transmission network and a network of charging stations.[79]

In FY23, Fortescue completed construction of the transmission lines for the **Pilbara Energy Connect** (PEC) project, connecting Solomon to Iron Bridge and Port Hedland, WA. The Board also approved a further investment of US$373m to connect Eliwana, Cloudbreak and Christmas Creek, WA, forecast to be complete by FY25-26.[80]

Fortescue has begun designing and constructing the on-site electrical reticulation infrastructure that will extract energy from the PEC system to where it is needed on site. The Design will integrate FMG's entire iron ore mining and port operations into one common 220kV network.[81]

Figure: FMG Operations and Pilbara Energy Connect System



Source: FMG Pilbara Site Presentation

[78] APA, Acquisition of Alinta Energy Pilbara and Equity Raising, 23 August 2023
[79] FMG, Executive Plan for Decarbonisation, 20 September 2022
[80] FMG, Climate Change Report FY23, 28 August 2023
[81] FMG, Climate Change Report FY23, 28 August 2023

The growth in renewable energy generation in transmission across the Pilbara's dispersed network of mining operations is critical to the transition of diesel haul trucks to full-electric. Currently, Liebherr, Komatsu and Caterpillar are the largest OEMs for haul trucks favoured by Australia's largest miners including BHP, Rio Tinto, FMG, Hancock Prospecting, Anglo American, etc.

Most haul trucks used in Australia are diesel powertrain – electric drivetrain machines – meaning the massive machinery is powered by a large diesel engine, which powers an electrical system of alternators and wheel motors, transferring electrical power to mechanical work.

Previously, haul trucks produced by Komatsu and Liebherr were powered on a complete mechanical drivetrain, whilst popular models from Caterpillar, including the 793F, remain mechanical today.

The transition to battery electric mining haulage, and the possible introduction of Trolley Assist systems in Australia's iron ore operations provide a tangible roadmap to abating the ~2,500 million litres of diesel used annually in Pilbara's mining haul fleet.

BP's Australian Renewable Energy Hub

The Australian Renewable Energy Hub (AREH) is a phased development of one of the largest renewable energy precincts in the world, across 6,500 square km. In July 2022, BP acquired a 40.5% stake and operatorship of AREH, partnering InterContinental Energy (26.4%), CWP Global (17.8%) and Macquarie Green Investment Group (15.3%).[82]

The consortium aims to invest a total $50.6bn into AREH, comprising 26GW of combined solar and wind capacity to produce 1.6Mt of green hydrogen or 9Mt of green ammonia per annum.[83] The wind and solar assets would generate over 90TWh annually of green energy, equivalent to ~one third of all electricity generated in Australia in 2020.

The AREH project would generate 20,000 jobs over a 10-year construction period, with 3,000 ongoing jobs over the 50+ year operational period.[84] The Final Investment Decision is expected in 2025, with construction following a year later.[85]

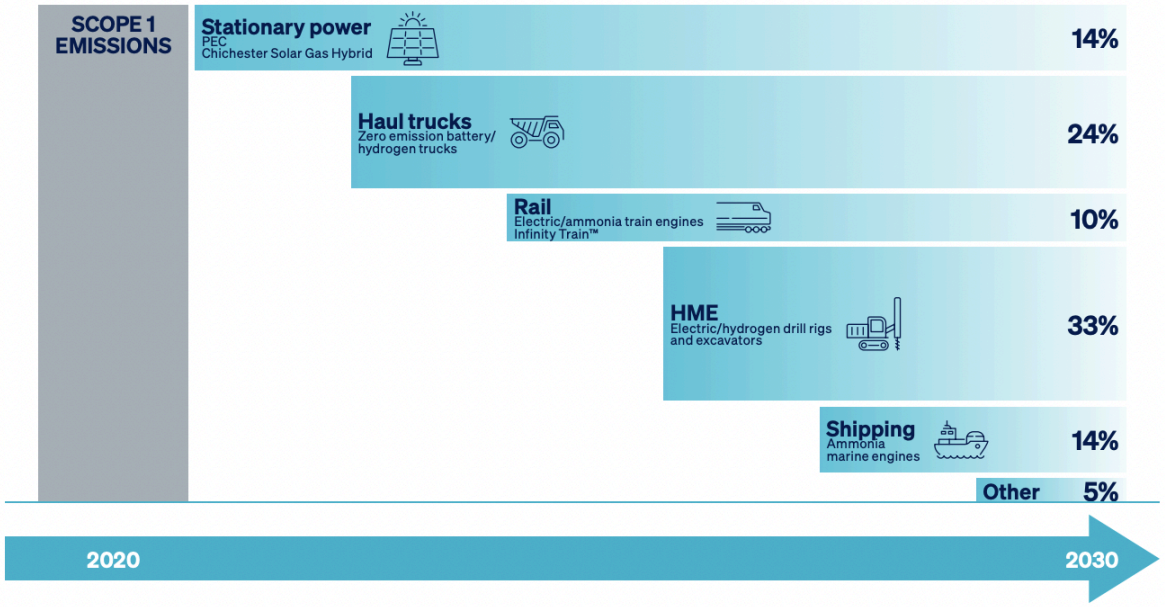
[82] BP, Renewable Energy Hub in Australia
[83] BP, BP to Lead and Operate One of the World's Largest Renewables and Green Hydrogen Hubs in Western Australia, 15 June 2022
[84] DCCEEW, World's Largest Renewable Energy Project Set for Australian Outback, April 2021
[85] AFR, BP Takes Major Slice of $52bn WA Green Hydrogen Hub, 15 June 2022

Fortescue Metals Group

Fortescue Metals Group (FMG) has set by far the most ambitious decarbonisation plans across Australia's bulk commodity majors, targeting real zero emissions (scope 1&2) and elimination of fossil fuel in operations by FY30. FMG's capital framework has shifted significant capital (US$6.2bn), to deploying zero-emissions and clean energy technology at speed and scale across its Western Australian iron ore operations.[86]

By 2030, realising FMG's climate targets will save more than 2.29 billion litres of diesel and 31 million GJs of methane gas in operations. In FY23, gas and diesel cost over $560m.[87]

Figure: Fortescue Decarbonisation Pathway



Source: Fortescue Climate Change Report FY22

In FY23, FMG shipped 192Mt of iron ore, generating US$16.9bn in revenue, translating to an EBITDA of US$9.9bn, down 5% from FY22.[88]In FY22, FMG shipped 189Mt of iron ore, generating US$17.4bn in revenue and an EBITDA of US$10.6bn. Revenue grew by 22% over FY22, with EBITDA rising 36% from FY21.[89]

In FY23, FMG consumed **633 million litres** of diesel. At the weighted-average FTCS rate of 40.9c/L in FY23, FMG received budgetary assistance of up to **$259m** in tax credits. In FY23, the excise rebounded to the standard rate of ~40% of the base price of diesel imports.

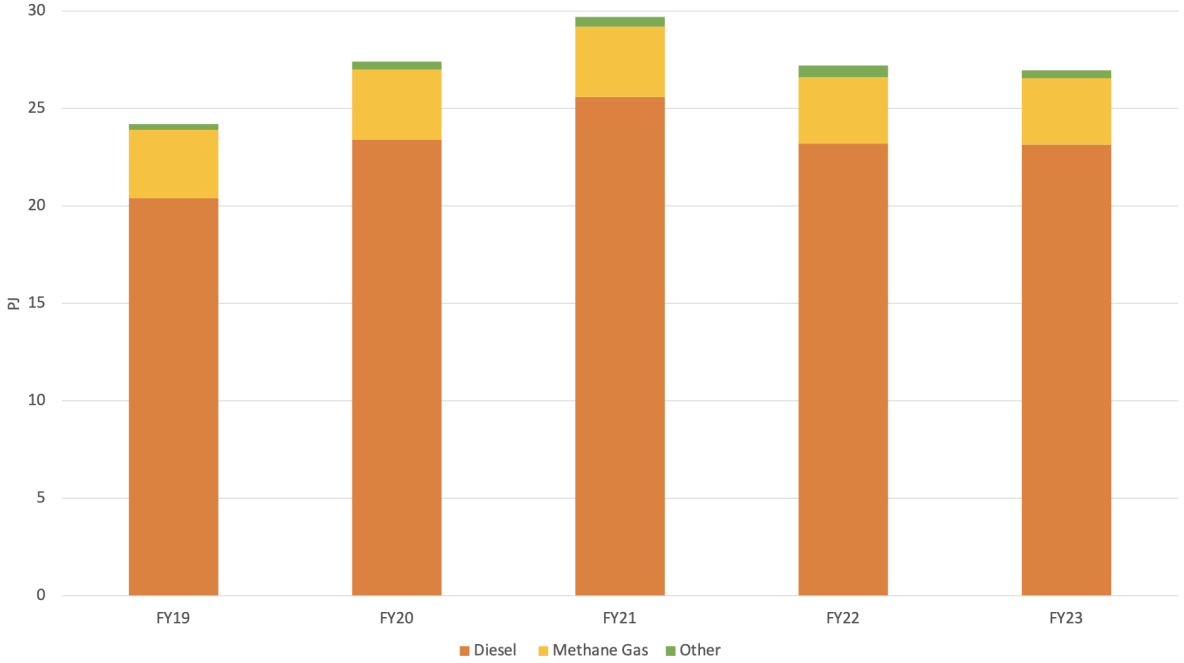
FMG's real zero pathway requires abating 2.55Mt CO_2-e operational emissions. Scope 1 emissions account for 75% for FMG's operational emissions, dominated largely by the consumption of imported diesel. In FY22, over 85% of FMG's energy demand is sourced from the burning of imported diesel in mobile mining equipment, rail systems and stationary power generation (i.e. diesel generators). 42% of FMG's self-generated stationary power was from diesel (58% from methane gas).[90]

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[86] FMG, Executive Plan for Decarbonisation, 20 September 2022
[87] FMG, Climate Change Report FY23, 28 August 2023
[88] FMG, Annual Report FY23, 28 August 2023
[89] FMG, Annual Report FY22,
[90] FMG, Executive Plan for Decarbonisation, 20 September 2022

Heavy Mining Equipment (HME), e.g. excavators, dozers etc, are the largest single source of diesel consumption, and the largest energy demand source, consuming ~265 million litres annually (33% of Scope 1). Haul trucks consume ~200 million litres annually (24% of Scope 1). Locomotives burn ~85 million litres (10% of Scope 1), transporting ore from Chichester and Western Hubs across its privately-owned 760km rail network to Port Hedland, WA. ~80 million litres are used in stationary power and other machinery associated with iron ore operations.[91]

Figure: FMG Scope 1 Energy Consumption by Fuel Source



Source: FMG Climate Change Report FY23, CEF Calculations

FMG forecasts operational expenditure savings of US$3bn by FY30 as a result of the company's real zero emissions pathway, driven predominately by the purging of diesel across operations (84% of savings).[92] Electrification is the key mechanism to eliminate fossil fuel risk in Australia's mining and manufacturing industries, by eliminating the demand for volatile and inflationary diesel imports.

FMG's net direct cash (C1) costs increased by 14% in FY22 to US$15.91/wmt as a result of rising fuel and energy costs, citing the West Texas Intermediate (WTI)'s 69% rise from US$51.83/barrel in FY21 to US$108.83/barrel in 4QFY22.[93] C1 costs increased by a further 10% in FY23 to US$17.54/wmt.[94]

As part of FMG's US$6.2bn capital allocation to decarbonisation, US$1.3bn will be allocated to electrifying FMG's fleet of haul trucks and heavy mining equipment. Currently, FMG's haul trucks account for ~24% of Scope 1 emissions, consuming ~200 million litres of diesel.[95]

[91] FMG, Climate Change Report FY22,
[92] FMG, Executive Plan for Decarbonisation, 20 September 2022
[93] FMG, Annual Report FY22,
[94] FMG, June Quarterly Production Report, 27 July 2023
[95] FMG, Annual Report FY22

In January 2022, FMG acquired UK-based battery technology developer, Williams Advanced Engineering (WAE), to develop zero emissions systems in rail, heavy mining equipment and mobile haul fleets.[96]

In June 2023, WAE 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.[97] 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, FMG announced a partnership with leading haul truck and mining OEM, Liebherr, to develop a supply chain of green mining haul trucks, integrating the platforms of Liebherr and zero emission power systems developed by FFI and WAE.[98] The partnership also has the opportunity to extend beyond Fortescue's operations, becoming a key zero emissions power technology provider to the tier 1 mining equipment OEM. Liebherr will provide 120 mining trucks, representing ~45% of FMG's iron ore operations fleet.

The first set of zero emissions haul trucks will be fully operational within FMG's operations by 2025, with further aim of having units available for commercial sale. The first sets will be built upon Liebherr's T264, a 240 tonne payload electric-drive haul truck.[99] In January 2023, FMG took delivery of the first full-electric haul truck developed with the Liebherr partnership, a mammoth 1,400kWh battery powered modified T264.[100]

The full-electric powertrain was imported to Australia, with assembly and installation all onshore in Perth, WA.

FMG's partnership with Liebherr has allowed it, through WAE, to take the lead in electrification of mine haulage. Liebherr's models are power agnostic, meaning all models in Australia can be retrofitted from diesel engines, into hybrid engines, full-electric systems, and hydrogen fuel cells. This is possible due to Liebherr's leading electric-drive technology.[101]

Liebherr has also made incredible developments in Trolley Assist Systems, a mechanism that uses overhead power lines to supply electric power to trucks directly during loaded incline parts of the cycle.

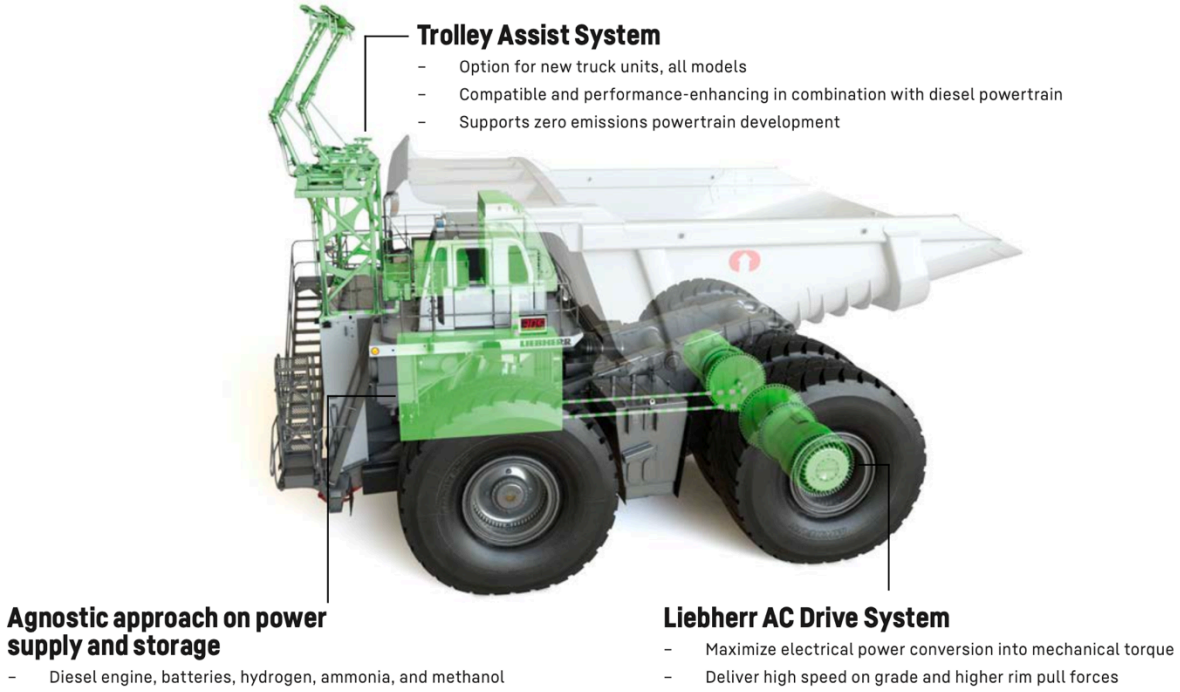
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Over a 1km track at 10% incline, trolley assist reduced fuel consumption from 50 litres to just 2.5 litres, a 95% reduction. Over the same track, Liebherr's heavy-class T264 (416t GVW) decreased fuel consumption from 37 litres to 2.3 litres, a 94% decline.[104]

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[96] FMG, Acquisition of UK-Based Williams Advanced Engineering, 24 January 2022
[97] WAE, Fortescue Expand Production of Batteries and Electric Powertrains in the UK, 20 June 2023
[98] FMG, Partnership with Liebherr to Supply Green Mining Haul Trucks, 15 June 2022
[99] WAE, WAE Showcase Latest in Off-Highway Electrification Solutions at Electric Mine 2023, 23 May 2023
[100] WAE, Fortescue Welcomes Arrival of Australia's First Prototype Battery System, 12 January 2023
[101] Liebherr, T264 Technical Brochure
[102] Liebherr, T284 Technical Brochure
[103] Note: Emissions reduction of 35-70%, based on 1-3 km trolley line (representing 25-80% of standard cycle)
[104] Liebherr, T264 Technical Brochure

Figure: Liebherr Electric-Drivetrain and Agnostic Powertrain Design



Source: Liebherr T274 Technical Brochure

The current partnership with Liebherr aims to electrify 45% of FMG's fleet across Western Australia. This will abate ~200 million litres of diesel annually.

In November 2021, Fortescue's Dr Andrew Forrest announced his support for removing the fuel tax credit system from 2025 and beyond for miners. Dr Forrest stressed that policy reform should not result in complete abolition, but rather a phase out of the Scheme's eligibility to the largest mining and energy companies, allowing the continued use of diesel in other economic areas i.e. agriculture, forestry and fishing.[105]

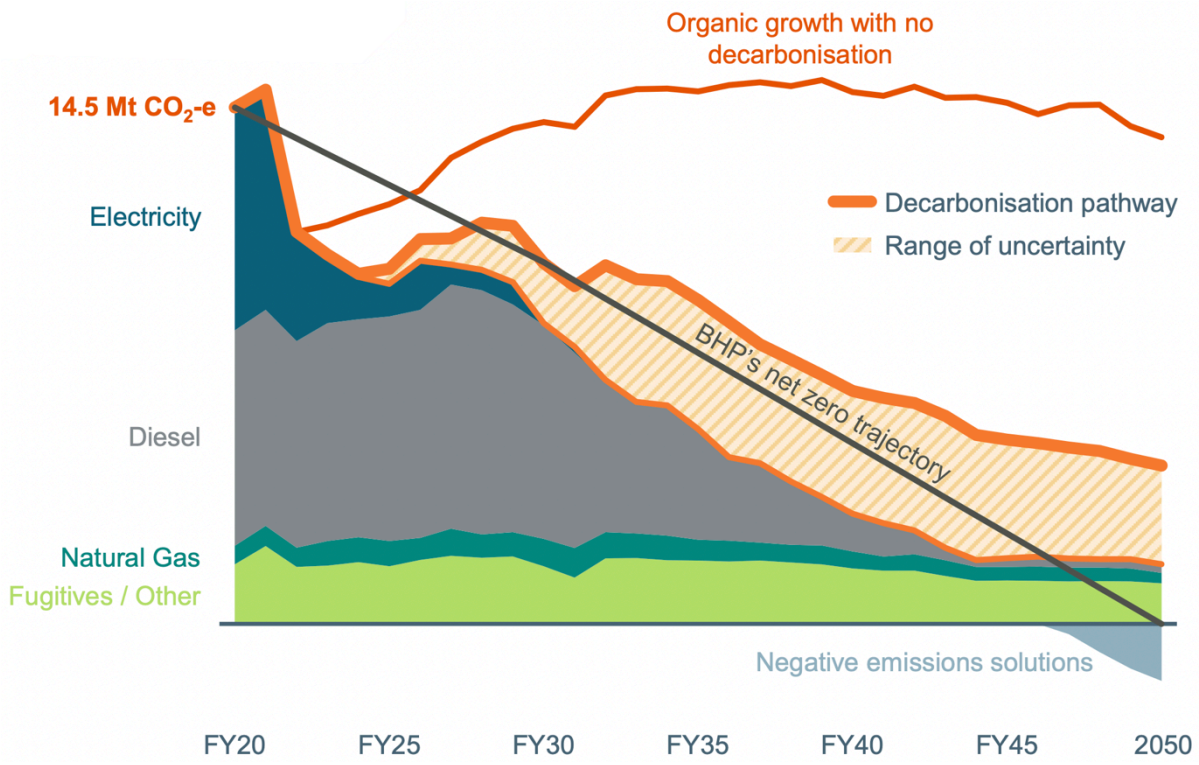
[105] AFR, Forrest Says Diesel Rebate Should Go After 2025, 23 November 2021

BHP

BHP has committed to net zero operational and supply chain emissions by 2050, with an interim target of 30% Scope 1 and 2 emissions reduction by FY30, relative to FY20. To meet the interim target, BHP has allocated US$4bn towards decarbonisation investments through to FY30, skewed heavily towards the back end of the decade.[106]

BHP claims its pathway to net zero will be non-linear as organic growth expands its energy demand and thus emissions profile. In simple terms, BHP's emissions will continue to rise between now and FY30, largely driven by increases in diesel consumption.

Figure: BHP Operational Decarbonisation Trajectory



Source: BHP Operational Decarbonisation Presentation

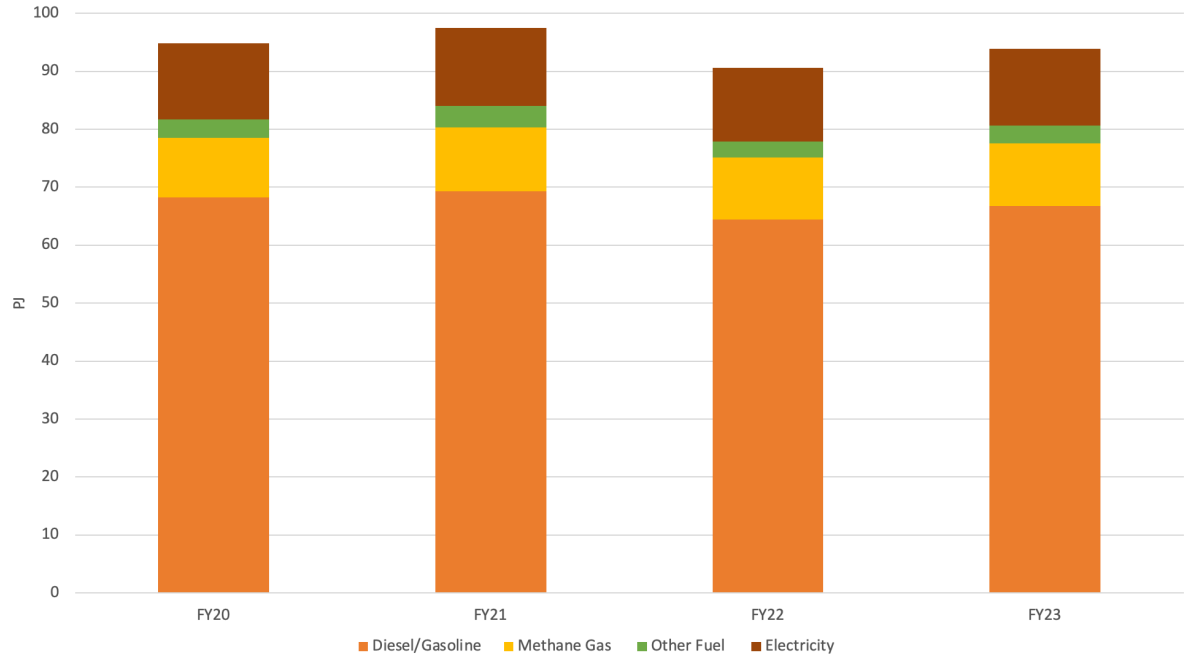
In FY23, BHP's Western Australia Iron Ore (WAIO) produced 253Mt of iron ore, generating US$24.7bn in revenue with an underlying EBITDA of US$16.7bn, down 19% and 24% respectively from FY22.[107] Australian coal operations, through BHP Mitsubishi Alliance (BMA) and NSW Energy Coal (NSWEC), generated US$10.9bn in revenue with an underlying EBITDA of US$4.9bn, down 30% and 47% respectively. As a consolidated group, BHP posted a 17% drop in revenue to US$53.8bn, with an underlying EBITDA decline of 31% to US$27.9bn in FY23.

Despite record production, BHP's WAIO earnings were offset due to compounding effects of lowering global iron prices, dropping 18% in FY23, and inflationary costs, specifically continued higher diesel prices. BHP's unit costs increased 6% to US$17.79/t. BHP's BMA experienced unit cost inflation of 8% over FY23 to US$96.46/t, primarily driven by higher diesel prices. NSWEC's unit costs grew 16% over the same period as a consequence of inflationary diesel prices and tightening labour markets.

[106] BHP, Operational Decarbonisation, 21 June 2023
[107] BHP, FY23 Financial Results, 22 August 2023

Inflationary fossil fuel imports, primarily diesel, are of critical concern to BHP's profitability across Australian operations. While distillate/diesel accounts for 62% of energy demand across BHP's consolidated projects, distillate accounts for over 71% of all energy use across Australian operations. BHP's largest divisions by revenue in Australia, WAIO and BMA, were dependent on distillate for 76% and 86% of total operational energy demand respectively in FY23.[108]

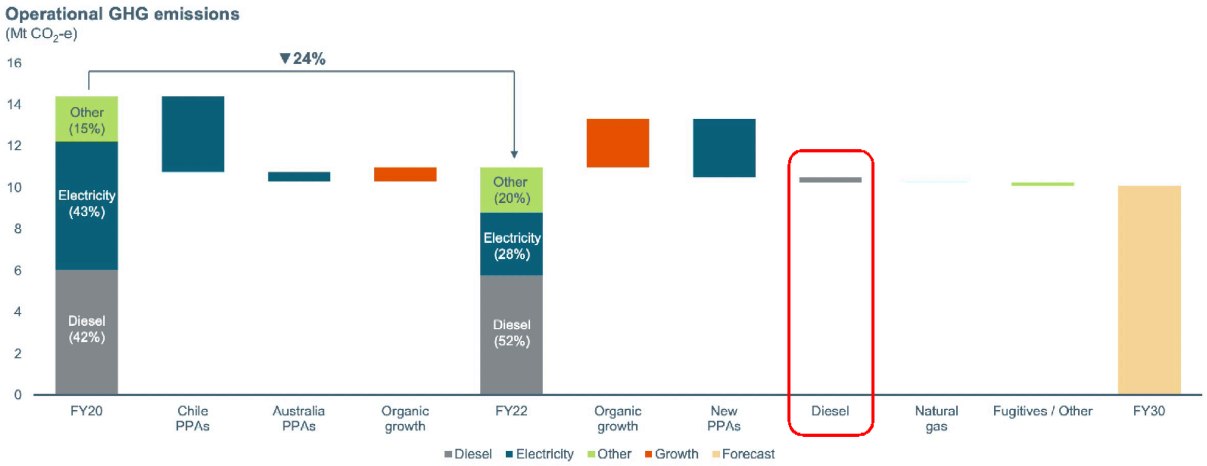
Figure: BHP Australian Operational Energy Consumption by Fuel Source



Source: BHP ESG Factbook FY23, CEF Calculations

Despite diesel accounting for a significant proportion of Australian energy demand, and 62% of BHP's global energy use, BHP's focus on and capital allocation to diesel abatement through to FY30 is negligible, shifting attention into mitigating electricity emissions, primarily in Chile. This is a massive missed opportunity for BHP to lead on decarbonisation.

Figure: BHP Emissions Reduction Pathway to FY30



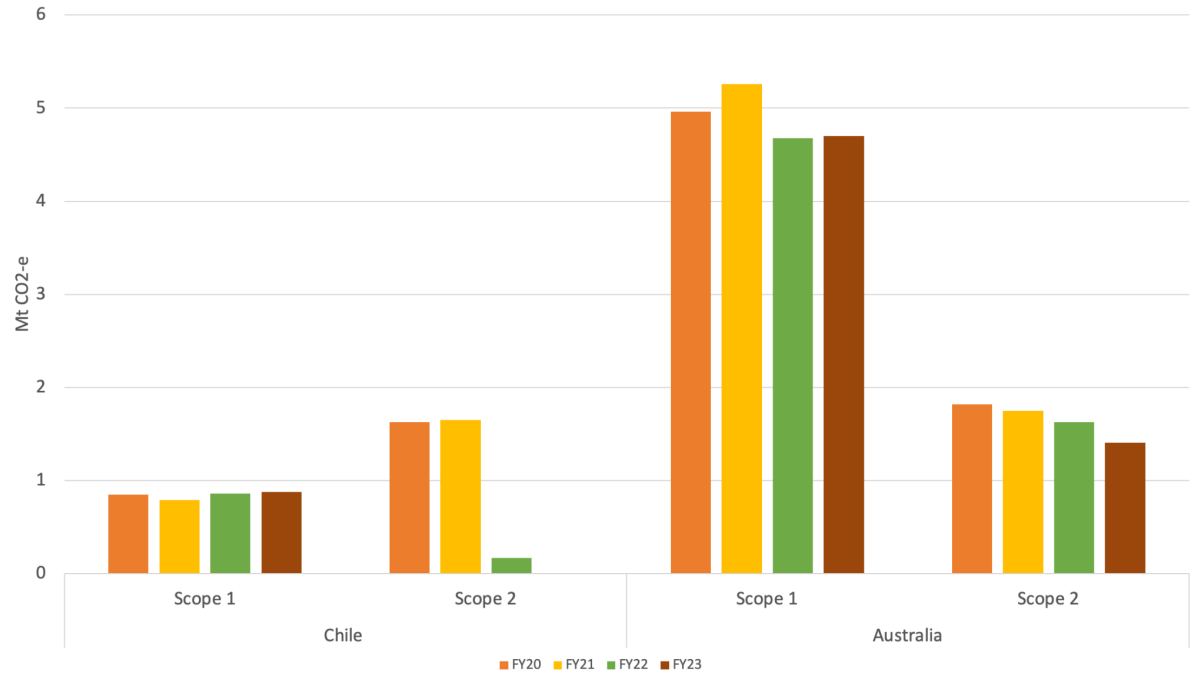
Source: BHP Operational Decarbonisation Presentation

[108] BHP, ESG Factbook 2023, 22 August 2023

The vast majority of BHP's capital allocation to decarbonisation to date is in Chile, specifically via power purchase agreements (PPA) in Chile, decarbonising electricity demand across BHP's Escondida and Pampa Norte (Spence and Colorado) nickel operations. BHP signed a 15-year PPA with Enel in FY22 for 3,300GWh per annum, powering 100% of Escondida's electricity demand from renewable energy.

BHP signed a 10-year PPA with Colbun for 3,300GWh per annum to Spence, powering 100% of Spence's electricity demand with renewables in FY23, and will cover ~90% moving forward as Pampa Norte's production scales. As such, BHP has eliminated Scope 2 emissions from its entire nickel operations across Chile.

Figure: BHP Emissions Profile



Source: BHP ESG Factbook FY23, CEF Calculations

BHP has also mapped the transition away from diesel used in its fleet, shifting to a combination of trolley assist and full-electric trucks from FY28 in Chile. Currently, BHP's Chilean operations use ~200 trucks, equating to an annual diesel consumption of ~**350 million litres**. Escondida and Pampa Norte's diesel use represents ~ 80% of BHP's entire Scope 1 GHG emissions in Chile.[109]

BHP will decrease diesel haul truck emissions in Chile 30% by FY30, via installation of trolley assist power lines, and phasing in full-electric haul trucks post FY30 to abate 100% of haul truck emissions. BHP has signed supply agreements with Caterpillar and Canadian industrial equipment dealer Finning to replace Escondida's fleet over the coming decade.

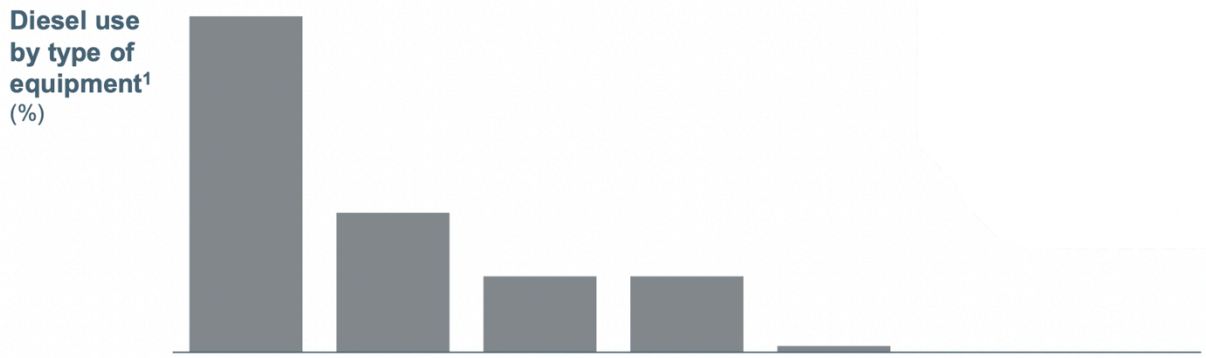
Given this leadership in Chile, CEF asks why BHP has delayed diesel abatement across Australia, opting to defer capital to reducing diesel use post FY30 (i.e. well beyond when the current board and CEO have all retired!). BHP consumed 66.8 petajoules (PJ) of energy from distillate across its Australian operations in FY23.[110] With a weighted-average Fuel Tax Credit

[109] BHP, Operational Decarbonisation, 21 June 2023
[110] BHP, ESG Factbook 2023, 22 August 2023

rate of 40.9c/L in FY23, BHP would have received up to **$580m** in tax credits. This is equivalent to ~ **1,420 million litres** of imported diesel, using BP conversions.

BHP Australian operations use ~550 haul trucks. Haul trucks and ancillary equipment make up the vast majority of BHP's diesel use, and thus the vast majority of BHP Australia's total energy demand.

Figure: BHP Diesel Consumption FY20



	Trucks	Ancillary & others	Locomotives	Excavators	Drills	Shovels	Draglines
Equipment count[1]	~550	~500	~180	~50	~100	~20	~25
Technology readiness	Under development	No current pathway	Under development	Available	Available	Available	Available

Source: BHP Operational Decarbonisation Presentation

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.[111]

When tested at Caterpillar's testing facilities, fully loaded, the Caterpillar achieved a top speed of 60km/h, and averaged 12 km/h over a 1km run up a 10% incline. The truck was able to capture energy during braking down the 10% decline, maintaining enough battery energy to complete the entire run and perform additional complete cycles.[112]

In May 2023, BHP began testing a prototype full-electric haul truck, built on a Caterpillar 793F frame.[113] BHP plans to run the trial Caterpillar from 2024, and deploy post 2028 following testing and commercial viability.

Also in August 2021, BHP joined Komatsu's Greenhouse Gas Alliance, a collection of world-leading miners aiming to develop commercially viable zero-emission haul truck solutions.[114] Komatsu is targeting a 50% reduction in Scope 3 emissions by FY30, relative to

[111] BHP, BHP and Caterpillar to Accelerate Development of Zero-Emissions Mining Trucks, 31 August 2021
[112] The West Australian, WesTrac to Play Key Role in Lower Emissions after Caterpillar Trials First Battery Electric Truck, 23 November 2022
[113] SMH, Monster Movers: BHP Tests Electric Trucks the Size of Two-Storey Houses, 29 May 2023
[114] BHP, BHP Revs into Komatsu's GHG Alliance, 3 August 2021

FY10. Zero-emissions hauling is a critical component to decarbonising Australian mining, and thus, decarbonising Komatsu's supply chain emissions.

In May 2023, Komatsu gathered members at its Arizona proving grounds to showcase a full-electric haul truck performing cycles, both with static charging and trolley assist systems charging batteries during descent and assisting the trucks on incline.[115]

Figure BHP Electrification contracts:

Company	Partner	Vehicle	Trial	Deployment
BHP	Caterpillar	Trucks	2024	2028
BHP	Komatsu	Trucks	2025	2028
BHP	Progress Rail	Locomotives	2024	2029
BHP	Wabtec	Locomotives	2024	2029
BHP	Liebherr	Excavators	2024	2027

The transition to electrification will translate to genuine operational cost savings over time as globally-significant firms eliminate fossil fuel risk and are no longer susceptible to the hyperinflationary and hyper-volatility of imported diesel.

BHP estimates annual operational expenditure (opex) savings upwards of US$200m annually, driven largely by the reduction of technology-reliant diesel. By FY50, opex savings forecasts are likely to reach US$900m annually.[116]

From FY24-FY30, BHP's decarbonisation capital allocation of US$4bn will be divided primarily into WAIO and Escondida, specifically:

- **WAIO** US$1.6bn (40% of capex)
- **Escondida** US$1.24bn (31% of capex)
- **BMA** US$480m (12% of capex)
- **Pampa Norte + Potash** US$440m (11% of capex)
- **Olympic Dam + Nickel West** US$240m (6% of capex).

[115] Canada Mining Journal, Komatsu Gathers GHG Alliance for Battery-Powered Haul Truck, 1 June 2023
[116] BHP, Operational Decarbonisation, 21 June 2023

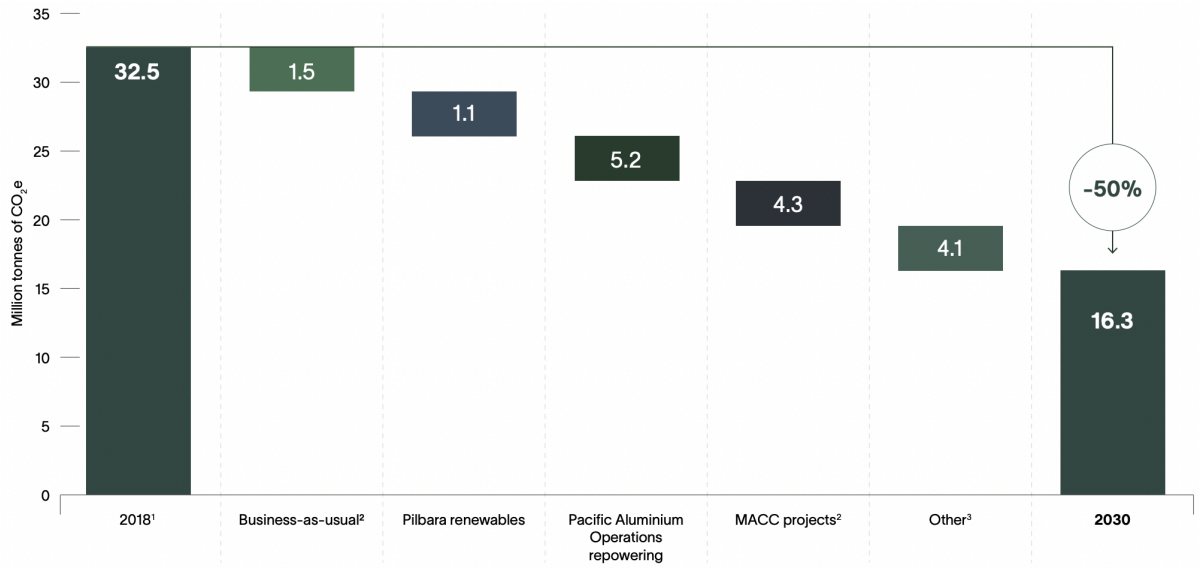
Rio Tinto

Rio Tinto has an interim emissions reduction target of 50% by 2030 relative to 2018, and net zero by 2050. To achieve its climate goals, Rio Tinto has allocated US$7.5bn to decarbonisation investments through 2030, US$1.5bn of which will be deployed from 2022-25.[117]

Rio Tinto states its approach to climate change is to: (1) be the best operator, (2) achieve impeccable ESG credentials, (3) to excel in development, and (4) to strengthen social license.[118] However, in 2022, Rio Tinto's decarbonisation-related capital expenditure (capex) totalled only $94m, a fraction of the $500m guidance Rio promoted at the start of the year.[119]

In 2022, Rio Tinto has achieved a 7% reduction in consolidated group emissions from its 2018 baseline.[120] This has been primarily driven by a reduction in Scope 2 emissions from renewable energy penetration in nickel mining in Escondida, Chile, and Kennecott, US. It is third of the way through its emissions reduction timeline, and significantly behind the trajectory needed to achieve its 50% emissions reduction target in 2030.

Figure: Rio Tinto Emission Reduction Target



Source: Rio Tinto Climate Change Report 2021

In 2022, mobile diesel used in haul trucks, diesel locomotives and other mining equipment contributed 3.6 Mt CO_2-e to Rio Tinto's operational emissions. 61% of Rio Tinto's global emissions from mobile diesel are from direct consumption in its WA iron ore division. Rio Tinto uses ~ **1.3 billion litres** of diesel in trucks, trains and mobile equipment globally.[121]

In iron ore, Rio Tinto uses ~ **794 million litres** a year to power its haul trucks, mining equipment and rail systems. Given the weighted-average fuel tax credit rate of 38.1c/L in

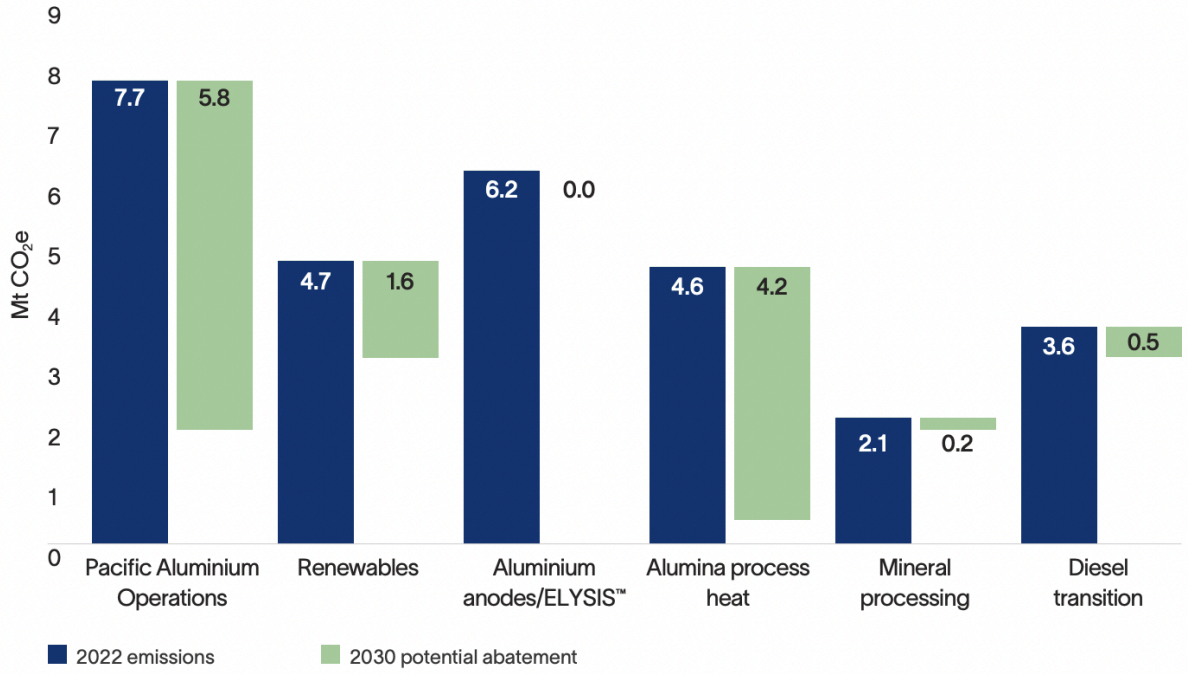
[117] Rio Tinto, Annual Report, 2022
[118] Rio Tinto, Climate Change Report 2022, 22 February 2023
[119] Rio Tinto, Climate Change Report 2022, 22 February 2023
[120] Rio Tinto, ESG Factbook 2021
[121] Rio Tinto, Climate Change Report 2022, 22 February 2023

FY22, Rio Tinto would have received up to **$303m** in tax credits to consume diesel in its Australian iron ore operations alone.

Despite being the largest diesel consumer across its WA iron ore competitors, Rio's emissions reduction pathway will 'potentially' abate up to only 0.5 Mt CO_2-e from mobile diesel by 2030.[122] This represents an emissions reduction of just 12.2% across the decade. This poses a significant risk to Rio Tinto's profitability as it maintains high exposure and demand for hyperinflationary fossil fuels. Rio Tinto's Pilbara iron ore unit costs continued to rise in 2022 to $21.3/wmt, up 14.5% from 2021, primarily driven by inflationary diesel imports and tightening labour markets.[123]

If Rio Tinto's 2030 emissions reduction pathway is successful, mobile diesel will be the second largest contributor to Rio's emissions profile by 2030.

Figure: Rio Tinto Emissions Abatement Strategy to 2030



Source: Rio Tinto Climate Change Report 2022

In September 2021, Rio Tinto announced a partnership with Caterpillar to develop zero-emissions autonomous haul trucks for its WA mining operations. The trial will use converted 793F Caterpillar haul trucks, fitted with Caterpillar electric powertrain technology. If successful, Rio Tinto will deploy 35 new 793 Caterpillars at Gudai-Darri, its most technically advanced iron ore mine.[124]

In August 2021, Rio Tinto partnered with Komatsu to fast-track the development of zero emission mining haulage solutions. As part of the **Komatsu GHG Alliance**, Rio Tinto will begin testing of power-agnostic (diesel-electric, full-electric, trolley-assisted) models before adopting on a commercial scale in the latter half the decade.[125]

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[122] Rio Tinto, Climate Change Report 2022, 22 February 2023
[123] Rio Tinto, Annual Report, 2022
[124] Rio Tinto, Rio Tinto Teams up with Caterpillar for Zero-Emissions Autonomous Trucks, 15 September 2021
[125] Rio Tinto, Rio Tinto and Komatsu Partnering for Zero-Emission Mining, 2 August 2021

Appendix

BP Conversion Figures

Products	To convert					
	Barrels to tonnes	Tonnes to barrels	Kilolitres to tonnes	Tonnes to kilolitres	Tonnes to gigajoules	Tonnes to barrels oil equivalent
From	Multiply by					
Ethane	0.059	16.850	0.373	2.679	49.400	8.073
Liquified petroleum gas (LPG)	0.086	11.600	0.541	1.849	46.150	7.542
Gasoline	0.120	8.350	0.753	1.328	44.750	7.313
Kerosene	0.127	7.880	0.798	1.253	43.920	7.177
Gas oil/diesel	0.134	7.460	0.843	1.186	43.380	7.089
Residual fuel oil	0.157	6.350	0.991	1.010	41.570	6.793
Product basket	0.124	8.058	0.781	1.281	43.076	7.039

Source: BP Statistical Review of World Energy 2021 – Approximate Conversion Factors