



Unlocking Green Metals Opportunities for a Future Made in Australia

Consultation Paper Submission

Climate Energy Finance

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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 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.

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Submission to the Federal Government, Department of Industry, Science and Resources:
Unlocking Green Metals Opportunities for a Future Made in Australia: Consultation Paper

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Section 1. Key Asks and Recommendations

Key Ask. Climate Energy Finance (CEF) sees an urgent imperative for the Federal Government to establish the policy and budget support to accelerate the development of a competitive Australian green metals industry by investing a minimum of an additional \$10-30bn capital and direct budget support in the 2024-25 Mid Year Economic and Fiscal Outlook (MYEFO), building on Treasurer Jim Chalmers' \$22bn budget support provided in May 2024, and the \$40-45bn of capital support established in May 2023 (via the NRF, NAIF, EFA, CEFC, ARENA). The employment and private investment potential for this is huge, and the strategic need is likewise compelling given the long term terminal threat to Australia's A\$220bn of fossil fuel exports in 2022-23.

Recommendation 1. Climate Energy Finance recommends the total investment be deployed strategically via a complementary mix of financing mechanisms, including:

- **Production Tax Incentives** of \$10bn for green metal refining, expanding on the Critical Minerals Production Tax Incentive introduced in the Federal Government's 2024-25 budget to cover strategic metals imperative to Australia's economic resilience and security, and to the global transition to net zero, and complementing the Hydrogen Production Tax Incentive to lower the cost-differential for first movers in embedding decarbonisation.
- **Contracts-for-Difference (CfD)** to further bridge the gap between the green premium present during early development of low-emission value-added capacity, allowing Australia's first movers to export Australia's world-leading renewable energy resources to our key trading partners in a globally competitive market.
- **Public procurement for green metals** to create national demand signals for decarbonised bulk commodities and strategic metals, introducing emissions intensity requirements for public infrastructure, defence projects, and government-funded renewable energy and associated transmission and distribution projects.
- **Establish an Australasian Green Iron Corporation Joint Venture** between the Federal Government of Australia and governments of Australia's key trading partners to enable international partnerships and collaboration across the green metals value chain, incorporating Australia's iron ore mining majors, international leaders in steel production, and representative industry bodies. This will facilitate the transfer of critical skills, technology, investment, and alignment of decarbonisation objectives to reduce domestic and exported emissions.
- Establish a **new \$10-20bn mandate in the Future Fund** to undertake strategic, public interest, patient equity and infrastructure investments into value-adding Australia's world leading critical minerals and strategic metals onshore powered by renewable energy so we export embodied decarbonisation in aid of the decarbonisation objectives of our key Asian trade partner economies whilst starting to pivot Australia's current commodity export profile away from its massive overreliance on fossil fuels (\$220bn in 2022-23 of LNG, coking and thermal coal).

Recommendation 2. To give DFAT and Austrade a clear new mandate to build international collaboration and consensus to work towards an Asian Carbon Border Adjustment Mechanism (CBAM) to extend and reinforce the merits of the EU CBAM introduced in October 2023. Enhancing the value of Australia's key resource exports by onshore value-adding, powered by firmed renewable energy means the addition of embodied decarbonisation is a \$100-200bn annual trade value uplift opportunity, but only if there is the right price signal incorporated in Asian trade (refer Section 5).

Foreign Minister Penny Wong and Trade Minister Don Farrell need to step up internationally and support the onshore decarbonisation efforts of Ministers Chris Bowen, Ed Husic and Jenny McAllister and leverage the domestic progress made with the Safeguard Mechanism and the ambitious 82% Renewables by 2030 target.

Recommendation 3. Introduce **clear community benefit principles** and **First Nations capacity building and benefit sharing** as conditions for investment recipients.

Recommendation 4. Provide **no investment nor budget support for fossil fuel powered projects** for the onshore refining of critical minerals and strategic metals, unless there is a clear path medium-term to accelerate decarbonisation, e.g. in conjunction with a phased renewable energy buildout and/or the blending in of green hydrogen. CEF also recommends capping and progressively phasing out historical fossil fuel subsidies (such as the Fuel Tax Credit Scheme) to Australia's resource industry to transform a headwind into a tailwind to incentivise corporate leaders to align with the Federal Government's national interest objectives i.e. the Future Made in Australia (FMIA).

Recommendation 5. Support the integration of **industrial demand response mechanisms** into Australia's existing and future grid-connected, energy-intensive value-added refineries. The electrification and scaling of Australia's onshore capacity in green metals refining will require significant new renewable electricity demand. Leveraging industrial demand response during periods of peak power demand and renewable energy droughts will significantly lower the need for additional renewable energy generation, long-duration storage projects, transmission infrastructure, and reduce overcapacity / gold-plating of the NEM during the energy transition.

Section 2. Consultation Paper Direct Response

Question 23. What approach and features do you consider to be most effective?

For example:

- a. Which incentive would lead to the biggest increase in private investment in green metals production across production, investment, and innovation-linked incentives?

Climate Energy Finance (CEF) sees the expansion of production-based tax incentives into strategic green metals refining and value-added industries, namely green iron, nickel and aluminium, as an imperative for the Federal Government to incentivise private investment in onshore value-adding and so realise the massive economic and investment opportunity it presents to transition Australia from a historical petrostate to a world-leading electrostate. CEF sees this as a key opportunity to build investment, regional employment and net export growth in alignment with the FMIA.

BHP has clearly flagged its Australian value-adding in the nickel sector is loss-making and strategically challenged ¹ by the joint China-Indonesian government sponsored investments to massively expand Indonesia's export profile in the nickel sector over 2018-2024,² announcing in July 2024 the suspension of nickel mining.³ This is a clear part of a wider strategic plan to value-add Indonesia's resource base pre-export, and to progressively build out the entire battery and EV manufacturing ecosystem.⁴ Australia faces the threat of ongoing deindustrialisation as our ageing domestic metal refineries need modernisation and/or replacement. China has rapidly expanded global commodity supply in order to flood the global market, which has seen serious ongoing commodity price declines across rare earths, lithium and nickel, to the detriment of the financial viability of key Australian operations.

The introduction of a **Green Iron Reduction Tax Incentive** and **Green Aluminium Refining Tax Incentive** would strongly complement the Federal Government's Hydrogen Production Tax Incentive scheme introduced in the 2024-25 budget.

CEF entirely endorses the use of the financial expertise and independent governance of our leading public financial institutions - NAIF, NRF, ARENA, EFA and ideally the Future Fund - to assess and 'pick' potential winners, providing supportive strategic public capital (infrastructure, debt, VC, equity and grant) to de-risk and crowd-in private investors, both domestic plus foreign

¹ AFR, [King says BHP prioritised shareholder returns over nickel jobs](#), 22 May 2024

² AFR, [Stellantis, Vale in nickel talks in Indonesian coup](#), 14 May 2024

³ AFR, [BHP shuts nickel business to arrest losses](#), 11 July 2024

⁴ FT, [Hyundai and LG Energy open Indonesia's first battery cell factory](#), 3 July 2024

technology and market leaders. CEF entirely endorses the public investments in support of the likes of Alpha HPA⁵, Iluka Resources⁷ and Arafura.⁸ CEE sees a greater need for conditionality with respect to the provision of patient public capital. This should entail binding commitments to: diversity on the board; First Nations involvement in the projects; incorporation of renewable energy power purchase agreements (PPA) and electrification / decarbonisation; development of Australian worker apprentices, retraining, et al. This would help build community buy-in for the FMIA and to accelerate the energy transformation.

This also increases the probability of these Australian firms remaining majority Australian owned, hence likely to pay corporate tax here once successful.

CEF sees a key role for a special purpose mandate of \$10-20bn to the Future Fund to take strategic minority equity stakes in Australian firms developing value-add projects in Australia, particularly where it encompasses embodied decarbonisation via leveraging Australian low cost, zero emissions renewable energy resources.

As part of the negotiations for the extension of production-based tax credits to BHP Nickel, and the development of the ESG premium price signal in conjunction with the EU, the Future Fund could take a 20% equity stake to help recapitalise this business and fund reinvestment / revitalisation, sharing in the long-term upside as and when nickel prices recover.

Question 23. What approach and features do you consider to be most effective?

For example:

- b. What are the merits of receiving incentives through the tax system relative to grant based funding?

The US Inflation Reduction Act (IRA) includes a range of clean energy tax credits and provisions to increase the domestic production of renewable energy and use. On 22 December 2023, the US Treasury announced the proposed regulations for the **Clean Hydrogen Production Tax Credit 45V** (CHPTC), which provides a 10-year incentive for the production of hydrogen using renewable energy, with a credit of up to US\$3/kg H₂. Projects eligible to receive the CHPTC would be required to begin construction by 2033.

⁵ AlphaHPA, [Successful \\$175M EQUITY RAISING TO TAKE FINAL INVESTMENT DECISION](#), 21 May 2024

⁶ AlphaHPA, [HPA FIRST PROJECT STAGE 2 CREDIT APPROVAL FOR \\$400M IN AUSTRALIAN GOVERNMENT LOAN FACILITIES](#), 17 April 2024

⁷ Iluka Resources ASX Release, [ENEABBA RARE EARTHS REFINERY – FINAL INVESTMENT DECISION](#), 3 April 2022

⁸ Arafura Press Release, [COMMONWEALTH GOVERNMENT SUPPORTS THE NOLANS PROJECT WITH US\\$533 MILLION FINANCE PACKAGE](#), 14 March 2024

The CHPTC is structured as a four-tier incentive program, with the largest incentives for the lowest-emission hydrogen production methods, illustrated in the table below.

Emissions Intensity (kg CO ₂ -e / kg H ₂)	Clean Hydrogen PTC (per kg H ₂)
4 - 2.5	Up to US\$ 0.60
2.5 - 1.5	Up to US\$ 0.75
1.5 - 0.45	Up to US\$ 1.00
Less than 0.45	Up to US\$ 3.00

The US IRA also includes a **Renewable Energy Production Tax Credit 45Y (REPTC)**, which provides a maximum US\$6.60/MWh tax credit (US\$5.50/MWh base) for renewable projects with a larger generation capacity than 1MW.

The CHPTC is able to be stacked with the REPTC, providing further economic incentives for projects that require hydrogen as a feedstock, to transition to production methods that utilise renewable energy, as opposed to traditional steam methane reformers (SMRs) that produce hydrogen from methane gas.

The merit of production-based tax incentives is the ability to stack multiple support measures across the value chain of critical minerals and strategic metals refining to maximise the use of renewable energy in the mining and refining process. CEF endorses this approach for Australia.

Australia needs to be fully cognizant that global capital will gravitate to the markets with the best risk-return metrics. China leads the world in almost all zero emissions industries of the future. And that building on the US IRA, government policy and financial supports in Canada, Japan, Korea, India and the EU means that the idea for Australia to 'leave it to the free market' will mean we will miss out on these massive investment and employment opportunities from embracing and facilitating our response to the rapidly evolving global energy transformation.

The Harvard Kennedy School ranks 133 countries with regards to their manufacturing capability in its Economic Complexity Index, and Australia also slipped from 55 in 1995 to 93 today.⁹ The deindustrialisation of the Australian economy is well underway, and will require a concerted Government investment in reskilling to move away from the dig-and-ship mentality of the last 3-4 decades.

⁹ The Australian, Manufacturers hope Future Made in Australia will level the playing field, 3 July 2024

Australia needs to respond to the global national security threat of increasingly concentrated global supply chains, and the FMIA and the unlocking of green metal value-adding within Australia is a way to respond strategically to this, by extending and leverage our existing mining competitive advantage as well as our potential to be a low cost, world scale renewable energy generator.

Question 23. What approach and features do you consider to be most effective?

For example:

- c. Would a 'contracts for difference' scheme or other program designs be preferred?

CfDs provide developers and producers price security over the lifetime of the contract. As the CSIRO clearly documented,¹⁰ first-of-a-kind (FOAK) capital deployments have a significant risk attached, and it is critical for Australia to learn-by-doing in the domestic context. The absence of a clear carbon emissions price signal in international trade (particularly in the greater Asian sphere) is a major barrier undermining Australian corporate leadership in investing in onshore refining, notwithstanding the global competitive advantage stemming from our world leading renewable energy resource potential.

CEF sees it as imperative that the Australian government derisk FOAK projects, and collaborate with our key trade partners to provide the right financial incentives until measures like an ESG premium or an Asian Carbon Border Adjustment Mechanism (CBAM) emerges medium-term, to align and elevate the European Union CBAM. A CfD in the domestic context would incentivise the use of low emissions materials domestically without inflicting an additional cost premium on the end products. A CfD for exported Australian value-added commodities would provide the financial incentive to accelerate decarbonisation ambitions, and should ideally work in concert with our key trade partners, e.g. Japan's CfD for green ammonia.¹¹

¹⁰ CSIRO / AEMO, [CSIRO releases 2023-24 GenCost report](#), 22 May 2024

¹¹ HydrogenInsight, [Japan's CfD subsidy scheme for clean hydrogen looks set to have two separate reference prices](#), 30 April 2024

Question 12. What are the key barriers to investing in new green metals facilities or decarbonising existing facilities? Please indicate the level of priority for addressing each barrier.

The biggest barrier to unlocking investment in new green metal facilities and decarbonising existing facilities is the lack of a high, progressively increasing, regulated price on carbon emissions (refer Section 5). The Safeguard Mechanism is a good first step to reestablishing a price signal in the domestic market for scope 1 emissions for our 219 largest polluting facilities. But even now the price signal of carbon units of A\$30-35/t is well below the A\$75/t cap (rising with inflation +2% pa) that Minister Bowen articulated at the relaunch. CEF strongly advocates for a progressive tightening of ACCU supply and the need to flag the stage 2 extension of the safeguard mechanism to facilities of >25,000tpa, from the current 100,000tpa threshold.

Australia's mining firms were granted access to our public resources decades ago on the provision that they would invest in onshore value-adding pre-export. After the debacle of BHP's Boodarie Iron plant in Port Hedland around 1990,¹² and a similar debacle at Rio Tinto's HiSmelt facility in Kwinana, WA, the Australian mining majors have unrestricted access to continue their zero value-add dig-and-ship strategies that are fabulously profitable near term, but leave Australia entirely strategically vulnerable longer term as the world embracing the need and opportunities for decarbonisation.

As the world's #1 exporter of iron ore (50% global share) and coking coal (55% global share), Australian mining majors should be required, and assisted, to reinvest in the embracing solutions for Australia to aid our key trade partners decarbonise their economy, to our mutual benefit. Green iron is a \$100bn annual value-uplift opportunity for Australia, if we can invest in technology to bring this for magnetite, then hematite, to commercial readiness. We acknowledge the positive step forward with ARENA providing \$59m of grant funding in support of green iron R&D earlier this year, but note we need to go faster.¹³

Likewise, Australia is a world leading bauxite-alumina-aluminium exporter. Rio Tinto has made significant steps forward in 1HCY2024 towards underwriting the necessary investments to progressively embrace decarbonisation, and the longevity of their business across Australasia as a result (refer Section 4).

Australia needs our largest mining corporates to lean into this strategic priority for Australia, leveraging their world-scale balance sheets and capacities, including strong customer

¹² BHP, [Fact Sheet](#), 24 AUGUST, 2005

¹³ RenewEconomy, [ARENA boosts funding and names winners for GH2, iron and steel projects](#), 9 April 2024

relationships with leading global steel producers across Asia. This is a global investment and technology race to the top, and Australia is starting late, and is still lacking ambition relative to both other countries' efforts, and the magnitude of the investment, employment and net export opportunities ahead for Australia.

The lack of demand pull is also a key barrier to development of green metal markets. As a material player in the domestic market, the Federal and State Governments should be leading the development of the market demand for embodied decarbonisation in our domestic market, leveraging the governments' collective buying and contracting power in procurement.

Australia also needs to ensure consistency and collaboration across all levels of government - local, state and Federal. It is critically important that all states align with the FMIA and the climate ambitions of the Federal Government, particularly NSW and West Australia, where the commitment and application is really lagging, particularly on zero emissions project approvals. We note the leading efforts of South Australia to leverage green metals, green hydrogen and collaborate to lift heavy industry decarbonisation efforts,¹⁴ whilst the efforts in Queensland are likewise impressive.¹⁵

Question 17. What factors would enable the acceleration of metals decarbonisation? For producers, what levels of production would be feasible over time?

International and domestic carbon pricing, as well as the introduction of an **Asian Carbon Border Adjustment Mechanism (CBAM)** that works cooperatively and enhances the effectiveness of the European CBAM. The biggest opportunity for green metals refining and processing in Australia powered by firmed renewables is to value-add our exports. This clearly needs an explicit, high price signal in international trade, particularly for North Asia. CEF would strongly encourage the Australian government to mandate DFAT to advocate with our key Asian trade partners for the development of a North Asian CBAM.

As a key pillar of the FMIA National Interest Framework, targeted government intervention is justified where market failures are present, including where negative externalities from more emissions-intensive production methods are not appropriately priced into global markets, so cleaner production methods that present cost effective abatement opportunities are not able to compete on a level playing field with existing industry.

¹⁴ Minister Chris Bowen, [Press conference with Tom Koutsantonis MP, South Australian Minister for Energy and Mining](#), Port Augusta SA, 10 July 2024

¹⁵ CEF, [Queensland's Energy Transformation: From Coal Colossus to Renewable Energy Superpower](#), February 2024

Absent a price on carbon to accurately price negative externalities present in high-fossil fuel consuming, energy-intensive industries, the most effective way to reach price parity with traditional fossil fuel-dependent refining practices that externalise the full cost of their carbon pollution is to establish production-based tax incentives for projects that leverage Australia's abundant natural resources to embed decarbonisation in our key and emerging exports until a clear price on carbon emissions is explicitly priced in international trade.

Question 22. To what extent has government support influenced investment thinking in Australia in respect to projects targeting decarbonisation?

A critical aspect for the success of the FMIA is the alignment of economic incentives with the broader national interest objectives of Australia. An effective price on carbon and production-based tax incentives combined can provide the investor signal that brings price parity to green metals refining relative to that of traditional fossil-fuel metals refining. CEF notes that the government's continued subsidy support for the consumption of imported fossil fuels is a serious headwind to decarbonisation undermining the transition to electrification and decarbonisation of Australia's mining industry.

The Federal Government cannot transition Australia to a renewable energy and value-added refining superpower without significant reform to one of the world's most damaging fossil fuel subsidies, the **Fuel Tax Credit Scheme** (FTC Scheme).

The growth in our over-reliance of high-emission fossil fuels to power our industries has been spurred on by the continued subsidisation of imported petrol and diesel to our largest emitters. Tax concessions via rebates are the largest component of Federal Government and public subsidisation of fossil fuels in Australia, primarily for the consumption of diesel. Over 86% of public fossil fuel support is given in the form of Federal tax expenditures. Since the establishment of the Fuel Tax Act of 2006, in which the current form of the FTC Scheme was introduced, the Federal Government has provided over \$95bn in fuel tax credits to 2023, largely to Australia's largest industrial emitters within the resources sector.¹⁶

The continued subsidisation of imported liquid fossil fuels has resulted in a systematic government failure even in the face of record high profit margins in Australia's iron ore and coal export industries. This undermines Australia's energy security even as it remains a headwind to our country's decarbonisation commitments, particularly contradicting and undermining the Albanese Government's new strategic vision of a Future Made in Australia.

¹⁶ ATO, [Taxation Statistics Excise - Table 4](#), 7 August 2022

As the world, and Australia's key trading partners, transition to a decarbonised economy, it is imperative Australia recognises the risks and hypocrisy associated with exporting commodities that are extracted and transported using high-emission fossil fuels, commodities that are critical to achieving global net zero. The global energy transition represents a fundamental reshaping of global energy and resource security, and the value shift to utilising low-emissions energy within manufacturing. This requires a global overhaul and revaluation of supply chains for key input materials required to produce zero-emission technologies. Fiscal signals need to align with the policy vision, not contradict and undermine it.

The global transformation represents an incredible opportunity cost and risk to Australia if our mining sector continues to 'dig and ship' with high-emissions imported diesel plus methane gas acting as the critical energy sources to maintain our key economic driver, our iron ore industry. However, the transition also presents a once-in-a-century opportunity to emerge as an export powerhouse of low-emission value-added commodities, embedding decarbonisation across a greater share of the value-chain. Australia can leverage our world-leading renewable energy resources and our ability to co-locate the scale of renewable energy generation required to decarbonise our industrial sectors, maximising our competitive advantages.

Capping the diesel fuel rebate at \$50m annually per group would raise \$2-3bn per annum from the 8-10 largest Australian mining majors. Tax revenue raised could be 100% redirected into a special purpose fund with the National Reconstruction Fund to de-risk and accelerate the deployment of EV in the mine haulage sector. Bringing a collaborative industry consensus could accelerate the electrification of mine haulage and rail fleets by 5-10 years, whilst the agreement to a collective solution could see massive onshore investment in Australian mine equipment manufacturing and assembly by global original equipment manufacturers Caterpillar, Komatsu, Liebherr. This in turn could build a massive source of ongoing demand for specialised Australian made batteries, further extending the FMIA gains in building out Australian manufacturing beyond the metals sector.¹⁷

¹⁷ CEF, [Fuel Tax Credit Scheme and Heavy Haulage Electric Vehicle Manufacturing in Australia](#), September 2023

Question 29. What would be an appropriate level of incentive to support the development of competitive production for green alumina, aluminium, steel and iron?

CEF encourages the Federal Government to introduce a minimum of \$10-30bn in new green metals refining measures in the 2024-25 Mid-Year Economic and Fiscal Outlook (MYEFO), in the form of production tax incentives, CfD, domestic content support, and capital support via the Future Fund.

Acknowledging Australia has made good down payments in the last two Federal budgets, CEF advocates for at least \$100bn of new public capital and direct budget support over the coming decade. This is small relative to the commitments of South Korea, Japan, Europe and the US, but also small relative to the massive investment opportunities in the transformation, decarbonisation and reindustrialisation of the Australian economy required.

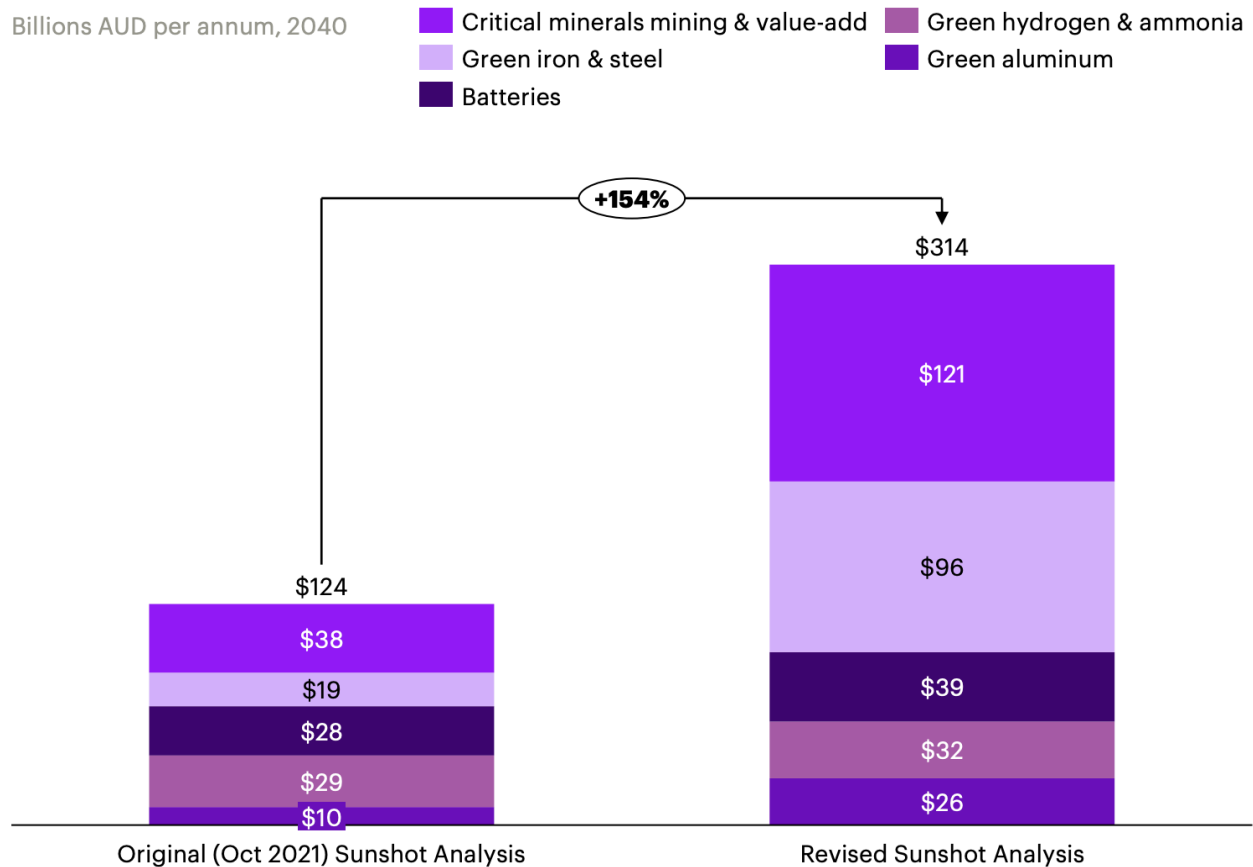
Australia embracing technology and innovation is going to be key. CEF is entirely in support of Grattan Institute CEO Aruna Sathanapally's statement: "We can't have our head in the sand and there are certain things that markets don't do well. R&D of new technologies is one of them," and "But I think there is something there that we do need to take seriously, which is that we can't just assume free trade and geopolitical stability will always be the case. You have to balance the risk against the cost."¹⁸

¹⁸ Capital Brief, [Grattan Institute's new CEO signals move into tech policy](#), 10 July 2024

Section 3. Australia's Green Exports Opportunity

From Accenture's original Sunshot analysis (2021), to their latest revision in September 2023, the clean energy export opportunity has grown 154% to a potential \$314bn per annum by 2040, led primarily by the growth of critical minerals refining and the development of an onshore, value-added industry of critical mineral and iron refining.¹⁹

Figure 3.1: The Clean Energy Export Opportunity for Australia by 2040



Source: Accenture²⁰

The 2023 Accenture Sunshot report models a private sector leverage of 2.8:1, meaning every \$1 of strategically invested public capital should catalyse \$2.8 in private investment across the clean export value chain. As renewable energy technologies continue their rapid deflation as a result of China's world leadership in manufacturing capacity, coupled with growing international adoption of carbon pricing mechanisms, international markets and investors are scaling their ambition for establishing green metal supply chains.

¹⁹ Accenture, [Sunshot: Achieving Global Leadership in Clean Exports](#), September 2023

²⁰ Accenture, [Sunshot: Achieving Global Leadership in Clean Exports](#), September 2023

Section 4. Developing Green Aluminium in Australasia

Australia currently hosts four aluminium smelters along the east coast of Australia, as well as six alumina refineries across Queensland and Western Australia. Aluminium smelting is the largest single consumer of electricity in Australia, responsible for ~ 10% of electricity demand across the National Electricity Market (NEM). Australia's aluminium smelters consume ~ 13.8 GWh/kt of aluminium, equating to ~ 23.5TWh per annum on current operating capacity across the NEM.²¹

Rio Tinto is the largest electricity user in Australia, and the largest producer of aluminium, operating smelters and alumina refineries across Queensland, New South Wales, and Tasmania. In 2023, Rio Tinto's Scope 1 & 2 emissions (on an equity basis) from its Pacific aluminium operations totalled 10.5Mt CO₂-e, with 80% of emissions from purchased electricity, and the remaining from aluminium anodes.²²

Rio Tinto's Tomago Aluminium, the largest aluminium smelter in Australia, requires 950MW of constant power supply, equating to 12% of NSW's electricity demand, and is the largest load in Australia. Currently, Tomago Aluminium secures its high-emissions power supply from a long-term power agreement with AGL, set to expire in 2028.²³

According to Rio Tinto, its three Gladstone production assets - Yarwun alumina refinery, Queensland alumina refinery, and the Boyne aluminium smelter - require more than 1GW of reliable power to operate, equating to over 4GW of firm wind and solar power required to decarbonise its electricity supply.

Developing Australia's green aluminium industry requires the decarbonisation of electricity supply at significant scale, and the shift away from carbon anodes to inert anodes as part of the smelting process. After zero effort in the last decade, Rio Tinto have made a step-change in progress in Australia in 1H CY2024 to establish long-term renewable energy contracts to decarbonise and transition away from coal-fired power plants:

- On 24 January 2024, Rio Tinto announced a 25-year PPA for 100% of the electricity generated from European Energy Australia's 1.1GW Upper Calliope Solar Farm to power its Gladstone operations. The PPA with European Energy would be sufficient to reduce Rio Tinto's operating emissions by 1.8Mtpa CO₂-e.²⁴

²¹ Renew Economy, [You See an Alumina Refinery, I See a Very, Very Big Battery](#), 31 July 2023

²² Rio Tinto, [Sustainability Fact Book](#), 2023

²³ Tomago Aluminium, [Industry Briefing Session](#), 14 November 2022

²⁴ Rio Tinto, [Rio to Drive Development of Australia's Largest Solar Farm at Gladstone](#), 24 January 2024

- On 21 February 2024, Rio Tinto announced Australia’s largest renewable energy 20-year PPA to supply its Gladstone operations, with 80% of the zero-emission electricity generated from Windlab’s planned 1.4GW Bungaban Wind Farm over a 25-year term.²⁵

Combined the PPA’s Rio Tinto have announced will provide 2.2GW of renewable energy to Gladstone aluminium operations, lowering electricity emissions for Rio Tinto and Queensland by up to 5Mtpa CO₂-e, generating the equivalent of 10% of Queensland’s current electricity demand.

- In March 2024, the Newcastle Herald reported Rio Tinto released a Request for Proposal (RfP) for zero-emissions generation and firming capacity to decarbonise the energy demand of its Tomago smelter.²⁶

On 28 June 2024, Rio Tinto announced it will install some pilot carbon free aluminium smelting cells at its Arvida smelter in Quebec, Canada, using the first technology licence issued by the ELYSIS joint venture (Rio Tinto and Alcoa).²⁷ The partnership will invest US\$285m (C\$375m) to build a demonstration plant of ten pots operating at 100kA, moving closer towards full-scale commercialisation of zero-emission aluminium technology.

Rio Tinto also operates the New Zealand Aluminium Smelter (NZAS) alongside Japan’s Sumitomo Chemical Company (Rio Tinto 79.36%) on Tiwai Point, operating as New Zealand’s only aluminium smelter.

On 31 May 2024, NZAS announced long-term, high-renewable energy penetration electricity supply deals until 2044. NZAS expanded and diversified from its previous single contract with Meridian Energy to form 20-year arrangements with Meridian Energy, Contact Energy and Mercury Energy for a volume of 572MW to power the three potlines at Tiwai Point.²⁸

New Zealand has historically been primarily powered from renewable energy sources, with hydroelectricity remaining the base load source of electricity for the country. In 2023, according to the Ministry of Business, Innovation & Employment (MBIE), hydroelectricity supplied 26.3TWh into the grid, equivalent to 61% of net generation.²⁹ Variable renewable energy is the fastest growing generation technology, with wind and solar generation growing by 13% and 30% year-on-year respectively. In contrast, coal and gas-fired generation dropped by 18% and 5% respectively in 2023.

²⁵ Rio Tinto, [Rio Signs Australia’s Biggest Renewable Power Deal as it Works to Repower its Gladstone Operations](#), 21 February 2024

²⁶ Newcastle Herald, [Tomago Aluminium Seeks Massive Renewable Energy Supply for Smelter](#), 22 March 2024

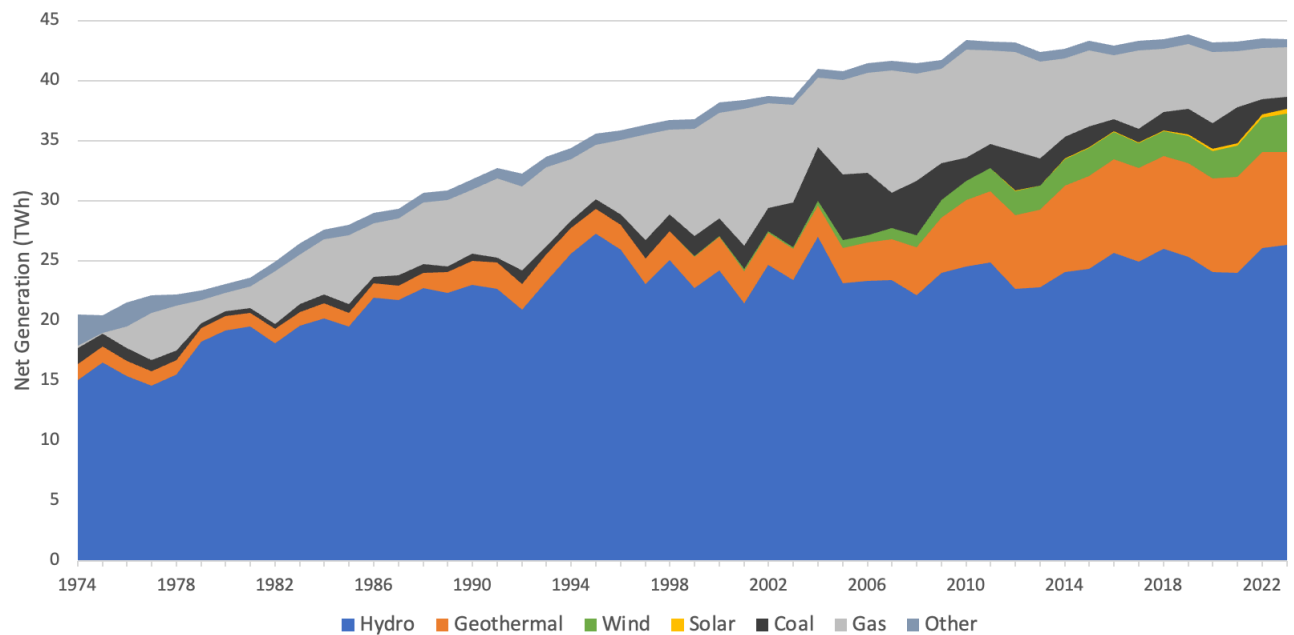
²⁷ Rio Tinto, [Rio to Install Carbon Free Aluminium Smelting Cells Using First ELYSIS Technology Licence](#), 28 June 2024

²⁸ NZAS, [Tiwai Point to Stay Open in 20-year Deal](#), 31 May 2024

²⁹ MBIE, [Electricity Statistics Data Tables](#), updated 13 June 2024

As a result, renewable energy supplied over 88% of net electricity generation across New Zealand in 2023 (Figure 3.1). NZAS' Tiwai Point is grid-connected, meaning it's powered primarily from renewable energies. As a result, NZAS produces ~ 335,000tpa of aluminium with a carbon intensity of just 2t CO₂-e / tonne aluminium, **85% lower** than the international average of 13t CO₂-e / tonne aluminium.³⁰

Figure 4.1: New Zealand Historical Electricity Generation



Source: NZ MBIE³¹

As electricity grids reach high levels of renewable energy, and variable renewable energy has an increasingly critical role in power systems, aligning electricity demand with that of supply becomes integrally to the stability and security of the grid. In New Zealand, given the majority of power is sourced from hydroelectricity, 'dry year' problems rise when New Zealand's hydro lakes do not receive sufficient rainfall or snowmelt, resulting in decreased generation capacity.

Intermittency of generation requires a reshaping energy grids to allow for periods of intermittent demand. Currently, process heat accounts for 34% of New Zealand's energy consumption. Industrial electrification via process heat has huge potential (upwards of 4TWh by 2050) in New Zealand.

The integration of industrial **Demand Response Management (DRM)** is a critical mechanism to achieving beyond 90% renewable energy.

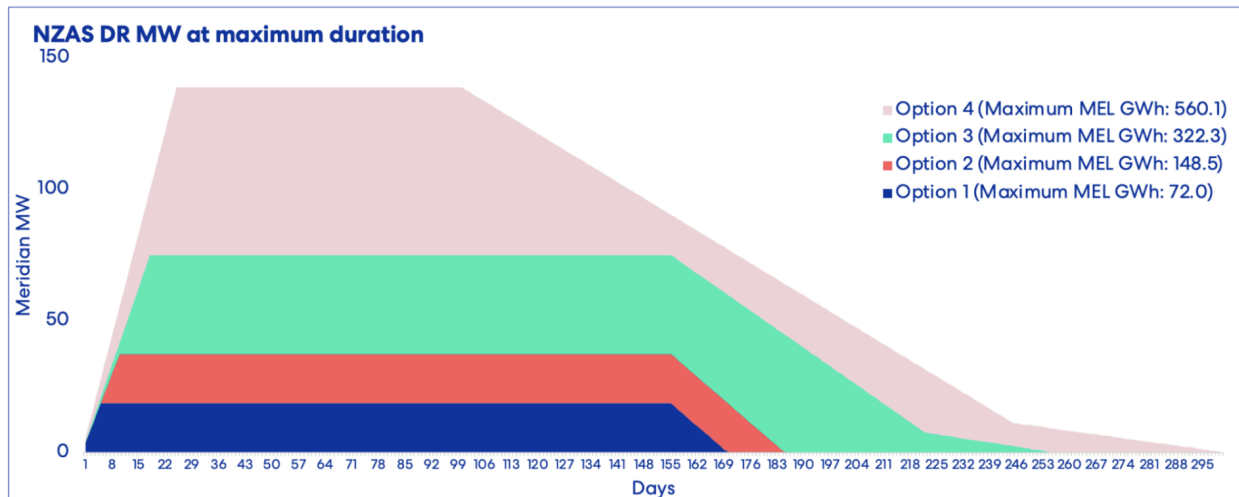
³⁰ Meridian Energy, [2024 Investor Day Presentation](#), 25 June 2024

³¹ MBIE, [Electricity Statistics Data Tables](#), updated 13 June 2024

On 31 May 2024, Rio Tinto’s NZAS announced a world-leading 20-year term DRM agreement with Meridian Energy.³² The DRM builds on the base contract for 472MW until 31 December 2024, and lowering to 377MW from 2025 to 2044 at a sustainable price subject to conditional CPI inflation from 2028.³³ Meridian Energy is able to call the following options for NZAS to lower physical electricity consumption in Figure 4.2.

Figure 4.2: NZAS DRM Agreements and Maximum Call Volumes per Option

Option	Equivalent reduced consumption (MWh per hour)	Exercisable Reduction from Meridian demand response agreement (MWh per hour)	Usual Ramp-Down Notice Period	DR Period (equivalent number of days)	Usual Ramp-Down Period (equivalent number of days)	Usual Ramp-Up Notice Period (equivalent number of days)	Usual Ramp-Up Period (equivalent number of days)	Maximum Calls
1	25	18.75	3 Business Days	Minimum 10 days, maximum 150 days	5 days	3 days	15 days	Unlimited, but the Option cannot be exercised more than 4 times in any 12-month period
2	50	37.5	3 Business Days	Minimum 15 days, maximum 145 days	10 days	3 days	30 days	Unlimited, but the Option cannot be exercised more than 2 times in any 18-month period
3	100	75	3 Business Days	Minimum 22 days, maximum 137 days	18 days	5 days	100 days	The Option cannot be exercised more than 8 times over the Term
4	185	138.75	5 Business Days	Minimum 30 days, maximum 75 days	25 days	5 days	200 days	The Option cannot be exercised more than 4 times over the Term



Source: Meridian Energy³⁴

If an option is called, a payment is made to NZAS for real reduction of load. In addition, NZAS is paid an annual premium in exchange for Meridian Energy to exercise its optionality of demand response calls.

³² NZAS, [Tiwai Becomes New Zealand’s Largest Battery and Helps to Keep the Lights On](#), 31 May 2024

³³ Meridian Energy, [2024 Investor Day Presentation](#), 25 June 2024

³⁴ Meridian Energy, [2024 Investor Day Presentation](#), 25 June 2024

As per CEF's **Recommendation 5**, this model can be modified for application in Australia during periods of seasonal low renewable energy generation, and for responding to enhancing grid reliability and peak load management.

Industrial DRM can also help Australia navigate occasional wind energy droughts as experienced in April and May of 2024. Although Q2 is predictably a lower wind output period for Australia, 2024 experienced a lull in wind energy generation that pushed the combined output of renewables below its level of 2023. Coopers Gap, the largest operating wind farm in Australia, dropped to a capacity factor of 29% in 2QCY24, down from 36% in 2QCY23.³⁵

Implementing industrial DRM into green metals refining, incorporating Australia's largest load centres (aluminium smelters across the NEM), presents a significant opportunity for maintaining energy security and stability during the energy transition, maximising production during periods of predictably high renewable generation, and ensuring metals refining is not dependent on thermal power station reserves during irregular periods of lower output. Industry can be comfortably incentivised for this reserve capacity, as evidenced with NZAS.

Rio Tinto is a key example of corporate leaders beginning to respond at scale to accept and act in alignment with the shift of national interest objectives and the climate science, building shareholder pressure for a credible pathway to net zero emissions, even absent a price signal on carbon or clear market for green metals.

Australia's fossil fuel and resource majors are realising the builder pressure from shareholders to implement timely, costed pathways to net zero, aligning capital expenditure and investments into tangible emissions reduction technologies. This is evident in April 2024's unprecedented rebuke of Woodside Energy's climate plan, with 58% of investors voting against the plan - the strongest protest recorded against listed climate-related companies.³⁶ One of which voted against Woodside's climate action plan was the largest superannuation fund in Australia, AustralianSuper (which held a 4.5% stake in WDS at the end of June 2023).³⁷

³⁵ OpenNEM, [Coopers Gap Wind Farm](#), accessed 10 July 2024

³⁶ The Guardian, [Woodside Energy's Climate Plan Rejected by Shareholders in Globally Unprecedented Rebuke](#), 24 April 2024

³⁷ ABC, [Shareholder Rejection of Woodside's Climate Plan Sends Message to Company, But Can it do Anything More Consequential](#), 27 April 2024

Section 5. A Price on Carbon Emissions

Across the globe, economies are shifting energy and industry policy to that which factors in a price on carbon, both implicitly and explicitly. The two largest emissions trading schemes (ETS) are in China and the EU.

Carbon prices are needed to capture and price in the negative externalities associated with carbon emissions, i.e. the burden placed upon the public from diminishing crop yields, health care costs, and the rapidly rising monetary impacts of climate change and the increasing severity and frequency of heat waves, droughts, flooding and sea level rise. The IEA models in its Net Zero Emissions scenario the developed world having comprehensive carbon prices of US\$250/t by 2050, with major developing countries having a carbon price of ~US\$200/t. While carbon markets globally are expanding with each year, there is a long way to go.

CEF are strong advocates for the introduction and progressive rise of a carbon price across the whole economy as a clear indication of policy direction both domestically and internationally. This would act as the most effective mechanism to align private investment in clean energy technologies and production methods with that of national emissions reduction objectives.

Putting a price on carbon shifts the burden back onto the entity, and their supply chain, that is responsible for carbon emissions. Emissions do not respect international borders. The burden of climate change is placed onto the shoulders of everyone, with those least responsible suffering the largest burden. A credible global price on carbon eliminates the ability for fossil fuel producers to ship emissions offshore free of charge, externalising their cost of doing business, a massive ongoing subsidy that continues to undermine the Federal Government's Climate Change (net zero future) Act 2023 and the economic competitiveness of zero emissions alternatives.

Currently, there are three main carbon pricing mechanisms: Emission Trading Systems (ETS); direct carbon taxes; and Carbon Border Adjustment Mechanisms (CBAM).

- **Emission Trading Systems (ETS)** – introduces a cap to the level of GHG emissions and allows industries with low emissions to sell additional allowances to larger emitters. The ETS creates a supply and demand market dynamic, with higher demand for allowances driving up the prices the entity must pay to emit. The most effective and significant scheme is the European Union (EU) ETS, which has been in place for several decades, and is progressively expanding beyond the electricity sector to heavy industry, and has credible prices currently averaging €60-100/t and a ratcheting-up over time capacity.
- **Carbon Taxes** – an explicit price on carbon with a defined tax rate on GHG emissions or carbon content of fossil fuels. Unlike the dynamic market of an ETS, a carbon price is pre-defined, and often has a legislated ratchet-up profile over time e.g. Singapore (S\$25/t), Canada (C\$80/t) and New Zealand (NZ\$50/t).

- **Carbon Border Adjustment Mechanisms (CBAM)** – October 2023 saw the EU introduce its transitional CBAM to ensure that the imposition of the carbon price on EU industry doesn't create an unfair advantage for high emissions import alternatives, covering critical industries including iron/steel, aluminium, cement, fertilisers, hydrogen and electricity.

On 28 May 2024, The EU and Australia signed a Memorandum of Understanding (MoU) for a bilateral partnership to cooperate on sustainable critical and strategic minerals.³⁸ The MoU is designed to provide a framework to build secure value chains between the economies that support the clean energy and digital transition. The scope of the MoU includes, but is not limited to, the:

- Cooperation and integration of sustainable material value chains, including networking, joint facilitation (i.e. joint ventures), and promotion of trade and investment linkages,
- Development of open, fair and competitive markets for critical raw and processed minerals, developing Australia's domestic sector to enable the EU to diversify its suppliers necessary to achieve the green transition,
- Cooperation on ESG standards and assessments that align international mineral pricing with high ESG standards.

This MoU marks a significant moment for international development of high environmental, social and governance (ESG) standards for mining supply chains, a major opportunity to leverage and extend the EU Battery Passport.³⁹ CEF views this as a good first step towards developing decarbonised commodity trade and the reshaping of supply chains to regions of high renewable energy resources. As global leaders export more technologies and resources critical to the net zero transformation, exporters are beginning to reshape and enhance carbon pricing and emissions reduction mechanisms to align their industries with the EU.

In September 2020, President Xi Jinping announced that China will “aim to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060” (the “dual carbon” goals). A key policy step to deliver on this ambition saw China move from seven regional pilot ETS schemes to a national ETS in July 2021. CEF views China's progress on decarbonisation as well ahead of these conservative targets, and notes China installed a world leading, staggering 24GW per month of new wind and solar, clearly showing a determination to accelerate its global investment and technology leadership in cleantech industries of the future. As our #1 trade partner by far, Australia needs to understand the strategic threat, and opportunities, for us of China's achievements.⁴⁰

³⁸ Aus DISR, [MoU Between the EU and Australia on Strategic Partnership on Sustainable Critical and Strategic Minerals](#), 28 May 2024

³⁹ European Commission, [Circular economy: New law on more sustainable, circular and safe batteries enters into force](#), 17 August 2023

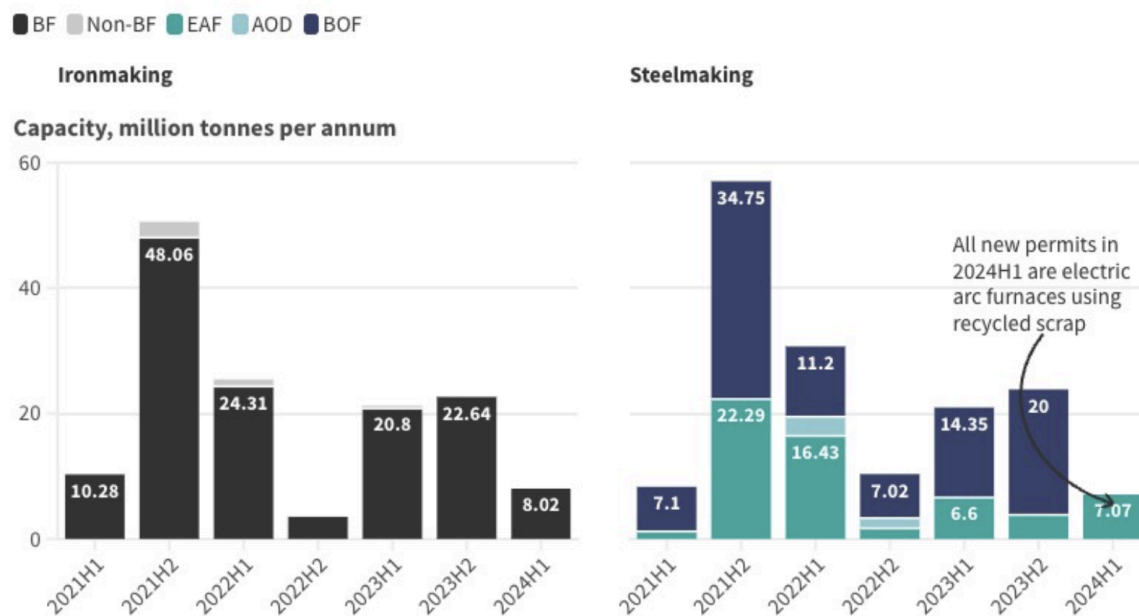
⁴⁰ CEF, [POWER SHIFT: Staggering rise of renewables positions China to end new coal power before 2030](#), April 2024

Whilst the pricing of the Chinese ETS is still averaging only US\$12/t, by volume this scheme is the largest in the world, covering 40% of China's total energy emissions, 4x the EU ETS.⁴¹ The current national ETS covers 2,257 enterprises from China's power sector as of the end of 2023. The facilities covered under the ETS emit ~5.1 billion tonnes of CO₂-e annually.⁴² Coverage is expected to soon include energy-intensive industrial sectors – including petrochemicals, chemicals, building materials, iron and steel, non-ferrous metals, paper and domestic aviation – which account for another 30% of energy sector emissions. April 2024 saw China's Ministry of Ecology and Environment (MEE) significantly tighten allocations to enhance the effectiveness of the ETS.⁴³

The steel industry is the second-largest emitting sector in China behind electricity, emitting some 1.8bn t CO₂-e pa. The decarbonisation of this industry is critical to achieving global net-zero, and Australia could play a globally significant role in collaborating with China to deliver on this.

In the first half of 2024, China approved **zero** new permits for coal-based steelmaking projects, the first time since China announced its dual carbon objectives in September 2020. Conversely, China approved over 7Mt of EAF capacity in 1H2024, signalling an imminent tipping point towards China's transition to a decarbonised steel industry.⁴⁴

Figure 5.1: New Permits for Ironmaking and Steelmaking Projects in China



⁴¹ IEA, [Enhancing China's ETS for Carbon Neutrality: Introducing Auctioning](#), May 2024

⁴² SCMP, [China Strengthens State Control on Carbon Emissions Trading](#), 5 February 2024

⁴³ Bloomberg, [China Carbon Price Tops 100 Yuan For First Time as Rules Tighten](#), 24 April 2024

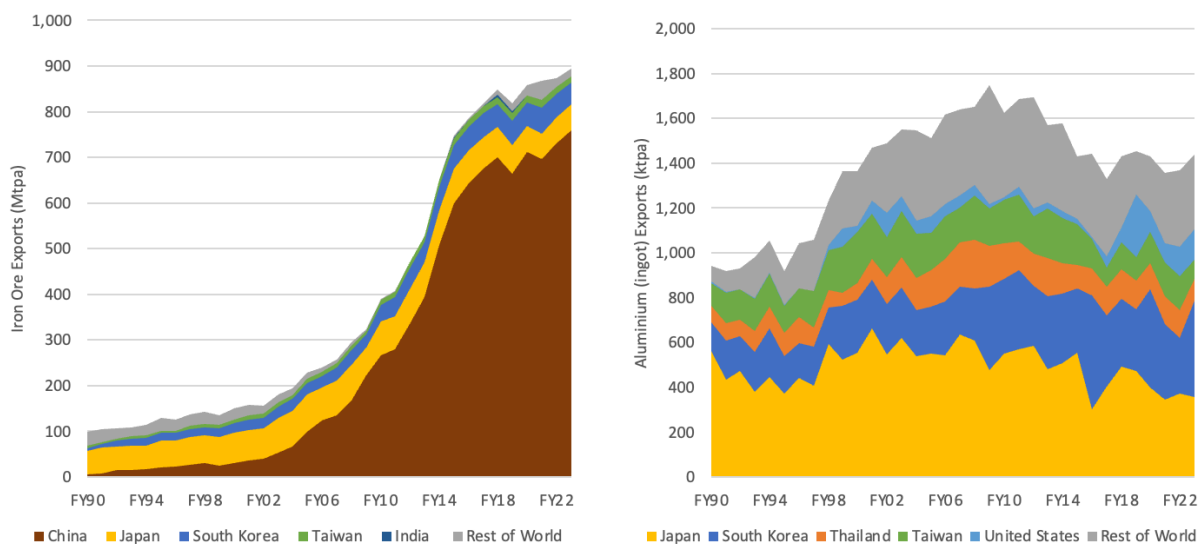
⁴⁴ CREA, [Turning Point: China Permitted No New Coal-based Steel Projects in 1H2024 as Policies Drive Decarbonisation](#), 11 July 2024

Source: Centre for Research on Energy and Clean Air ⁴⁵

The decarbonisation of China’s steel industry presents a significant risk, and opportunity for Australia to align its domestic decarbonisation objectives with that of its key trading partners to ensure Australia’s economic powerhouse industries of today and tomorrow, including hot briquetted iron (HBI) and green iron, remain an integral part of the value chain.

The vast majority of Australia’s strategic metal exports are to developed Asia. In 2023, Australia exported 755Mt of iron ore to China, 85% of total iron exports. The second and third largest export destinations of Australia’s iron ore, Japan and South Korea, combined for a further 12% of total iron exports. Collectively, Australia’s largest trading partners accounted for 96% of iron ore export volumes in 2023.⁴⁶ Aluminium exports to Asia, including Japan, South Korea, Thailand, Taiwan, Indonesia, and Malaysia, accounted for 78% of the 1,452kt exported in 2023.

Figure 5.2: Australian Iron and Aluminium Export Destinations by Volume



Source: Resource and Energy Quarterly June 2024 ⁴⁷

On 10 February 2023, Japan’s Cabinet approved the Green Transformation (GX) Policy, a 10-year roadmap of Japan’s decarbonisation strategy in order to achieve its Nationally Determined Contribution (NDC) of 46% emissions reduction by 2030, and carbon neutrality by 2050.⁴⁸ Japan’s GX Roadmap is the transformation of the entire economic and social system from an

⁴⁵ CREA, [Turning Point: China Permitted No New Coal-based Steel Projects in 1H2024 as Policies Drive Decarbonisation](#), 11 July 2024

⁴⁶ OCE, [Resources and Energy Quarterly June 2024](#), 01 July 2024

⁴⁷ OCE, [Resources and Energy Quarterly June 2024](#), 01 July 2024

⁴⁸ International Carbon Action Partnership, [Japan’s Cabinet Approves Policy Roadmap Including Plans for National ETS](#), 22 February 2023

economy and industrial structure dependent on fossil fuels to ‘structures driven by clean energy’ – driving economic growth through emissions mitigation.

The GX Roadmap aims to achieve JPY 150 trillion (~ US\$1 trillion) of public and private capital investment into decarbonisation and clean energy industries. The roadmap is also targeting to establish carbon pricing mechanisms via an emissions trading scheme (GX-ETS) for high-emission sectors, and the introduction of a carbon levy for fossil fuel importers, with the price on carbon gradually ratcheting up to increase investment into clean energy sources that mitigate reliance on fossil fuels. This includes a proportional carbon levy placed on fossil fuel importers from 2028.⁴⁹

19 March 2024 saw South Korea’s financial institutions pledged to provide 420 trillion won (US\$313bn) in policy loans through 2030 to finance projects that will accelerate Korea’s pathway to achieving its 40% NDC emissions reduction target by 2030, relative to 2018.⁵⁰ The green fund would be delivered by Korea Development Bank, Export-Import Bank of Korea, Industrial Bank of Korea and Korea Credit Guarantee Fund. The increase in transition financing would provide 60 trillion won (US\$45bn) annually, a 67% rise from the 5-year average according to South Korea’s Financial Services Commission.

May 2024 saw South Korea’s Ministry of Trade, Industry and Energy announce a new energy plan that involves a dramatic reduction in reliance on coal (from 33% in 2024 to 10% in 2038) and LNG (from 28% to 11%), and an increase in reliance on nuclear (31% in 2024 to 36% by 2038), renewables (7% to 33%) and hydrogen and ammonia imports (0% to 6%).⁵¹

As per **Recommendation 2**, CEF views an Asian CBAM as a key development to provide the right price signal for Australian mining majors to accelerate the deployment of capital to build embodied decarbonisation into our critical mineral and strategic metal exports, which in turn will pivot from our massive over-exposure to fossil fuel exports of old.

A multilateral Asian CBAM with Australia’s largest trading partners would critically provide the necessary and clear price signal needed for Australia’s iron majors, BHP and Rio Tinto, to accelerate and scale their investment timeline to embed decarbonisation in mining operations and establish domestic, green value-added capacity onshore.

CEF expects the carbon price in China to progressively rise. Our discussions with key government officials suggest a price ambition of as high as RMB 2,000-3,000/t (US\$275-413/t) by 2060, which is higher than even the IEA models (US\$250/t for developed countries and US\$200/t for key developing countries like China by 2050).

⁴⁹ GR Japan, [Overview of Japan’s Green Transformation \(GX\)](#), January 2023

⁵⁰ Bloomberg, [South Korea Finance Sector Pledges \\$313 Billion in Green Funding](#), 19 March 2024

⁵¹ S&P Global, [Korea to sharply reduce LNG’s share in power mix by 2038, boost nuclear role](#), 31 May 2024

China Baowu Group, the largest steelmaker globally by far, is moving aggressively to explore options for a path to decarbonisation, but unfortunately they are still officially working towards a 2060 NZE target. This target needs to be accelerated by a decade to 2050 to drive technology and investment innovation. The Chinese steel industry has already likely peaked emissions, given Chinese domestic steel demand likely permanently peaked in 2022 (aided by the rapid decline in China's property sector in 2023-24), and the growing access to steel scrap means a progressive rise in the use of EAF and circularity, further progressively reducing China's need for Australian iron ore and coking coal.

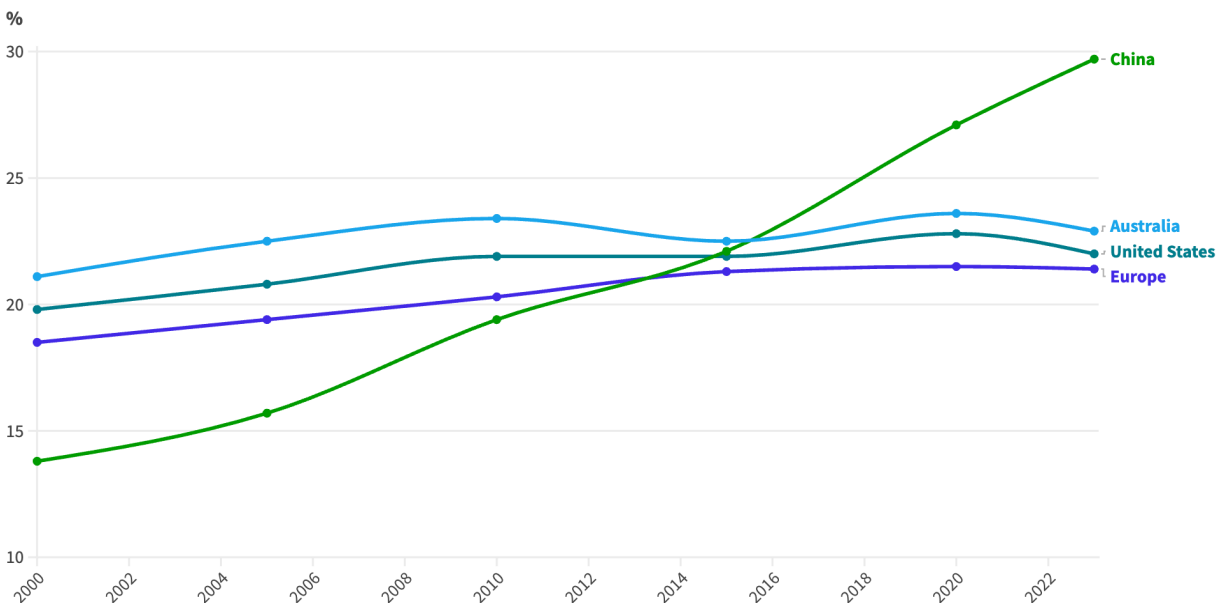
This would also work to send the right policy signal to shift Chinese investment from new blast furnaces to electric arc furnaces. This then ties decarbonising the steel industry to the accelerating decarbonisation of the electricity sector.

China has long pursued an electrification of everything strategy that is now world-leading, as is China's embracing of EVs, like Rewiring Australia is now advocating for us - Charts 5.3 & 5.4.

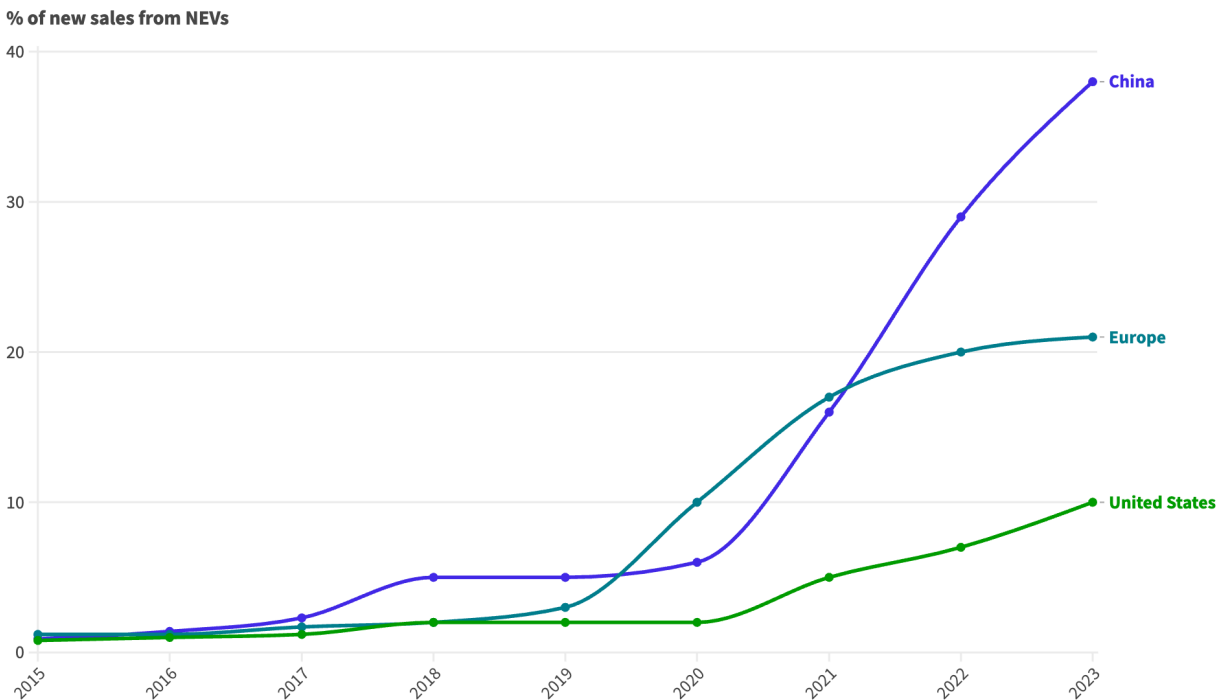
Figure 5.3: The Progressive Electrification of Everything in China is World leading

Share of final energy from electricity

China has leapfrogged United States, Europe and Australia in electrification



Source: CEF calculations, [Enerdata](#)

Figure 5.4: The Pivot to Electric Vehicles Manufacturing and Use in China is World leading

Source: CEF Calculations, IEA ⁵²

As to the path towards establishing an Asian CBAM, China has the advantage over Korea and Japan of an existing well established national ETS. CEF understands from METI in Japan that they are considering a national ETS by 2028, which would be an excellent precursor and endorsement of an Asian CBAM.

China could move alone, leveraging their growing climate alliance with the EU, particularly if Donald Trump is elected for a second-term in 2024, and American isolationism takes even greater hold. This could play very favourably into China's hands of serving as the new global climate leader in partnership with the EU and Asia as the US stagnates amid climate science denialism to serve its incumbent, politically powerful fossil fuel vested interests.

The safeguard mechanism has provided an effective first step towards reasserting our requirement to progress decarbonisation in alignment with our Paris Agreement commitments and the reality of the climate science.

⁵² IEA, [Global EV Outlook 2024](#), April 2024