



A Strategy for Whyalla: Enabling the Transformation and Decarbonisation of the Steelworks

Leveraging targeted industry and climate policy to support a first-of-a-kind capital deployment into green iron production in the Australian context.

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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.

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Report Summary

As South Australia (SA) sets a pathway forward to revitalise the Whyalla Steelworks, it must remain steadfast in its ambition to leverage its leadership in renewables and comparative advantage in new energy trade to deploy capital at speed and scale into firming renewable energy supply and **build a first-of-a-kind (FOAK) green iron hub in the southern hemisphere.**

The SA Government must reevaluate the cost and risk of locking-in a fossil gas ‘transition’ of Whyalla. **Gas is not the solution for Whyalla, in the interim and in the long-term.** Domestic gas prices in Australia make it uneconomic, and incompatible with Australia’s decarbonisation and climate ambitions. **CEF’s analysis shows that public capital expenditure of \$1.7-2bn over a decade in gas supply subsidies and hundreds of millions in gas pipeline infrastructure spending would be required to just halve the competitive gap** in pricing between SA and other direct reduced iron (DRI)-producing nations in North America and the Middle East where gas prices are a fraction of east Australia’s.

Gas giant Santos has long been a gas supplier to the Whyalla Steelworks and would continue to be in a gas-led ‘transition’. **Billions in public capital towards a methane gas ‘transition’ of the Steelworks is a taxpayer subsidy to Santos that Australia can ill-afford.** Australia does not have a gas shortage problem; more supply is not the solution. It has a gas export and price distortion problem, driven by Santos’ large-scale siphoning of domestic supply into export markets.

To provide strategic, targeted public, national interest support for a FOAK capital deployment in clean commodity production, CEF recommends SA Government adopt a **Long-term Energy Service Agreement (LTESA) / Scheme Finance Vehicle (SFV)-style government underwriting mechanism** to unbundle project-on-project risk (the stacking of risk from mutually dependent projects). This is **critical to lowering the cost of capital for the firming renewables required to establish a green DRI facility**, improving the bankability of a green transformation for Whyalla.

Absent a price on carbon, SA must champion the development of bilateral partnerships with key offtake markets to bridge the commercial gap between fossil fuel- and renewables-powered production, and catalyse green iron and steel trade corridors, between Australia, Japan, Korea and China. **CEF sees a critical gap in strategic public support for clean commodity market-forming mechanisms** to complement supply-side production-based credits and capital grants. This includes a **Clean Commodities Trading Initiative (CCTI) providing a long-term price guarantee for Whyalla’s new owners** to commit to the major capital investments required to transition to a DRI facility and enable decarbonisation of the process.

SA must also focus on the broader SA green iron opportunity, with Whyalla as a lighthouse green iron project. The stalled progression of green iron in the broader SA context has been further exacerbated by the lack of clarity over policy direction. **CEF urges the SA Government to publish the outcomes and recommendations of the Green Iron Opportunity Expression of Interest consultation process** launched in June 2024 to provide clarity and direction to industry.

Scaling a green iron industry requires the SA Government to enable the expansion of the state’s magnetite industry through common-user and strategic public-private infrastructure. In addition to generating significant spillover benefits for the Eyre Peninsula, **unlocking SA’s current investment pipeline of magnetite deposits could grow magnetite production to 29Mtpa, conservatively generating \$6bn in export revenues and over \$300m in royalties annually to the SA budget.**

Summary for Policymakers

The Green Iron Opportunity for SA

Whyalla now stands at a crossroads. The forced administration of the Steelworks in February 2025 provides SA, and Australia, a critical nation-building opportunity to pivot from fossil fuel-based steel to a model in which SA's abundant, world-leading renewables and magnetite resources are deployed to produce green iron and steel in a global marketplace undergoing a nascent but momentous and inevitable shift to a future of zero-emissions iron and steelmaking. **Green iron is Australia's single largest export industry opportunity in a net zero economy.**

Recommendation: The SA Government must re-evaluate the cost and risk of lock-in of a gas 'transition' of the Whyalla Steelworks

Months after the SA Government correctly forced the Whyalla Steelworks into administration, it now stands at another crossroad of significance. The SA Government has the opportunity to deploy its global comparative advantage in renewable energy resources and leverage the enabling policy and financing frameworks of the State and Federal Governments to crowd-in the critical investment required to decarbonise and future-proof the Steelworks. The alternative is to capitulate to the fossil fuel industry that has eroded the viability of Australia's existing manufacturing base – principally, the gas oligopoly. This approach would ensure new value-added facilities, including gas-based DRI in Whyalla, are globally uncompetitive.

Deploying public subsidies to lock in high-emissions fossil gas in an open-ended 'transition phase' for Whyalla to renewables based operations would be a grave strategic misstep with drastic and ongoing budgetary and national interest impacts.

Leaving aside the flawed assumption that gas is key to decarbonisation, **it is economically unviable.** SA has some of the highest-cost domestic methane gas in the gas producing-world at an average of A\$13/GJ in FY25, putting the state at one of the largest comparative disadvantages in Australia in industrial processing and manufacturing powered by gas, with a declining local gas resource. For over a decade, gas prices in SA have risen at a compounding 10% every year.

In September 2025, SA Premier Peter Malinauskas concerningly spruiked gas oligopoly propaganda that the development of gas giant Santos' Narrabri project in northwest NSW would address this, and must be an urgent priority for additional new gas supply to firm the grid and to 'decarbonise' heavy industry, including in his state.¹

However, Narrabri gas is prohibitively expensive. Australia's Future Gas Strategy identified that it would have a production cost of ~\$10/GJ, 45% higher than production costs in Queensland.² Production continues to decline in the Cooper Basin which spans southwest Queensland and northeastern SA and supplies the majority of SA's gas demand, having already fallen 60% in the past 3 decades. Beyond taking many more years to deliver, Narrabri's influence on domestic gas market pricing would ensure prices remain unviably high.

SA has a competitive disadvantage in fossil fuels. A methane gas-based 'transition' would require the deployment of significant public capital into gas subsidies and enabling gas infrastructure to bridge the gap in commercial viability between DRI produced in SA, and by existing DRI producers in other nations. DRI producers in the Middle East and North America pay \$2.20 and \$3/GJ respectively, putting **SA gas at an unsustainable 200-300% cost premium.**

¹ ABC, [Traditional Owners Slam State Premiers for 'Disgraceful' Call to Push Ahead with Santos Gas Project](#), 26 September 2025

² IEFA, [Narrabri Not the Best Solution for Eastern Australia's Gas Supply](#), 25 September 2025

CEF analysis shows that **to just halve the commercial gap in methane gas** prices compared to other DRI producing nations in the US and Middle East would require a \$6.60/GJ subsidy over 10 years, costing taxpayers \$2bn. Accounting for the average rise in delivered gas prices to SA, a 50% gas subsidy over 10 years, to underpin a gas-led 'transition' in Whyalla, **would likely cost taxpayers \$1.7-2bn.**

Furthermore, a gas-based revitalisation of Whyalla would require a ~\$0.5bn investment into the expansion of enabling gas infrastructure, posing significant risks of an enduring gas lock-in to Whyalla. A methane gas 'transition' in Whyalla is not possible without such an investment. Any allocation from the \$1.9bn fund capitalised by the State and Federal Government for the future of the steelworks would see taxpayer subsidisation of long-term gas pipeline capacity.

The existing Whyte Yarcowie to Whyalla lateral connection to the Moomba-Adelaide pipeline would require a **minimum 390% expansion in gas pipeline capacity across 160km** to supply the Whyalla DRI plant and to maintain supply for existing demand, including industrial users in Port Pirie.

For context on the scale of investment required, NSW's under-construction Kurri Kurri lateral pipeline project, comprising a relatively short 21km gas transmission pipeline and 24km storage pipeline, has recently seen a latest cost blowout of a further 70% to \$450m. To recover costs, APA has signed a 30-year tariff agreement with Snowy Hydro, a massive government methane subsidy.

Given the scale and likely substantial costs of enabling gas infrastructure required, there is significant risk of gas lock-in for SA's industrial sector. **Critically, this would undermine progress towards the transformation to a green iron plant.**

Gas is not the solution for Whyalla, in the interim and in the long-term.

SA's comparative advantage is in its abundance of renewable energy resources. These have enabled the state to develop one of the lowest wholesale-cost, highest-penetration variable renewable energy grids in the world. Additionally, SA hosts world-leading magnetite iron ore deposits that will be critical to the decarbonisation of primary iron and steelmaking in a decarbonised world positioning it to lead in green iron production.

CEF urges the SA and Federal Government to reevaluate the risks and costs of a methane gas 'transition' of the Whyalla Steelworks. The SA Government should remain steadfast in its vision and ambition to deploy the significant state and federal support allocated to the Steelworks to deliver a FOAK renewable energy-powered green iron plant in the southern hemisphere. The alternative is unviable: the erosion and misuse of strategic public capital to continue to transfer taxpayer and energy consumer wealth to prop up the fossil gas industry, while simultaneously undermining Australia's Future Made in Australia (FMIA) and green re-industrialisation objectives.

CEF urges the SA Government to reevaluate and re-direct the latest funding for gas exploration, storage, and transport announced in the 2025 SA Gas Initiative Grant Scheme into low-emission firming solutions and low-emission fuels.³

It is critical that Australia grasp the generational opportunity that the re-industrialisation of Whyalla represents to reposition as a lighthouse project for clean commodities in Australia and Asia – and that requires an urgent prioritisation of clean energy supply in SA.

Public capital towards a methane gas 'transition' of the Whyalla Steelworks is a Santos subsidy.

Oil and gas major Santos, a principal player in Australia's gas oligopoly, has long been a supplier of methane gas to the Whyalla Steelworks. A gas-led Whyalla 'recovery' would see the gas for steelmaking operations continue to be supplied by Santos, and would principally benefit Santos.

³ SA Government, [2025 SA Gas Initiative Grant Scheme](#), 30 October 2025

In short, a methane gas subsidy to the new owner of the Whyalla Steelworks would be a \$1.7-2bn 10 year taxpayer funded subsidy to Santos.

Santos has led a decade-and-a-half strategy of **making others pay for its mistakes**.⁴ As the gas giant developed its mammoth LNG export facility in QLD, Santos signed long-term supply contracts with Asian buyers whilst simultaneously failing to develop the necessary gas reserves to supply the expansion. Santos' solution: siphon from the domestic market to sell offshore.

Santos has consistently purchased over 130 PJ of gas every year since 2017 from the domestic market to meet its export commitments. This has subjected domestic users to export parity or greater prices, driving a tripling of domestic gas bills and fuelling the hyperinflation in Australia's east coast domestic gas market. This in turn has massively undermined industrial policy and the viability and global competitiveness of Australia's energy-intensive manufacturing and value-adding industries that currently rely on gas to power operations.

Santos' draining of the domestic market could expand significantly if it fails to replace its purchase contracts with domestic producers as its existing contracts with Origin Energy and AGL expire in 2027.⁵

The gas oligopoly rhetoric, again led by Santos⁶ and BlueScope, that taxpayers must support the further development of expensive, high-emission methane gas fields to alleviate the pressures of a gas supply shortfall and inflated pricing is a fallacy.

Australia does not have a gas shortage problem, it has a gas export and price distortion problem. In the past 30 years, Australian gas production has risen 475%, and risen 130% since Queensland established its LNG industry a decade ago.⁷ LNG exports, as well as the gas burned in the liquefaction process, accounts for more than 80% of Australia's national gas demand. Conversely, since LNG exports began in Queensland, east coast gas demand excluding LNG has fallen 25% as prices have tripled.⁸

A socialisation of the costs of the destruction of the economic viability of manufacturing in Australia to bankroll the entity that has materially driven east coast gas market dynamics would perfectly encapsulate the regulatory capture of Australia's and SA's Governments.

The situation is exacerbated by the fact that taxpayer-funded subsidies would be delivered to a firm that has now racked up a **10th consecutive year of zero corporate tax payments**, despite generating \$47bn in oil and gas revenues from Australia's commonwealth resources.⁹

Recommendation: Provide strategic, targeted support for a FOAK capital deployment in clean commodity production to scale firmed renewables and green hydrogen.

There is a key role and opportunity for Australia's special investment vehicles (SIVs) to deploy strategic, public-interest capital into market-forming mechanisms that can leverage the balance sheet and credit rating of the Federal Government to de-risk projects, provide concessional financing facilities, public-private partnerships, first-loss capital for FOAK projects, revenue-underwriting and demand offtake to utilise renewables from the outset.

⁴ ABC, [Why Santos is Behind Your Soaring Electricity and Mortgage Costs](#), 14 October 2025

⁵ ACCC, [Gas Inquiry 2017-2030: Interim Update on East Coast Gas Market](#), 30 June 2025

⁶ Santos, [CEO Keynote Speech to AEP Conference](#), 28 May 2025

⁷ DCCEEW, [Australian Energy Update 2025](#), 22 August 2025

⁸ IEEFA, [Australian Gas Users Pay Price as LNG Exporters Prioritise Spot Market Windfalls](#), 20 February 2025

⁹ The Australia Institute, [New Government Data Confirms Gas Exporters Continue to Pay No Tax](#), 03 October 2025

Unbundling project-on-project risk with strategic government capital participation in each stage of the green iron value chain can significantly lower the cost of capital and thus bridge the commercial gap between fossil fuel-based production and renewable-based production.

In Sections 3-4, CEF outlines a proposed ring-fenced ownership structure across magnetite mining, the DRI facility, EAF and enabling renewable energy infrastructure and renewable hydrogen facility to minimise project-on-project risk and crowd-in international export credit agency financing through capital participation of international joint venture partners.

The largest production factors that determine the cost of production for a DRI plant is the delivered cost of firm renewable energy and delivered cost of renewable hydrogen. The delivered unit costs of both these factors are primarily a function of the capital cost of the project. Engineering, procurement and construction (EPC) of firm renewable energy infrastructure and balance of plant, as well as the cost of capital, therefore ultimately determine the relative competitiveness of clean value-added commodities.

CEF has proposed the **SA Government adopt an Long-term Energy Service Agreement (LTESA) / Scheme Finance Vehicle (SFV)-style government underwriting mechanism** to unbundle the largest sub-allocation of capital for a green DRI/HBI facility – the renewable energy generation and firming capacity. This strategic government intervention can significantly reduce project-on-project risk for private investors in the minerals processing infrastructure, thus lowering the cost of capital and improving the bankability of a green iron transformation for Whyalla.

Recommendation: Develop bilateral partnerships with key offtake markets to bridge the commercial gap and catalyse green commodity trade corridors absent a price on carbon.

To enable the SA and Australian green iron opportunity, CEF views carbon pricing in trade across Asia as the critical policy instrument to drive the global green commodities opportunity and catalyse investment into decarbonisation at a speed and scale commensurate with the climate emergency. Finance cannot credibly be mobilised into decarbonisation at anywhere near the required speed and scale without a credible price signal. A carbon price is central to establishing certainty on future expectations, and is decisive to both driving capital flows into the energy transition that is the necessary precondition of industrial decarbonisation, and away from the continued global financing of fossil fuel production and consumption.

Australia's largest Asian trading partners are already signalling through investment shifts, and climate, industry, trade and foreign policy that embedded carbon in production and trade will be increasingly subject to penalty through carbon pricing mechanisms. The broad decarbonisation of economically-advanced Asian nations to which Australia exports shifts the value proposition for new world economy manufacturing to regions with comparative advantages in renewable energy generation, such as South Australia, as manufacturing becomes electrified and decarbonised.

However, in the short- and medium-term, government intervention is required through supportive budgetary and other measures to alleviate the cost premium of value-adding commodities via low-emission pathways – i.e., using renewable energy. This is vital to addressing the market failure of unpriced externalised carbon emissions and to developing green industrial capabilities. Market incentives level the playing field as carbon prices rise over time to correct this key market failure.

In Section 1 we outline how the Federal Government has introduced a suite of supply-side incentives for hydrogen and green metals investment. However, CEF sees a **critical gap in strategic public support for clean commodities in market-forming mechanisms** to complement supply-side production-based credits and capital grants.

In Section 4 CEF recommends the establishment of a **Clean Commodities Trading Initiative (CCTI)**. The CCTI could be the enabling mechanism that provides long-term price guarantee for Whyalla's

new owners and their financial partners to commit to the major capital investments required to not only transition to a DRI facility, but to enable the decarbonisation of the process. The potential benefits of this intervention extend far beyond preserving existing jobs. Transforming Whyalla into a green steel hub would position the region at the forefront of a global growth industry.

The multiplier effects would be substantial. Beyond the direct jobs in steel production, the transformation would create opportunities across the supply chain — from renewable energy development to advanced manufacturing, logistics, and professional services. These would be high-quality, future-proof jobs aligned with global decarbonisation trends rather than vulnerable to them.

Alternatively, CEF recommends the expansion of the **H2Global Joint Tender** mechanism to facilitate the creation of bilateral and trilateral green iron corridor agreements with Australia, Japan and Korea. The H2Global model simulates the existence of a functioning market on supply and demand through double-sided auctions, issuing tenders for the most competitive suppliers of renewable hydrogen derivatives, offering secure purchase agreements. Through securing long-term, government-backed offtake contracts, producers are able to obtain pricing, markets, counterparties and legal security necessary to the bankability of a project, thus accelerating the progression towards FID and into construction.

CEF sees a critical role for such a bilateral mechanism in green metals, expanding the model to green iron, capitalised by joint funding between producer and offtaker governments. The H2Global model can enable the trilateral green iron corridor between Australia, Japan and Korea.

Recommendation: SA must focus on enabling the broader SA green iron opportunity, making Whyalla a lighthouse green iron and steel project.

A competitive bidding process for the steelworks is underway. To the detriment of the above vision, BlueScope – Australia’s only other domestic steelmaker outside the bankrupt GFG Alliance portfolio – and its consortium has secured the right-of-last-refusal. BlueScope has made it clear it does not accept the path to green iron and steel, but instead is demanding multi-billion-dollar methane gas subsidies for long term interstate supply if it is to proceed with its proposed ownership of the steelworks. BlueScope’s last right of refusal has massively undermined competitor bid interest from proponents that have the necessary and critical ambition to transform the facility into renewables-based production of iron and steel from the outset.

The stalled progression of green iron in the broader SA context has been further exacerbated by the lack of clarity over policy direction. In June 2024, the SA Government published the SA Green Iron Opportunity Expression of Interest (EOI) with the objective to de-risk private investment in the establishment of a green iron value chain. The EOI highlighted SA Government’s ambition to enable pit-to-port projects through strategic public support, showcasing opportunities to enable green magnetite mining and beneficiation in the Braemar region and production of DRI/HBI at Port Pirie, as well as green mining, beneficiation and iron reduction in the North Gawler region, leveraging port infrastructure of Whyalla.

As part of the EOI process, the Department of Energy and Mining outlined the planned finalisation and publication of its recommendations in November 2024 following an extensive consultation period. Now, a year on, the more than 50 proponents involved in the EOI process have yet to receive any recommendations, outcomes or next steps for the broader SA opportunity. This lack of transparency and direction has significantly undermined the ambition of the SA Government to facilitate the industry-government collaborative development of new value-adding green industries in the state that can enable the iron ore regions with favourable geology for a green iron industry.

CEF urges the SA Government to publish the outcomes and recommendations of the EOI process to provide clarity and direction for the industry.

To support this, CEF endorses a number of recommendations put forth to the SA Government in Infrastructure SA's 20 Year State Infrastructure Strategy that, coordinated with the recommendations of the Green Iron Opportunity EOI, can form the basis of the next steps to unlock the broader SA opportunity. Principally CEF recommends:

- The prioritisation of common-user infrastructure to aggregate demand and provide more efficient allocation of infrastructure solutions to realise the value of SA's future-facing natural resources that are critical to a decarbonising global economy.
- The prioritisation of a final investment decision for the Northern Water project.
- Investigation into common-user water supply to unlock the Braemar iron ore region.
- The development of a SA infrastructure decarbonisation policy to ensure the expedited development of firmed renewables built ahead of demand needs as well as to phase out remaining fossil fuels in SA's existing and emerging manufacturing and value-adding industries.

Proponents with the necessary ambition to deploy a renewables-based solution at speed and scale need vision and clarity on direction of the SA Government. A coordinated infrastructure decarbonisation strategy can ensure community benefit principles and First Nations capacity building and capital involvement. The scale of infrastructure required to enable SA's green iron opportunity has significant potential to First Nations lands if equitable and sustainable community principles are not a critical component to the regulatory approvals and development process. The integration of best practice principles outlined by the First Nations Clean Energy Network ensures project timelines are expedited whilst protecting country and ensuring cultural heritage is preserved and protected.

Recommendation: Focus on scaling SA's magnetite mining and export opportunity, leveraging established markets and enabling policy and infrastructure.

Magnetite has an established, liquid seaborne traded market, already generating significant 30-35% value-in-use premiums over lower quality hematite ores that dominate Australia's existing production. As decarbonisation and energy efficiency is increasingly valued in Australia's export markets, the prospect of premium pricing for quality and value-in-use expands as steel decarbonises. Australia's magnetite producers can generate strong returns on investment without green premiums or carbon pricing mechanisms.

Facilitating the growth of SA's magnetite industry with common-user enabling infrastructure is critical for SA's green iron opportunity, generating significant spillover benefits to industry and the state. Unlocking SA's current investment pipeline of magnetite deposits could grow magnetite production to 29.2Mtpa, **generating \$6bn annually in export revenues and over \$300m in royalties to the SA budget every year**. CEF believes these figures would likely be conservative given the higher value-in-use premiums SA magnetite can leverage above high-grade benchmarks and the ability to have variable pelletising capacity as and when markets reflect sufficient pelletisation premiums.

CEF sees an opportunity for Australia and SA Australia to facilitate the growth of high-purity, high-grade iron mining that is a necessary precursor to scaling a green iron industry, through the recognition and addition of **high-purity iron into Australia's critical minerals list**. The introduction of high-purity iron to the critical minerals list and the expansion of the critical mineral production tax incentive introduced as part of the Federal Government's FMIA re-industrialisation package could catalyse SA's magnetite industry. CEF recommends high-purity iron criteria be defined as projects that can produce high grade iron with iron content exceeding 67% Fe and combined gangue content of 3% or less.

Section 1. Introduction: History of Whyalla Steelworks and Scoping the Opportunity

In April 2023, the Malinauskas Government published the SA Economic Statement, with the central pillars of the Statement to capitalise on the global green transition, accelerate the state's energy transformation and actively promote the re-industrialisation of the state through green energy and green product investments.¹⁰

The levers that have positioned SA at the forefront of Australia's green exports opportunity have been consistent, strategic progression in timely and ambitious policy, regulation and legislation, de-risking investment through offtake arrangements, direct investment and market participation, and meaningful public engagement with industry and local community.

In 2004, the Rann Labor Government established the state's first renewable energy target of 15% by 2014 and 26% by 2020, which catalysed more than \$6bn in large-scale renewable energy and storage projects, with a further \$21bn in the investor pipeline. In 2017, the Weatherill Labor Government developed Australia's first state-level hydrogen development plan, the Hydrogen Roadmap, to facilitate the production, use and export of hydrogen. This was supported by the succeeding Marshall Liberal Government, producing the SA Hydrogen Action Plan in 2019 to foster the industry's growth through infrastructure, regulation, trade, innovation and integration into the energy system.

Through successive Labor and Liberal Governments, renewable energy generation and firming deployments across SA have continued to advance. Through the early 2000s, gas and coal dominated the state's grid. The state's first renewable energy project was connected in FY2007. Fast forward to FY16, SA had phased-out coal-based generation. In FY25, renewable energy contributed 74% of the state's electricity demand. SA has a bipartisan target to achieve a 100% renewables grid by 2027.

The accelerated transformation to a decarbonised economy can position SA to extract value from the emerging industries and export industries in a decarbonised global economy from the state's abundant resources that historically have not held a comparative advantage to that of other jurisdictions. Both the Labor and Liberal Governments of SA recognise the significant investment, jobs, export revenues, royalties, economic diversification and prosperity that can be unlocked from this transformation.

Through the rapid growth of industrialised economies through North and Southeast Asia, steelmakers have prioritised lower-quality, higher-impurity hematite iron ores, of which Western Australia (WA) dominates in resources. Capital-intensive and labour-intensive industries have traditionally been located in close proximity to demand centres and positioned in regions with low-cost investment frameworks. This has been immensely successful and profitable across WA resource value chains as negative externalities of this global framework have been unpriced and sidelined from economic decision-making – principally a price on carbon.

Now, Australia's largest Asian trading partners are showcasing policy signals through investment shifts, climate, industry policy, trade and foreign policy that embedded carbon in its trade and production is becoming increasingly penalised through carbon pricing mechanisms. The transition towards a decarbonised global economy, in particular the broad decarbonisation of economically-advanced Asian nations, shifts the value proposition for low-emission manufacturing to regions with comparative advantages in renewable energy generation as manufacturing becomes increasingly electrified.

2025 is the time to build low-emissions industries of the future, leveraging SA's competitive advantages of scaled renewables and magnetite, not subsidising expensive methane gas lock-in.

¹⁰ SA Government, [South Australian Economic Statement](#), 03 April 2023

1.1. The Failed White Knight and Lessons Learnt

Box 1. Brief History of the Whyalla Steelworks

Over the early 1900s, BHP developed the Iron Knob and Iron Monarch mines along the Eyre Peninsula's Middleback Range, supplying minerals for fluxes in lead smelters in Port Pirie. The Middleback Ranges later supplied BHP's Port Kembla steelmill (spun-off as BlueScope in 2002).

In **1941**, BHP began constructing the region's first blast furnace to support the Commonwealth's WWII shipmaking efforts. In **1965**, the Whyalla Steelworks was officially opened. Fast forward to **October 2000**, BHP spun-off Whyalla as OneSteel, a domestic integrated steel manufacturer, with iron ore mines, steelworks, harbour & port facilities, distribution and downstream fabrication.

In **April 2016**, OneSteel (rebranded as Arrium) entered voluntary administration with debts exceeding \$4bn. After 14 months of administration, KordaMentha announced a consortium backed by Korea's POSCO as the preferred bidder. Despite this, GFG Alliance successfully won the tender to purchase the Whyalla Steelworks.

In **March 2021**, GFG Alliance's financier Greensill collapsed after Credit Suisse froze US\$10bn worth of investment funds and serious fraud allegations. The Steelworks was starved of critical sustaining capex, leading to extended periods of shutdowns and a growing list of creditors.

In **February 2025**, the SA Government forced Whyalla into administration, appointing KordaMentha as administrators, revealing creditors were owed more than \$1.3bn. In the same month, the Federal Government announced a joint \$2.4bn rescue and conditional re-industrialisation package for Whyalla Steelworks alongside the SA Government.

A white knight for the town and workforce of Whyalla in 2017, in which Sanjeev Gupta promised billions of dollars' worth of projects when GFG Alliance bought the steelworks out of administration, failed to deliver for South Australians. Australian and international media outlets have increasingly showcased the extent of the damage left to the Steelworks and the town of Whyalla by GFG Alliance. This report is not intended to provide a forensic recount of the starvation of capital and resources by the previous ownership. Rather, CEF aims to outline the options and steps to move forward, including enabling policy and financing levers of the SA and Federal Governments, to crowd-in the critical investment required to decarbonise and future-proof the anchor industry of the Eyre Peninsula, as well as facilitate the investment and expansion of export industries across the iron and steel value chain across the state more broadly.

In November 2024, CEF published an analysis of Australia's green iron opportunity in its 'Green Metal Statecraft: Forging Australia's Green Iron Industry' report.¹¹ In the analysis, CEF detailed how any move into administration by the GFG Alliance assets in Australia could provide an opportunity to bring in a credible, well-capitalised consortium with Australian firms and Asian steel expertise and synergies, as well as patient public interest equity and debt capital from the National Reconstruction Fund (NRF), Export Finance Australia (EFA) and/or the Clean Energy Finance Corporation (CEFC).

CEF recognised this structure would need to leverage access to the existing critical regional infrastructure of the Steelworks and downstream rolling mills and port that could facilitate nation-building investments in a DRI and EAF facility, leveraging the state's nation-leading deployment of renewable energy capacity and supportive, consistent climate and industrial legislation. CEF re-iterates that significant public strategic capital would be required to facilitate this FOAK investment in a future facing industry in the Australian context, as well as crowd-in further investment opportunities in the broader green iron value-chain for the state.

¹¹ CEF, [Green Metal Statecraft: Forging Australia's Green Iron Industry](#), 15 November 2024

The Whyalla Steelworks is configured as an integrated steelmaking value chain, producing slabs, billets, hot-rolled structural steel and rail products. The assets covered by GFG Alliance across the Whyalla Steelworks include:

- **Middleback Range Iron Ore Mining.** SIMEC Mining owns and operates the Iron Baron, Iron Knob and South Middleback Ranges mines, producing both hematite and magnetite ores. The Ranges produce ~ 2.2Mtpa of magnetite concentrate, of which ~ 1.3Mtpa is pelletised and used within the steelworks. SIMEC produces ~ 8-10Mtpa of hematite that is exported to Asian steelmakers, along with excess magnetite. In May 2024, the ABC reported leaked GFG Alliance documents that revealed SIMEC's hematite resources would be fully exhausted within the following 18-24 months (some time in FY26).¹²
- **Whyalla Blast Furnace-Basic Oxygen Furnace (BF-BOF).** Magnetite pellets and imported metallurgical coal (historically from Tahmoor Colliery in NSW) are fed into an integrated blast furnace (BF) and basic oxygen furnace (BOF), producing crude steel. In September 2023, GFG Alliance closed its coke ovens and have since imported coke from other sources.¹³
- **Ladle Metallurgy Furnace and Downstream Fabrication.** The Whyalla Steelworks (LIBERTY Primary Steel) has a production capacity of ~1.2Mtpa of cast steel, and 475ktpa of hot-rolled products.
 - ~50% of steel is directed into a billet caster, a part of which is then transferred to InfraBuild to produce steel rail products for the domestic market. The remaining steel billet is used for other structural applications.
 - ~50% of steel is directed into a slab/bloom caster on-site, fed through a structural rolling mill to produce long steel products, primarily for construction applications.
- **Port Facility.** The Whyalla port and transshipment facility that can load capesize vessels in the Upper Spencer Gulf, as well as two mobile harbour cranes. After entering into administration, KordaMentha engaged in a legal battle to secure control of the port from GFG subsidiary Whyalla Ports Pty Ltd. The Federal Court ruled in September the port was property of OneSteel Manufacturing, the legal entity controlled by KordaMentha and packaged with the Steelworks upon sale of the assets.¹⁴ The Whyalla Port has successfully exported up to 12Mtpa of iron ore, and currently exports ~8-9Mtpa of iron ore.¹⁵

The SA Government took decisive action to force the Whyalla Steelworks into administration following the recommendations of the Steel Task Force, established in 2015 to support Whyalla's mining, smelting and manufacturing operations following the previous administration of Arrium.

In February 2025, the SA Government amended the Whyalla Steel Act 1958 to force the Steelworks and associated infrastructure under OneSteel Manufacturing Pty Ltd into administration to secure the long-term future of the steel supply chain before it was too late. CEF applauds the leadership of the SA Government in acting to start the journey to secure the future economic resilience of the region against the crippling of the Steelworks under the former ownership that starved not only the furnaces but the enabling and surrounding infrastructure of critical sustaining capex, whilst systemically failing to pay creditors.

Two administrations within a decade underline the operational and financial challenges of continuing the end-of-life, emissions-intensive, legacy BF-BOF and manufacturing process. The SA Government must learn from the lessons in between these interventions, and structure public support funding to support a renewables-based transformation of the Steelworks. Any new owners of the Steelworks must be selected as entities that are well-capitalised, globally-recognised, established steelmakers

¹² ABC, [Whyalla's Hematite Mine Workers Face Job Losses or Reduced Hours, Leaked Documents Reveal](#), 23 May 2024

¹³ GFG Alliance, [Coke Ovens Closure: History in the Making](#), 05 September 2023

¹⁴ ABC, [SA Premier Claims Major Victory in Dispute over Whyalla Port Ownership](#), 03 September 2025

¹⁵ Magnetite Mines, [Magnetite Mines and GFG Alliance Sign Port Services MoU](#), 06 February 2023

that have the industry knowledge, corporate balance sheet and investment grade credit rating to underpin the capital required to finance the scale of investment required.

However, the competitive administration process by KorthaMetha has been severely undermined by providing BlueScope and its consortium the right-of-last-refusal. This has massively undermined competitor bid interest from proponents that have the ambition and ability to transform the facility into a renewables-based DRI-EAF from the outset. BlueScope has made it clear it does not accept the path to green iron and steel, but instead is demanding multi-billion dollar methane gas subsidies for long term interstate supply to proceed with the ownership of the Whyalla Steelworks. This has resulted in widespread speculation that the process has been gamed so as to extract massive taxpayer subsidies for the inefficient allocation of resources that enables and facilitates the further gouging of taxpayer funds by Australia's gas oligopoly, in addition to the failure for this pathway to deliver on the Governments' decarbonisation transition agenda.

1.2. Scoping the Opportunity

South Australia has identified 5 key industries that are anticipated to drive electricity demand across the state: mining, iron & steel, desalination, hydrogen, and data centres. Most of these industrial sectors are interconnected, with the development of one driving the economic case for investments into the other sectors. Every new advancement across these sectors will require significant long-term planning on the flow-on electricity infrastructure requirements from industries that will be enabled from initial investments.

The development of a new magnetite mining precinct, producing high-grade, low-impurity DRI grade concentrate and/or pellets, could drive the development of a green iron facility. To leverage the comparative advantages of the renewable energy resources of the state, a green hydrogen project could be developed with sufficient value placed on embedded carbon emissions from Australia's key resource trading partners. Water constraints require the development of a water desalination plant. All of which materially advance the industrial demand placed on the South Australian electricity network.

Large industrial loads – including mining, clean commodity value-adding, desalination and data centres – are driving record connection enquiries in the short- to medium-term, with active interest into load connections exceeding 2.5GW. ElectraNet forecasts an additional 1.3GW by 2035 beyond the current interest.¹⁶ Currently, South Australia has ~ 3.5GW of large-scale wind and solar operating as of June 2025, with rooftop solar PV adding a further 2.4GW, tripling since 2019.

Since 2010, large industrial electricity loads have increased by an average of 5% annually. In 2024, large industrial loads grew 7%, outpacing broader energy consumption across the state. In 2009-10, industrial loads accounted for 9% of the state's energy demand. By 2024-25, this has grown to 18%.¹⁷

The connection interest for industry has rocketed in recent years. Between 2012 and 2022, ElectraNet received one industrial connection enquiry for a 50MW load. As of June 2025, ElectraNet has 37 individual industrial customers exploring 50 direct connections to its transmission network. Whilst highly improbable, if all proposed loads were implemented, these customers would aggregate to 15GW of new load, **5 times larger than the maximum total demand in 2024-25.**

Of the ~ 15GW of new connection interests, 48% came from mining, followed by iron & steel (24%), data centres (17%) and desalination (8%). The approach for Transmission Network Service Providers (TNSP) to reactively respond in transmission infrastructure investments for new loads in a timely manner is no longer sustainable. To enable the state's green iron and steel ambition, **more proactive planning and enabling investment into infrastructure must commence now.**

¹⁶ ElectraNet, [Transmission Annual Planning Report 2025](#), 07 June 2025

¹⁷ ElectraNet, [Transmission Annual Planning Report 2025](#), 07 June 2025

The transformation of the Whyalla Steelworks could unlock a FOAK capital deployment, in the Australian context, in embodied decarbonisation across the full value chain of a commodity, characterised as the largest single source of industrial emissions globally, accounting for 7-9% of annual global emissions. Public-private partnerships will be critical to enable South Australia to unlock a world-leading **lighthouse green iron project**.

This report analyses the opportunities to scale SA's role in low-emission exports across the iron value chain, identifying the enabling policy mechanisms that can be implemented as bilateral support with Australia and our key North Asian trading partners that will complement and enhance the funding and budgetary measures already introduced through Future Made in Australia (FMIA).

This report showcases a potential structure across the Whyalla value chain, ring-fencing value-add stages to leverage various consortia and the integration of strategic, patient public interest capital to ensure revenue upside sharing and embed a cost recovery model given the scale of public investment required to de-risk the transformation absent a price on carbon.

Box 2. Enabling Market-Forming Mechanisms and Financing Structures to Lower Cost of Capital

In Section 4, CEF outlines a number of mechanisms and financing structures that have been put forth to government and industry that would leverage government-backed offtake contracts and investment underwriting schemes to lower the cost of capital for capital-intensive clean commodity value-adding, enabling price discovery of the value of embodied decarbonisation and catalysing the commercialisation of future green iron and steel technologies.

1.3. Starting Point: South Australia's Legislation, Strategies and Targets for Green Iron and Steel

SA has already enacted multiple pieces of critical legislation to unlock the green iron opportunity in the state, leading Australia to develop a subnational Green Iron & Steel Strategy. The development of a renewable energy and green hydrogen-based DRI industry in SA is facilitated by existing policy, enabling the SA Government, Federal Government and private investors to deploy capital into renewables now, without a methane gas based transition period. To further accelerate this, the SA Government has designed dedicated renewable energy legislation and targeted release areas in close proximity to industrial hubs to accelerate approvals timelines and expedite lead times.

Figure 1.1: Legislation and Strategies Required to Enable Green Iron Industry

Green Iron & Steel Strategy	A well-designed strategy with measurable targets, delivered by bold and deliberate statecraft, provides the framework to track progress in scaling low-carbon industries and identify strategic areas for enabling investment, e.g. common-user infrastructure.
Renewable Energy Legislation	Designed to expedite approvals and development timeline to reduce lead times, as well as design specific release areas for investments to minimise land use conflicts and impacts to rural and regional communities.
Jobs and Skills Strategy	A coordinated jobs strategy ensures the state facilitates the development and flow of infrastructure construction and sustaining industrial jobs, ensuring community benefit principles and First Nations engagement with the energy transition.
Market Support Mechanisms	Supply-side market incentives, including PTCs, concessional financing, strategic public equity investment to lower WACC. Demand-side market incentives, including CfDs, cost-bridging mechanisms, bilateral trade corridor partnerships, etc.

Source: Climate Energy Finance (2025)

Green Iron Funding and Budgetary Assistance That Can be Leveraged

When the Steelworks was forced into administration, the Federal Government and SA Government announced a \$2.4bn rescue and re-industrialisation package to transform the Steelworks into a clean iron and steel hub. The funding was administered in distinct parts:

- **\$100m** for immediate, on the ground support, providing: \$50m for Creditor Assistance payments, \$32.6m in infrastructure upgrades, and \$6m to establish the Jobs Matching and Skills Hub in Whyalla.
- **\$384m** to fund the Steelworks operations during administration, ensuring workers and contractors continue to be paid, financed as a 50:50 split between state and federal governments.
- **\$1.9bn** allocated for investment in the future of the Steelworks, working with the new owner to invest in the upgrades and new infrastructure which will be vital to ensuring the facility has a sustainable, long-term future.

The SA Government is contributing \$650m of the \$2.4bn, including \$192m co-financing of the stabilisation pool and \$395m towards the future upgrades and investments in enabling infrastructure. The SA Government's 2025-26 budget has provisioned an additional \$192m, provided the Federal Government continues 50:50 contributions, in the event of an extended sales process.¹⁸

As part of its Hydrogen Strategy, the SA Government had allocated \$593m to the development of the Whyalla Hydrogen Jobs Plan, a 250MW electrolyser plant, storage infrastructure and 200MW hydrogen power plant. In February 2024, the SA Government announced it had reached an agreement with GFG Alliance to explore opportunities for hydrogen offtake from the facility to support the decarbonisation of the Whyalla Steelworks. However, following the administration of Whyalla, the project has since been shelved and the state funding reallocated to the Whyalla rescue package.¹⁹

In May 2025, the Office of Hydrogen Power SA was dissolved, with its functions – including the facilitation of the Whyalla Hydrogen Jobs Plan and broader industry development initiatives – transferred to the Department for Energy and Mining. However, in October 2025, an auditor-general report tabled in SA parliament revealed \$285.2m had already been spent of the \$593m allocation, including \$209.2m in capital costs and early design works.²⁰

To support the development of a green hydrogen and green iron industry in Australia, the Federal Government has also announced the following budgetary measures:

- **\$6.7bn** hydrogen production tax incentive (HPTI), providing A\$2/kg subsidy.
- **\$4bn** Hydrogen Headstart Program, designed as tailored contracts between ARENA and proponents, administered as cost-bridging production credit.
- **\$350m** contribution to Australia-Germany H2Global Joint Tender.
- **\$1bn** Green Iron Investment Fund, of which up to \$500m has been allocated to the Whyalla Steelworks. The remaining \$500m is open for existing and greenfield projects to de-risk early mover capital investments into green iron production. The first tender will run from 28 October 2025 to 16 January 2026.
- **\$750m** allocation to green metals, including iron, steel, alumina and aluminium from the FMIA Innovation Fund.
- **\$5bn** redistribution within the National Reconstruction Fund to establish a Net Zero Fund.
- Further general funding available from the CEFC and/or EFA.

¹⁸ SA Government, [State Budget 2025-26: Supporting Whyalla](#), 04 June 2025

¹⁹ CSIRO, [South Australian Government Hydrogen Facility \(Archived\)](#), 24 February 2025

²⁰ ABC, [Auditor-General Report Shows SA Government's \\$285m Hydrogen Spend](#), 15 October 2025

The above supply-side market incentives and innovation funding channels provide significant public support to lower the production cost of hydrogen and lower the private capital intensity of green iron production. However, Australia is still a long way yet to seeing a green iron project reach final investment decision (FID) and progress into construction at commercial scale. Projects require market-formation support and demand-side incentives to develop bankable projects that can be competitively financed.

There is a critical gap missing in Australia's green metals statecraft. In Section 4, CEF highlights a number of demand-side market-forming mechanisms that have been put forth that the SA Government could champion to facilitate the development of the state's lighthouse clean commodity industry.

Green Iron and Steel Strategy

In June 2024, SA released its Green Iron and Steel Strategy, setting the state's vision to position itself as the partner of choice for decarbonised steelmaking.²¹ SA's strategy requires a long-term, coordinated strategy to transform the Whyalla Steelworks to that of a renewable hydrogen and low-carbon steelmaking industrial hub.

The Green Iron and Steel Strategy is centred around the following objectives:

Objective 1: Enhancing SA's comparative advantage by:

- Demonstrating the magnitude, quality, and development potential of SA's iron ore deposits,
- Confirming SA's green export viability through a Green Iron Supply Chain Study with the Port of Rotterdam, and
- Working with industry and the education sector to address technological and workforce challenges.

Objective 2: Establishing local green steel industry foundations by:

- Partnering with the Federal Government to support the Whyalla Steelworks low-carbon transformation,
- Delivering a commercial de-risking study, in partnership with industry, to plan for development of a DRI plant and supporting value chain, and
- Supporting establishment of specialised industrial precincts and common user infrastructure corridors to de-risk and expedite projects across the value chain.

Objective 3: Ensuring a sustainable, long-term industry and shared prosperity by:

- Finding solutions for First Nations advancement and community autonomy by sharing project benefits with communities, First Nations and Native Title holders,
- Phasing in the purchasing of Australian green steel for infrastructure projects as production capacity emerges, and
- Targeted support to facilitate the delivery of a new hydrogen-based green iron plan in SA by 2030, or earlier.

Hydrogen and Renewable Energy Act

The SA Government's landmark Hydrogen and Renewable Energy (HRE) Act 2023 officially came into operation in July 2024, a fit-for-purpose legislation aimed at accelerating renewable energy deployment through the streamlining of project and land use approvals.²²

The HRE Act seeks to enable an efficient, flexible, transparent and consultative regulatory 'one window to government' framework for hydrogen generation and renewable energy infrastructure. The HRE Act is designed to:

²¹ SA Government, [Green Iron and Steel Strategy](#), June 2024

²² SA Government, [Hydrogen and Renewable Energy Act 2023](#), 11 July 2024

- Licence and regulate the entire lifecycle of renewable energy projects and hydrogen, recognising the central role First Nations participation plays in decision-making.
- Maintain commitment to multiple land use, recognising overlapping legal rights over the same land, e.g. pastoral leases, mining tenements and licences.
- Deliver investment certainty and security to unlock the pipeline of renewable energy projects.
- 'One window to government through the Department of Energy and Mining to expedite the development of renewable and hydrogen capacity.

Streamlining land access, environmental approvals and development approvals for significant projects is consistently highlighted across the renewable energy sector as a critical area for improvement to reduce business costs in the progression towards FID. In SA, land access provisions through the Pastoral Land Management and Conservation Act 1989 and planning processes under the Planning, Development and Infrastructure Act 2016, as well as environmental approvals and heritage approvals require complex interactions with multiple state and federal regulators. The single window to government ensures project coordination across regulators and departments, as well as provides transparency over the progression through approvals for developers.

A key aspect of the HRE Act to minimise the duplication of approvals processes is the development of release areas, with the SA Government working with First Nations and Native Title groups, pastoralists, landowners and communities to identify areas that can sustainably host large-scale renewable assets. Under this framework, renewable infrastructure proponents will be able to submit bids into a competitive tender for land allocations within release areas.

The SA Government has proposed to release two renewable energy areas on the Upper Spencer Gulf in close proximity to the Whyalla Steelworks: the Whyalla West and Gawler Ranges East:

- The **Whyalla West** proposed release area covers ~ 6,200km², located 50km from Whyalla at its southern point and 25km from Port August at its eastern point.²³ The proposed area covers the Barngarla Native Title Determination Area and includes part or all of 18 pastoral leases.
- The **Gawler Ranges East** proposed release area covers ~ 5,200km², located 80km from Whyalla at its southern point.²⁴ The proposed area covers the Gawler Ranges Native Title Determination Area and includes part or all of 7 pastoral leases.

In August 2025, the SA Government introduced the State Development Coordination & Facilitation Bill 2025 (SDCF), intended to drive the development of these areas.²⁵ Through this legislation, the state's government aims to facilitate economy-wide decarbonisation and net zero industry growth; the introduction of the office of the Coordinator General to coordinate, consolidate and streamline regulatory processes; and enact 'State Development Areas' – environmentally and economically suitable development 'go zones', including net zero industrial precincts.

Such 'go zones' would be proactively assessed by regulators for developments to be assessed at pace, accelerating the development and deployment of large-scale renewable energy capacity required to boost economic complexity and economic growth through decarbonised, value-adding industries.

The development of release areas in close proximity to emerging and potential clean energy-intensive industrial precincts, in conjunction with the proposed competitive tender process to approve the best proposals, opens up a significant opportunity to develop a large-scale renewable electricity generation and firming infrastructure park from a world-scale industrial park and renewable energy developer, e.g. Envision Energy.

²³ SA Government DEM, [Whyalla West Proposed Release Area](#), September 2024

²⁴ SA Government DEM, [Gawler Ranges East Proposed Release Area](#), September 2024

²⁵ Government of South Australia, New [Legislation to Accelerate Housing, Jobs](#), 08 February 2025

The economies of scale of an integrated facility established in a release area could significantly improve both the speed of approval and economics of scale in electricity and hence hydrogen required to accelerate the move to commercial price parity with emissions-intensive counterparts that dominate global trade, including iron & steelmaking, hydrogen, ammonia, methanol, etc. CEF explores this proposal in more detail in Section 7.

Jobs and Regional Employment Strategy

In August 2025, State Development South Australia published the state's first Upper Spencer Gulf Workforce Strategy, developed with consultation from industry, local communities and stakeholders to ensure the region's workforce demand is supported.²⁶ The SA Government recognises the region is a critical actor in the state's mission to reduce its carbon footprint in heavy industry and to capitalise on the state's potential in a decarbonised economy as a resource-rich, renewable energy superpower.

A key component of the \$2.4bn federal and state rescue and re-industrialisation package of the Whyalla Steelworks was to provide targeted support for the development of a resilient, skilled workforce for the Steelworks, local supply chain business and the broad scope of parallel industries based in the region.

Currently, the Upper Spencer Gulf produces \$3bn in annual Gross Regional Product (GRP), employing 22,600 workers with a 55.9% participation. The Gulf has a region-wide unemployment rate of 8.3%, however the unemployment rate in industrial hubs across the Gulf, including Whyalla, Port Augusta and Port Pirie would be relatively lower.²⁷

The Workforce Strategy, projected out to 2030, outlines a number of key outcomes the SA Government is targeting. Economic and project modelling undertaken by State Development identified a peak of 4,000 new jobs will be created to support the construction of major projects and infrastructure, stabilizing at ~ 1,500 by 2030. To support this growth, State Development is actively engaging to:

- Enable the Upper Spencer Gulf to attract, develop and retain the skilled workers needed to meet current and projected labour demands, with the objective to grow to the workforce by 1,500 through skills and workforce attraction, retention and development initiatives.
- Improve workforce participation of disengaged and disadvantaged people to position these groups to benefit from economic growth in the region. Currently, the Gulf's engagement in the labour force is more than 6 percentage points lower than the state average.
- Build the immediate workforce for priority projects in the region. From 2025 to 2030, the increased workforce demand will emerge from construction and infrastructure projects, both public and private. These projects are critical to enable opportunities for emerging industries and the broader community.

As part of the \$99.2m allocation from the \$2.4bn package to provide immediate support for the Steelworks, SA will develop a \$6m Jobs and Skills Hub in Whyalla, co-located with Whyalla TAFE – supporting the Steelworks to access skilled workers required to maintain the critical infrastructure and to build the workforce to meet expected demand from renewable energy, resources, steelmaking, manufacturing and construction across the Gulf.²⁸

²⁶ State Development SA, [A New Workforce Plan for the Upper Spencer Gulf](#), 04 August 2025

²⁷ State Development SA, [Upper Spencer Gulf Workforce Strategy](#), 04 August 2025

²⁸ State Development SA, [Upper Spencer Gulf Workforce Strategy](#), 04 August 2025

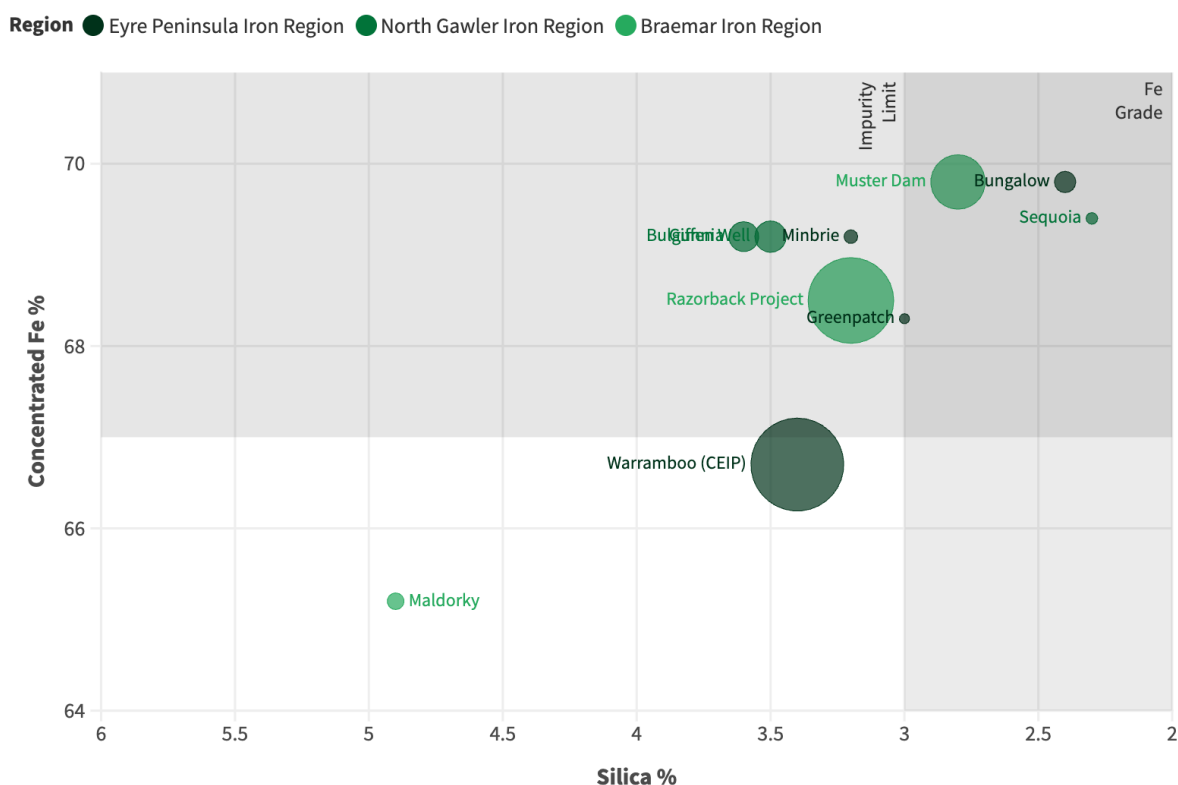
Section 2. Iron Ore Mining and Magnetite Exports

The mining sector accounts for the largest share of South Australia's industrial economy, contributing \$10.7bn in direct and indirect spending to the state in 2023, supporting over 42,800 jobs.²⁹ SA is a globally-significant producer of copper concentrate and copper cathode, and exports the second largest volume of iron ore from Australia, albeit a fraction of iron ore production in WA. The expansion and facilitation of magnetite mining, processing and value-add domestically is one of the largest economic opportunities of the state this century.

South Australia currently produces ~ 2.2Mtpa of magnetite concentrate from the Iron Magnet mine in the South Middleback Range, owned by OneSteel Manufacturing (Whyalla). The majority of this is used within the Whyalla Steelworks, and complemented by ~ 8-10Mtpa of hematite exports from the same region. However, the hematite deposits in operation are expected to be depleted by the end of FY2026. To recover this forthcoming decline, it is imperative the SA Government facilitate the expansion of magnetite mining in its iron ore regions, primarily through the support and deployment of common-user electricity and water infrastructure to crowd-in private investment.

As of November 2024, South Australia has nearly 20 billion tonnes of JORC compliant magnetite ore, including 8.3 billion tonnes of Economic Demonstrated Resources. The vast majority of South Australia's magnetite deposits can be efficiently concentrated to 66-70% - suitable for the commercialised DRI pathways - see Figure 2.1.

Figure 2.1: SA Magnetite Resources and Current DRI Ideal Feedstock



Source: SA Government Department of Energy and Mining (2025)³⁰

²⁹ SA Chamber of Mines and Energy, [Annual Report 2024](#), 2024

³⁰ SA DEM, [Magnetite South Australia](#), July 2025

Developing a green iron industry in SA will require a significant step change in the development of new magnetite mining capacity. To-date, investment has been limited by geographical and capex-intensive associated infrastructure to extract and process, or beneficiate magnetite to a quality that is demanded in international trade.

In contrast to direct shipped hematite ores (DSO), much lower in situ iron content magnetite deposits require significant beneficiation; the processing of ores to improve the economic value through the removal of waste to increase the concentration of valuable minerals. This typically involves the grinding of ores to a particle size upon which magnetite is liberated from its silicate matrix. The comminution of magnetite ores, particularly grinding ores to liberation size, is incredibly energy intensive relative to almost zero-value-add hematite DSO operations, with an exponential relationship of grind size versus energy demand, but results in a higher value export product.

Many banded iron formation (BIF) deposits require a final concentrate grind size P80³¹ of 25-35 micrometres (µm), orders of magnitude higher than an equivalent DSO hematite lump (32-6 mm, or 32,000-6,000 µm) and fines (<6 mm, or 6,000 µm).³² Most of Australia's magnetite resources are situated within BIF deposits, however regions like the Braemar host its magnetite resource in meta-sedimentary siltstones, with lower Bond ball mill work indices than BIFs prominent in midwest WA and the Pilbara. While these resources are softer and more easily beneficiated than BIFs, these deposits still require significant energy resources to beneficiate to high-grade salable products.

Box 3. Challenges to Processing Magnetite Iron Ore in South Australia

Hematite iron ore deposits mined in Australia typically contain an iron (Fe) value of 55-62% in situ. This is a sufficient grade to extract and export with minimal on-site processing beyond a degree of crushing and screening. Magnetite iron ore deposits typically occur naturally with Fe values between 15-40%. To be optimised for sale, this needs to be concentrated to 65-70%.

To beneficiate magnetite ore, the general circuit involves the initial crushing and screening of run of mine ore to <6mm. Ore is then processed through comminution circuits, the grinding of particles down to liberation size to liberate magnetite from waste material (gangue).

The concentration of magnetite globally is primarily achieved through **wet magnetic separation** processes, typically low-intensity magnetic separators (LIMS), with only a small percentage produced via dry magnetic separation techniques.

Comminution and beneficiation circuits are optimised to a grind size that achieves the optimal concentrate specifications for the least amount of power input. The cost optimisation of processing means there is a trade-off between mass recovery of magnetite in the ore feedstock, and the input costs associated with liberation of magnetite.

Magnetite mining and processing with a wet magnetic separation pathway typically requires **~1,500-3,000 litres of water per tonne of concentrate**. For a 3Mtpa concentrate operation in SA, this would require 4.5-9.0 billion litres (gigalitres, GL) per annum. In comparison, hematite operations in the Pilbara consume ~ 250-300 litres per tonne, approximately a tenth of the water intensity.³³

Northern SA is largely water-constrained, with salinity and quality issues impacting groundwater access, with groundwater extraction in Northern SA carrying expensive unit costs. Desalination plants are also incredibly capex-intensive, particularly if the users require 100s of kilometres in water pipelines to produce concentrate on mines located in the regional iron ore deposits in the Eyre Peninsula, Braemar and North Gawler regions.

³¹ P80 refers to the target size in which 80% of the material passes through a screening of the target size.

³² Metso, [Eco-efficient and Cost-effective Process Design for Magnetite Iron Ore](#), 24 February 2025

³³ Company Accounts

Unlocking Water in the Eyre Peninsula and North Gawler Regions with the Northern Water Project

Mines in northern SA rely on groundwater from the Great Artesian Basin and small local aquifers. The process is expensive to extract, with local water systems also characterised by high salinity and water quality issues. To unlock and enable the growth of water-constrained magnetite deposits, process minerals and develop a domestic renewable hydrogen industry, access to water beyond the limited access to groundwater is critical.

To address this, SA Water, a government-owned and operated entity, has announced the largest infrastructure proposal in the state. The **Northern Water Project** is a proposed \$5bn infrastructure project to develop a seawater desalination plant, drawing water from the Spencer Gulf and connecting to northern SA via a 600km pipeline. The Project proposal would involve the construction of two 130ML/day plants, combining to 260ML/day, or 95GL pa at full capacity.

Extensive studies have been undertaken to investigate the construction of the desalination plant in Cape Hardy, ~ 200km south of Whyalla, and Mullaquana Station, ~ 20km south of Whyalla. The proposed pipeline would link the Eastern Eyre Peninsula, connecting critical industrial hubs and water-intensive industries, including Whyalla, Port Augusta, Woomera, Carapateena, Roxby Downs, Oak Dam and Olympic Dam - SA's copper mining region.

In February 2024, the SA Government announced it would contribute \$100m towards a \$200m feasibility study on the Northern Water Project. The study would be co-financed by enterprises that would benefit from the construction of the desalination plant and pipeline. BHP, given its significant presence in the state with Copper SA, would likely be the largest beneficiary of the infrastructure project. BHP would contribute \$77m to the study, with the difference covered by Fortescue, AMP Energy (since acquired by Revera Energy) and Origin Energy.³⁴

The Northern Water Project would be a commercial proposal, funded and developed by SA Water, underwritten by commercial offtake agreements with users of the desalination plant and pipeline, e.g. BHP and/or the new owner of the Whyalla Steelworks.

In August 2025, Fortescue and Origin pulled out of the Northern Water Project. The pullback of the state's ambition on renewable hydrogen was the impetus for Fortescue to pull out of the project, citing its involvement in the project was tied to the Port Bonython Hydrogen Hub proposal. Origin Energy also confirmed that by mid-2024 it had assessed hydrogen options in SA and came to a final decision not to proceed.³⁵

Box 4. Challenges to Processing Magnetite Iron Ore in South Australia

The proposed pipeline of Northern Water from Cape Hardy / Mullaquana Station to BHP's Copper SA assets would be constructed in close proximity to the **Eyre Peninsula** and **North Gawler** iron ore regions.

CEF recommends the design of Northern Water in its feasibility and engineering studies to model the integration of lateral pipelines to the respective iron ore regions from the arterial pipeline to Copper SA's assets. Commercial offtake contracts for water supply (possibly with an interim SA Government as counterparty to get the project to FID and into construction) would significantly de-risk one of the key bottlenecks to scaling magnetite production in SA.

³⁴ ABC, [SA Government to Spend \\$100m on 'Pre-Feasibility Study' for Northern Water Desalination Plant and Pipeline Network](#), 22 February 2024

³⁵ ABC, [Private Companies Pull Out of SA Government's \\$5bn Northern Water Project](#), 29 August 2025

Role of Government to Support the Commercialisation Green Iron Ore Technologies that Remove Water from Concentration Processes

Global magnetite producers and resource technology developers are actively investigating and undergoing RD&D into beneficiation processes that circumnavigate the need for water, i.e. dry processing. Vale of Brazil, the largest iron ore miner outside of Australia, paid US\$500m in 2018 to acquire New Steel, an emerging technology developer of a Fines Dry Magnetic Separation (FDMS) process.³⁶

In 2020, Vale announced plans to invest up to US\$100m to build an industrial plant for dry magnetic separation and concentration of low-grade iron ore from Minas Gerais, producing 1.5Mtpa. This followed the commissioning of a US\$3m pilot plant in Minas Gerais.³⁷

Metso, a world-leading Finnish minerals processing and metals refining technology developer, has also progressed dry low intensity magnetic separation pathways.

DryFlow Magnetics

DryFlow Magnetics is an Australian industrial technology company that is developing a patented dry magnetic separation process for magnetite iron ore in SA, and is demonstrating its efficacy for the beneficiation of hematite, copper, nickel, cobalt, rare earths, and other critical minerals.³⁸ Unlike conventional methods, DryFlow operates entirely water-free, unlocking mineral resources previously stranded in arid and remote regions. Independent validation confirms the technology can upgrade low-grade magnetite to benchmark and premium-grade iron concentrates, ideally suited to the green steel supply chain.

The removal of the water constraint could unlock 20 billion tonnes of magnetite resources in SA. The elimination of water in the process significantly improves opex, as well as eliminates the capital-intensive requirements to build wet tailings facilities that would only run if able to access critically constrained water resources. As a result of the technological advantage of removing water from the magnetic separation process, there are also significant energy savings that emerge.

As mentioned above, energy costs related to grinding ores exhibit an exponential-like cost curve, with costs rising significantly as one moves closer to liberation size due to the higher energy requirements. In traditional wet process magnetite operations, ore must be crushed down to liberation size with all feedstock, as the separation process occurs in a slurry.

DryFlow Magnetics employs a patented stacked-magnetics configuration that dynamically separates magnetically susceptible material from waste without the use of water. The process uses controlled magnetic field gradients to progressively upgrade ore quality through multiple stages of dry separation and regrind, achieving benchmark DRI-grade concentrates at substantially lower energy and environmental cost than conventional wet beneficiation.

The key advantage of DryFlow Magnetics is the ability to efficiently run cycles of grinding and separation in succession. As DryFlow is a dry, belt-driven beneficiation technology, ores can be ground down to a relatively larger particle size (e.g. 300µm), then passed through the magnetic process. This will remove ~ 30% of the waste material out of the sample. The sample containing magnetic material can then be ground down further (e.g. 100µm) and passed through the magnetic separator again. This will further concentrate the material containing magnetics. Finally, the sample – which has already removed a significant volume of waste rock – is ground to liberation size before final pass through the magnetic separator.

³⁶ Reuters, [Vale Buys Innovator New Steel for \\$500m](#), 12 December 2018

³⁷ Vale, [Vale Inaugurates Pilot Plant That Allows for More Sustainable Mining](#), 15 July 2020

³⁸ [Dryflow Magnetics](#)

The cost and energy efficiencies are a result of removing the bulk of the waste material prior to grinding to liberation size, as well as inherent efficiencies in the grinder and processes themselves.

DryFlow's process is ~30% more energy efficient than a wet separation process.

DryFlow offers several advantages over other dry magnetic separation technologies, such as Vale's FDMS highlighted above. Vale's FDMS requires significant capex and opex due to the need to dry ore feedstock to below 1% moisture and high energy consumption for air fluidisation. In comparison, DryFlow is able to process iron ores with moisture content up to 12%, as well as operate with a lower power draw due to its on-belt solid-state magnetics. Additionally, DryFlow can separate efficiently at larger particle sizes initially, reducing grinding requirements, and its throughput is determined by the size of the belts, offering less scale-up risk.

DryFlow has actively partnered with leading research institutions such as CSIRO, University of SA, University of Technology Sydney, industry partners including Loesche, Siemens, Joest, Century Engineering and Ammjohn Solutions. DryFlow's pilot facility in Adelaide has successfully concentrated iron ores from the Middleback Ranges, other South Australian deposits, Pilbara hematites and magnetites, as well as ore samples from global iron ore producers.

To date, DryFlow has received SEED funding from CSIRO, Orion Resource Partners, Industry Growth Program, State Development SA, Viriscent Ventures (the CEFC's VC arm), and Taronga Ventures.

Box 5. Supporting Australian RD&D Across Green Iron Value Chain

ARENA administers the Future Made in Australia Innovation Fund, a \$1.5bn grant funding pool to support pre-commercial innovation, demonstration and deployment of renewable energy and low-emission technologies. The Innovation Fund is distributed into three priority areas:

- **\$750m to Green Metals**; including iron, steel, alumina and aluminium.
- **\$500m to Clean Energy Technology Manufacturing** to enable development of technologies seeking to alleviate critical supply chain challenges facing the clean energy transition.
- **\$250m to Low Carbon Liquid Fuels (LCLF)**; including SAF and renewable diesel.

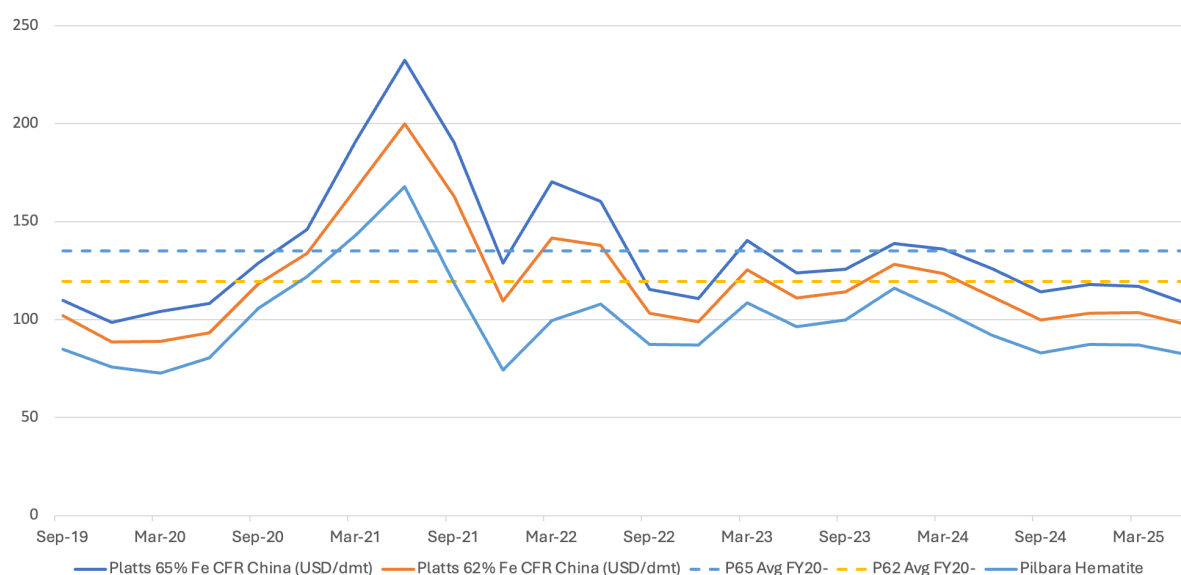
To CEF the dry magnetic separation technology developed by SA's DryFlow Magnetism is an ideal candidate for ARENA to allocate FMIA Innovation Fund grant funding, for DryFlow's potential to beneficiate magnetite to high-purity iron and unlock SA magnetite resources currently uneconomic due to the significant challenges in the capital intensity of water infrastructure.

CEF believes there is significant potential for the application of DryFlow Magnetism technology to unlock SA's magnetite industry, and is at a key stage of progression up the TRL ladder and into commercialisation for strategic, public-interest equity investment from Australian SIVs with higher risk tolerances i.e. the **National Reconstruction Fund**.

2.1. The Export Opportunity and Potential Value-Uplift of Magnetite

Since FY2020, the 65% Fe CFR China Index, the benchmark high-iron content price into China, has averaged US\$135/tonne (A\$205/tonne). In comparison, the 62% Fe Index, the benchmark used for hematite producers in the Pilbara, has averaged US\$119/tonne (A\$181/tonne). Australia's magnetite concentrate and pellet producers have been able to realise revenues close to the 65% index.

However, the declining ore grades in the Pilbara have led to average yields to the benchmark 62% of 85-90%, in part due to the value-in-use downgrade of higher impurity levels found in hematite ores in the Pilbara. As a result, since FY2020, Australia's magnetite producers have been able to realise revenues at a **30-35% premium** over hematite producers in the Pilbara - see Figure 2.2.

Figure 2.2: Benchmark Quarterly Iron Ore Prices Since FY2020

Source: Fortescue, Vale Company Accounts

Currently, the Middleback Ranges produce ~2.2Mtpa of magnetite concentrate and ~8-10Mtpa of hematite. Combined, these resources generate an estimated \$2bn annually in revenues. As aforementioned, the hematite deposits in operation are expected to be depleted in the latter half of FY2026. There are currently four magnetite concentrate proposals in SA to complement the Middleback Ranges existing Iron Magnet mine, 3 in the Eyre Peninsula and one in the Braemar iron ore region.

CEF analysis estimates that, if all projects proceeded through FID and become fully operational, SA could grow its magnetite industry to 29.2Mtpa, a 13x increase in annual magnetite production that could generate \$6bn pa in revenues, delivering over \$300m pa to the SA budget in royalties - see Figure 2.3.

Figure 2.3: Potential Export Potential from Proposed Magnetite Concentrate Projects

Project	Status	Capacity (Mtpa)	Potential (A\$m)	Royalty (A\$m)
SIMEC Mining Middleback Ranges	Operational	2.2	457	23
SIMEC Mining Middleback Ranges - Expansion	Proposed	7	1,456	73
Iron Road Central Eyre Iron Project (CEIP)	Proposed	12	2,495	125
Magnetite Mines Razorback	Proposed	5	1,040	52
Lincoln Minerals Lincoln Minerals Green Iron	Proposed	3	624	31
Total Annual Magnetite Potential		29.2	6,072	304

Source: Company Accounts, CEF Calculations

2.2. Eyre Peninsula Iron Ore Region

SIMEC Mining Middleback Range Expansion

Mining in the South Middleback Range began in 1989 with the extraction of hematite iron ore at the Iron Duke Mine. Magnetite iron ore mining commenced in the South Middleback Range in 2007 with Project Magnet, which included the construction of a co-located wet magnetic separation processing facility and slurry pipeline between the mine and the Whyalla Steelworks. Prior to its forced administration, GFG Alliance outlined a phased expansion plan to replace the exhausted hematite operations with a larger magnetite mining operation.

The Magnetite Expansion 2 Project (MEP2) involves the expansion of magnetite mining and processing in the South Middleback Range. MEP2 would extend the mine life to ~ 2045 and sustain existing production levels of the Whyalla Steelworks. MEP2 includes the development of a new tailings storage facility, a new magnetic separation concentrator facility, an additional concentrate slurry pipeline to transport the uplift in annual production capacity and upgrades to the Whyalla Port and pellet plant facilities.³⁹ MEP2 would increase production by 7Mtpa of concentrate.⁴⁰

In March 2023, the SA Government granted SIMEC Mining operational approval for the MEP2 expansion, developing the Cook's North and Cook's North West projects.⁴¹

Iron Road Central Eyre Iron Project

In 2019, Australian Stock Exchange (ASX) listed Iron Road proposed the development of the 12Mtpa Central Eyre Iron Project (CEIP), a significant revision down from its 2014 DFS for a 21.5Mtpa proposal. The latest development strategy estimates total project costs of US\$1.74bn, producing 12Mtpa concentrate at 66.7% Fe content.⁴²

The proposed mine and industrial port precinct of Cape Hardy are linked by an infrastructure corridor with optionality on the preferred method for iron concentrate, e.g. road transport or rail. The infrastructure corridor allows for power and water transmission along its length.

In February 2025, Iron Road announced it had employed WSP Australia to deliver a scoping study to investigate the feasibility, scope, equipment and probable cost of a 130km slurry pipeline from the CEIP to the Cape Hardy industrial port precinct. WSP's analysis determined the slurry pipeline capex at US\$576m, equating to ~ US\$1/wmt, a >80% reduction in transport costs relative to the previous dual powered road train option.⁴³

2.3. Braemar Iron Ore Region

Unlocking South Australia's Braemar region would represent an important step to expanding the state's, and Australia's, access to DR-grade magnetite iron ore. The Braemar can support the production of DRI for decades, providing diversification and growth to South Australia's existing, but small in comparison to WA, iron ore production. However, unlocking the region will require significant government support for the development of common user, enabling infrastructure, prioritising investments into:

1. **Water supply** - given the production of magnetite concentrate is also water intensive, likely requiring a combination of coastal desalination and fresh water supply, potentially utilising latent capacity from the Adelaide Desalination Plant and the Northern Water project.

³⁹ GFG Alliance, [Magnetite Expansion Project](#), April 2022

⁴⁰ South Australian Exploration and Mining Conference, [Magnetite Expansion Project](#), December 2022

⁴¹ SA Premiers Cabinet, [Green Light for SIMEC Expansion](#), March 2023

⁴² Iron Road, [Revised CEIP Development Strategy Reduces Project Capex Requirements by 56%](#), 25 February 2019

⁴³ Iron Road, [Slurry Transport of CEIP Concentrate to Port](#), 27 February 2025

2. **High-voltage power supply.** While SA has leading penetration of renewable energy in its grid, the state's grid does not have high-voltage transmission networks that other regions like Queensland have access to. AEMO and ElectraNet have brought forward the Northern Transmission Project (NTx) to strengthen the grid across the Mid-North Upper Spencer Gulf.⁴⁴
3. **Open access port bulk export capacity.** There is significant opportunity for the SA Government to invest in diversification from the privately-owned trans-shipment port of Whyalla (by the GFG Alliance), investing in green export industrial hubs in other port towns, including Port Pirie, commencing with open access port upgrades that can support iron ore transshipment to cape size vessels in the Upper Spencer Gulf.

Magnetite Mines Razorback Project

ASX-listed Magnetite Mines is developing the Razorback Iron Ore Project, a multi-stage DR-grade magnetite concentrate operation, with stage 1 producing 5Mtpa concentrate (25Mtpa feed), ramping up to 10Mtpa concentrate in stage 2 (67Mtpa feed). Magnetite Mines have modelled pre-production capital requirements of US\$1-1.3bn for stage 1 and US\$2.3-2.8bn total capital cost to stage 2 expansion, producing ~68.5% Fe concentrate for US\$87-96/tonne.⁴⁵

Magnetite Mines recognise the critical technical and economic barrier to the progression of the project as the fresh water volume required. To address this, Magnetite Mines have explored the potential to produce magnetite concentrates largely using saline water (seawater) from a composite sample of Iron Peak deposit ore. Lab tests have achieved concentrate grades of 69.9% Fe and < 2.0% combined silica and alumina content; similar to results using fresh water and meeting the current specification needed for DRI-EAF production through commercialised technologies.⁴⁶

In July 2024, Magnetite Mines signed a non-binding **Heads of Agreement with JFE Shoji Australia**, a subsidiary of Japan's JFE Steel, to form the basis for the negotiation towards a binding transaction for JFE to provide funding towards the Razorback Project's DFS. In exchange, the proposed transaction would provide JFE offtake rights for up to 10% of planned stage 1 capacity of the project's magnetite concentrate product over a 15-year term. JFE would hold the option to convert the offtake rights to equity or joint venture participation in the project.⁴⁷

July 2024 also saw Magnetite Mines announce a non-binding **MoU with ZEN Energy** to investigate potential energy offtake between Magnetite Mines and one or more of ZEN Energy's projects or relating infrastructure leasing agreements.⁴⁸

In October 2024, Magnetite Mines announced a consortium with developers across the green iron value chain to spearhead the Braemar region's progression towards realising a green iron industry. The Green Iron SA consortium comprises Magnetite Mines, Aurizon Holdings, Flinders Port Holdings and GHD. The consortium's key focus is fast-tracking the development of the Razorback Iron Ore Project, with future plans to produce DR-grade magnetite pellets and ultimately progress towards the manufacture of DRI/HBI from the industrial precinct of Port Pirie.⁴⁹

In March 2025, Magnetite Mines formally commenced the regulatory approvals process through its Mining Lease Proposal submission to SA DEM for a 5Mtpa output operation over 38 years.⁵⁰ The Mining Lease will provide secure tenure for construction, mining and ore processing operations.

⁴⁴ ElectraNet, [Project Fact Sheet: Northern Transmission Project \(NTx\)](#), April 2025

⁴⁵ Magnetite Mines, [Investor Presentation: Premium Iron Ore for Steel Sector Decarbonisation](#), October 2023

⁴⁶ Magnetite Mines, [Green Iron Grade Concentrates Produced Using Saline Water](#), 22 July 2025

⁴⁷ Magnetite Mines, [Heads of Agreement with JFE Shoji Australia](#), 08 July 2024

⁴⁸ Magnetite Mines, [MOU with ZEN Energy](#), 18 July 2024

⁴⁹ Flinders Port Holdings, [Green Iron SA Consortium Launches to Spearhead South Australia's Green Iron Revolution](#), 22 October 2024

⁵⁰ Magnetite Mines, [Razorback Project Mining Lease Approval Lodged](#), 26 March 2025

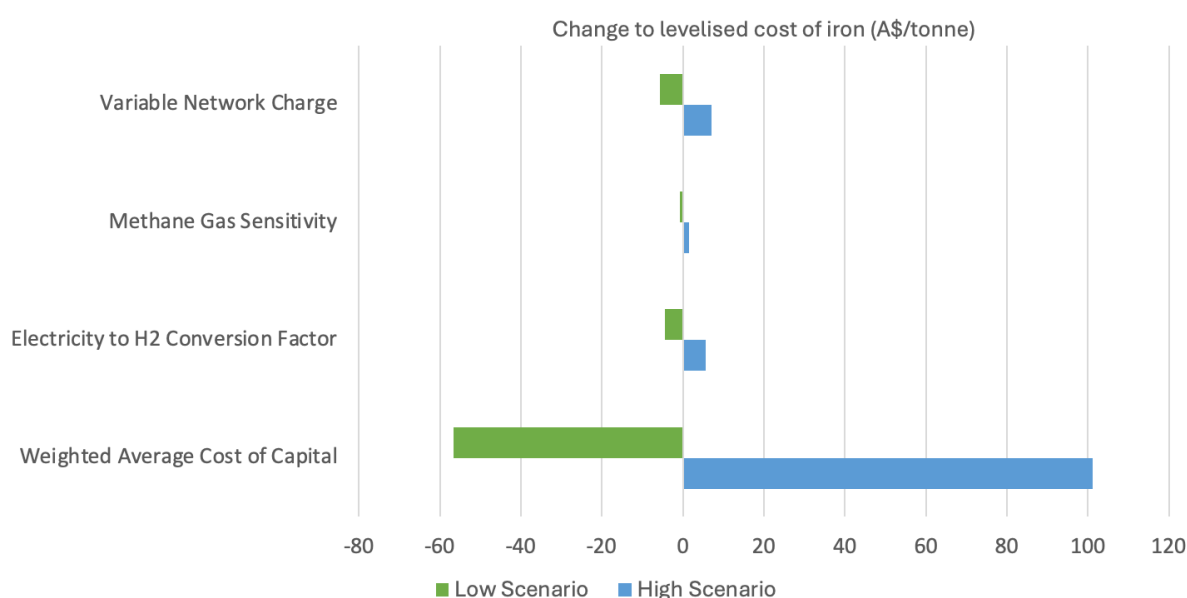
Section 3. DRI and Green Steel Production and Market Opportunities

The transition of the BF-BOF end-of-life Whyalla Steelworks to a renewables-based DRI-EAF facility represents the most capital-intensive and energy-intensive challenge across the green iron and steel value chain, however remains the most critical from a regional employment, economic impact, sovereign capability and security risk perspective. The development of a green iron industry in Australia represents the single largest opportunity this century for Australia to scale the value of our world-leading position in iron ore exports further down the supply chain and assist our key trade partners in delivering on their Paris Agreement decarbonisation commitments. At the optimistic end, replacing Australia's annual iron ore exports with green iron could generate up to \$386bn pa by 2060, a 220% value uplift, should technology and carbon pricing in Asian trade develop successfully.⁵¹

The largest factors of production that determine the cost of production for a DRI plant is the delivered cost of firm renewable energy and delivered cost of renewable hydrogen. The delivered unit costs of both these factors are primarily a function of the capital cost of the project. Engineering, procurement and construction (EPC) of firm renewable energy infrastructure and balance of plant, as well as the cost of capital, therefore ultimately determine the relative competitiveness of clean value-added commodities.

TSI found shifting the weighted average cost of capital (WACC) from the long-term post-tax real WACC of 4.5% to 3.6% led to a A\$57/tonne drop in the levelised cost of iron. Similarly, the increase to a 6% post-tax real WACC increased levelised costs of iron by A\$101/tonne. Given the capital intensity of renewable energy projects and associated infrastructure, sensitivities to the cost of capital provide the most material impact to the cost of production - Figure 3.1.

Figure 3.1: Sensitivity Analysis to Cost of Iron from Input Factors



Source: The Superpower Institute (2025)

Consequently, policy and support mechanisms that can reduce the risk exposure to lenders through government-backed offtake or energy revenue underwriting schemes presents as the most effective

⁵¹ The Superpower Institute, [A Green Iron Plan for Australia](#), 28 May 2025

lever to unlock clean commodity projects and bridge the commercial gap between green products and their emissions-intensive counterparts.

Quantifying the Base Investment Case

Techno-economic modelling conducted by Bivios and The Superpower Institute identified the following investments required to deliver 2.5Mtpa of green iron using Midrex and Calix's ZESTY platform (detailed in Section 5), in the Eyre Peninsula - see Figure 3.2. For the commercialised technology, a DRI plant would require 6.5GW of large-scale wind and solar PV, firmed by a 1.7GWh BESS. The firmed renewable generation would require an investment over \$14bn. Total capital costs for the Midrex platform, in an optimised setup, was modelled at over \$23.3bn, delivering a LCOE of A\$101/MWh and a LCOH of A\$10.3/kg.⁵²

Figure 3.2: Eyre Peninsula Green Iron Investments for 2.5Mtpa HBI Facility

Factor	Units	Flexible	Inflexible	Increase
Solar PV	MW	2,147	2,499	16%
Wind Turbines	MW	2,640	4,013	52%
Grid Connection	MW	1,189	797	-33%
BTM Transmission	MW	1,912	2,355	23%
Battery Capacity	MWh	432	1,701	294%
Iron Production	tph	441	285	-35%
Total Electricity Demand	TWh pa	10.2	10.9	7%
Solar PV	A\$m	2,744	3,193	16%
Wind Turbines	A\$m	7,221	10,978	52%
BTM Transmission	A\$m	168	207	23%
Hydrogen Production	A\$m	3,019	3,310	10%
Hydrogen Storage	A\$m	84	1,781	2020%
Iron Plant	A\$m	3,142	2,835	-10%
Other BoP	A\$m	674	1,052	56%
Total Capital Cost	A\$m	17,052	23,356	37%
Annual Operational Costs	A\$m pa	1,669	2,597	56%
LCOE	A\$/MWh	38	101	166%
LCOH	A\$/kg	7.48	10.27	37%
LCOI	A\$/t-HBI	668	1,040	56%

⁵² The Superpower Institute, [A Green Iron Plan for Australia](#), 28 May 2025

Note: LCOE: levelised cost of energy; LCOH: levelised cost of hydrogen.

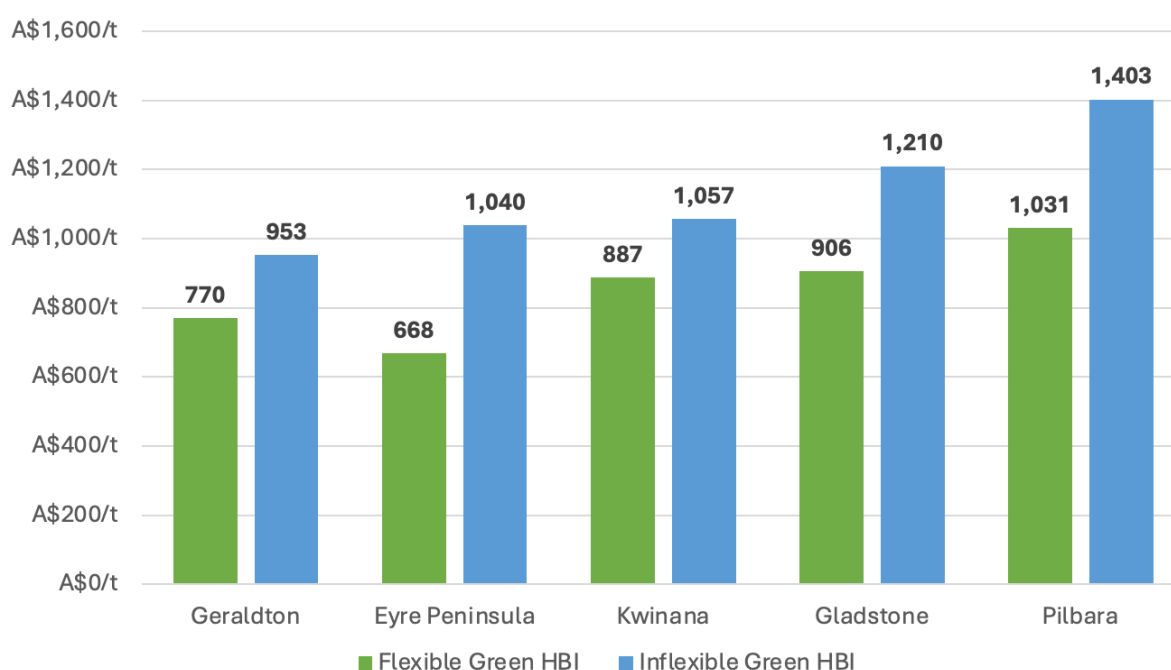
The levelised cost of iron was modelled at A\$1,040/tonne. DRI import prices for China and South Korea have averaged A\$610/t-HBI. This represents a **commercial gap of A\$430/tonne, or a 70% premium**.

Grid-connected facilities can significantly improve production economics, leveraging electricity arbitrage over large grids. As state-wide grids cover large areas, solar and wind production facilities can experience significantly different weather across the grid, impacting the ability to produce to full capacity. As a result, leveraging the price variation and fluctuation from a broad interconnected system of variable renewables can have a material impact on the levelised cost of green iron. In the Eyre Peninsula, a grid connection, coupled with a flexible technology, can reduce the cost of green iron by as much as 17%, from \$801/t to \$668/t.⁵³

However, a critical aspect of enabling the Whyalla transformation is **minimising project-on-project risk**. A risk multiplier is the use of unproven technology at commercial scale, such as the Calix ZESTY platform. Conversely, Midrex and Energiron platforms respectively produced 76.2Mt-DRI and 15.6Mt-DRI globally in 2024. For world shaft furnaced-based DRI, MIDREX plants accounted for 80.1% of production, followed by Energiron, producing 16.4%. Combined, the technology providers hold a +95% market share in methane-gas based DRI.⁵⁴ CEF recommends a Midrex or Energiron plant be the initial technology partner of choice for the transition of Whyalla to a DRI facility as new technologies scale up to a commercially deployable TRL level.

The Eyre Peninsula and Midwest WA represent the most commercially-viable industrial regions to establish a FOAK clean commodity project at this scale - see Figure 3.3.

Figure 3.3: Levelised Cost of HBI Production by Location, Technology



Source: The Superpower Institute (2025)

⁵³ The Superpower Institute, [A Green Iron Plan for Australia](#), 28 May 2025

⁵⁴ Midrex, [World Direct Reduction Statistics 2024](#), 25 August 2025

3.1. Methane Gas Will Play a Limited Role in DRI Production in SA and Undermine SA's Comparative Advantage

In August 2025, administrator KordaMentha reported the expected capex investment required for Whyalla's transformation would be up to \$8bn for the optimal development pathway of the modernisation of the steelworks, including the expansion of the mining operations in the South Middleback Ranges, magnetite ore concentration plant, a power plant and a new EAF to produce green steel for Australia's domestic market.⁵⁵ The capital expenditure estimate represents a first stage, methane-based DRI-EAF plant, designed as hydrogen-ready to decarbonise its gas demand as the renewable energy infrastructure is constructed.

BlueScope, leader of the main bidding consortium for the Whyalla Steelworks, has emphasised that Australian manufacturing needs secure, competitively-priced methane gas to scale the government's Future Made in Australia landmark re-industrialisation package. In BlueScope's FY2025 earnings report, the Port Kembla operator highlighted east coast gas prices are 3-4x that of the US and the Middle East, regions that produce similar volumes of gas.⁵⁶

In October 2025, BlueScope CEO Mark Vassella emphasised to the National Press Club the crippling impact of the multinational gas oligopoly and ongoing regulatory failure which sees Australian downstream industry having to pay more than three times the cost of methane gas than that of the two largest LNG exporters globally, Qatar and America.⁵⁷ In 2024, Australian industry paid an average wholesale price of \$10.3/GJ, compared to Qatar with an average domestic wholesale price of \$2.2/GJ, and \$3/GJ in the US, putting Australia 3.5-4.5x our major export competitors' domestic pricing. Australian industry and consumers alike are being gouged using our very own Australian public resource by multinationals who then pay next to no petroleum rent resources tax (PRRT, in place of a royalty) or corporate tax in Australia.

Whilst BlueScope repeats the AEMO forecast of a looming supply shortfall later this decade, CEF disagrees, there is simply no shortfall in supply. We have no dearth of gas investment. East Australian gas production is up 300% in the last decade even as domestic demand has plummeted a quarter - we have an oligopoly restricting domestic supply to keep domestic east coast prices at export price parity and beyond. CEF agrees with BlueScope about the need for a solution. The long term path is clear, as BlueScope notes with their net zero emissions target for 2050. Securing the future of Australia's manufacturing industry requires concerted state and federal government climate and industry to decouple value-add from fossil fuels that are increasingly uneconomic and unsustainable, and in the immediate-term ensure industry is not gouged from Australia's export price parity market.

CEF endorses the prospect of BlueScope's involvement in Whyalla, given its strong market understanding, capabilities and balance sheet. However, BlueScope has called for significant government subsidies of methane gas supplies into Whyalla as a pre-requisite for its involvement. CEF notes that BlueScope has a history of investing almost entirely in fossil fuel based steel facilities in Australia, even as it is a global steel decarbonisation leader in both its New Zealand and US scrap steel-based EAF divisions.

As BlueScope recommends, an aligned step would be to belatedly introduce an East Coast Domestic Gas Reservation, like in place for the last 15 years in West Australia. A gas reservation system should ensure 20% of all east coast methane gas production is reserved and available for domestic use. But it also must set and enforce a maximum domestic price, e.g. A\$8/GJ (double the market price in East Australia for the five decades to 2015). This would solve the problem. There is more than enough existing uncontracted gas available.

⁵⁵ AFR, [Whyalla Buyer Faces Upgrade Bill of Up to \\$8b, KordaMentha Says](#), 14 August 2025

⁵⁶ BlueScope, [FY2025 Financial Results Presentation](#), 18 August 2025

⁵⁷ National Press Club, [BlueScope CEO Mark Vassella](#), 7 October 2025

However, CEF emphasises that more fossil fuel production is not the answer to the climate crisis, a crisis laid bare in the 2025 Climate Risk Assessment and consistently reminded by the growing risks to Australia by the Insurance Council of Australia.⁵⁸ We need to align with the Australian Government's 62-70% 2035 emissions reduction target and invest in zero emissions industries of the future.

CEF also sees it as an imperative to address the growing industry rhetoric that green iron and steel is not possible, and therefore Whyalla and Australian manufacturing and value-add must therefore receive subsidised methane gas to remain competitive in trade-exposed industries, subsidies that would lock-in gas infrastructure for decades that the world cannot afford in a climate crisis.

BlueScope CEO Mark Vassella has stated no such thing as green steel. This obfuscates the reality of established and under construction green steel facilities across the globe. BlueScope's Australian integrated Port Kembla steelworks in NSW is 15x more emissions intensive than its highly successful, highly profitable steel production in Ohio, US.⁵⁹

BlueScope's North Star EAF in Ohio, US has an emissions profile that currently sits at a world low of just 0.16 tCO₂-e/t-crude steel, powered by long term power purchase agreement for zero emissions energy – see Figure 3.4. This electricity is independently verified by the market operator PJM Environmental Information Services. In comparison, the coal-based Port Kembla steelworks has an emissions profile that currently sits at 2.07 tCO₂-e/t-crude steel – refer Figure 3.5.

Figure 3.4: BlueScope's North Star Ohio EAF Emissions Profile

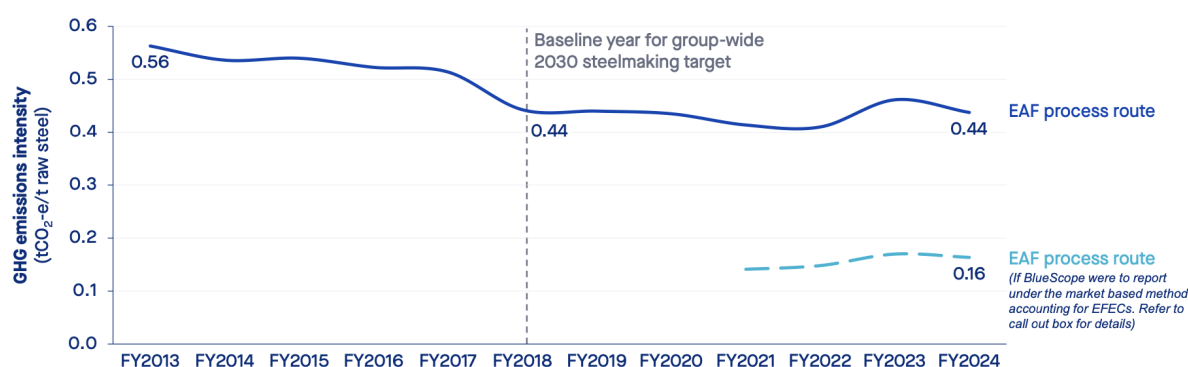


Figure 3.5: BlueScope's Port Kembla BF-BOF Emissions Profile



Source: BlueScope (2024)

⁵⁸ Insurance Council of Australia, [Insurance Catastrophe Resilience Report 2024–25](#), 7 October 2025

⁵⁹ BlueScope, [Climate Action Report 2024](#), September 2024

CEF notes that Sweden's Stegra is constructing the world's first integrated green primary steel plant in Boden, northern Sweden. The plant will utilise a 700MW green hydrogen electrolyser from Thyssenkrupp Nucera of Germany, and firm renewable energy from Vattenfall of Finland. This €6.5bn (A\$11.5bn) investment in a greenfield facility is well under construction and on track to produce green steel by 2026, using green hydrogen and green iron to slash emissions by 95% with a planned phase I production capacity of 2.5Mtpa of steel and 2.1Mtpa of green sponge iron.⁶⁰

CEO Mark Vassella confirmed that BlueScope could halve the emissions profile of its brand new \$1.15bn investment in the relining of its Port Kembla blast furnace (BF6) on scope 1-3 emissions per tonne by offtaking DRI from Whyalla SA, or even more if it is green iron.

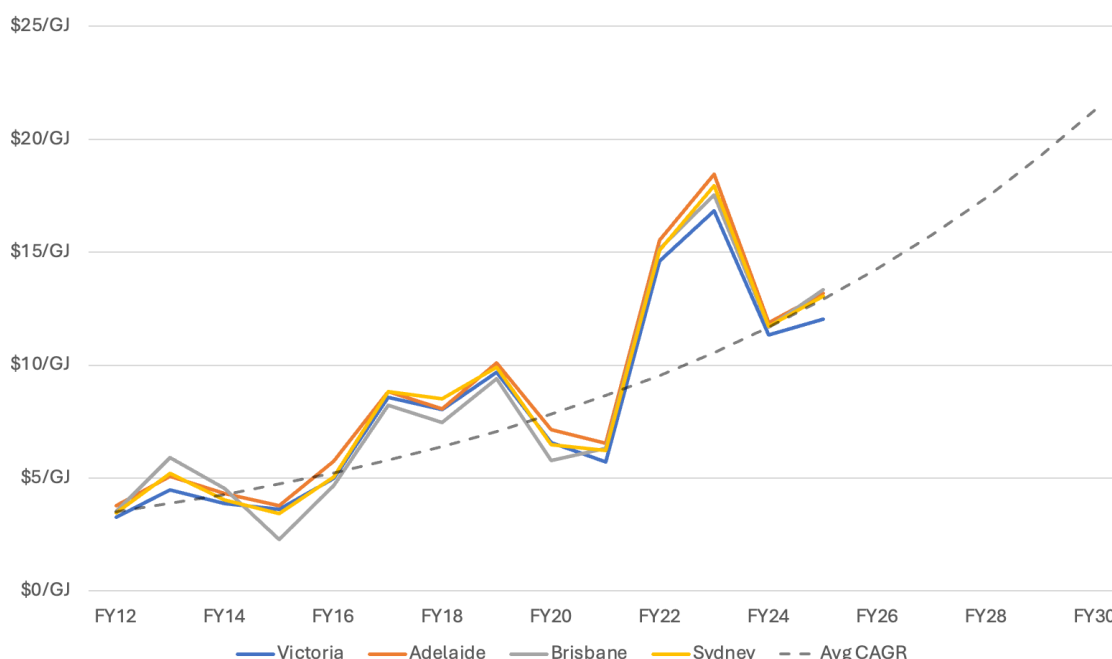
A Methane 'Transition' Will Lock in Gas-Based Infrastructure for Decades

Developing a DRI-EAF industry, powered from renewable energy and green hydrogen, is possible, technologically feasible, and directs all public support mechanisms towards a long-term solution that leverages SA's comparative advantage. **Whyalla and SA have a structural disadvantage in a methane gas-based transition, a disadvantage that will squander billions in public capital.**

Midrex reports methane gas-based DRI requires 275-300 Nm³/t-DRI, equivalent to 11.5-12.6GJ/t-DRI. For a 2.5Mtpa facility, annual gas demand would equate to 29-31 PJ. If realised in 2025, this would be equivalent to a 47% increase to the state's 2025 forecast demand in the 2025 GSOO.

The Adelaide Short Term Trading Market (STTM) hub had the second highest average wholesale price for methane gas in Australia in FY25, averaging \$13.18/GJ.⁶¹ STTMs across Australia have experienced significant rises in average spot prices following east coast LNG production. Since FY12, Adelaide STTM prices have risen 248%, close to the national average of 268% - see Figure 3.6. Wholesale gas prices in South Australia have risen at a CAGR of 10% since FY12. At its current trajectory, South Australian wholesale gas prices could rise to \$21.3/GJ by FY30 and \$34.4/GJ by 2035.

Figure 3.6: Average STTM Wholesale Gas Price Inflation, CEF Forecast



Source: Australian Energy Regulator (2025); CEF calculations

⁶⁰Stegra, [H2 Green Steel raises more than €4 billion in debt financing for the world's first large-scale green steel plant](#)

⁶¹AER, [Wholesale Gas Market Prices](#), current as of 01 July 2025

At prices 3-4 times that of the Middle East and the US, gas-based DRI would remain uncompetitive in the global market. Industry consultation has highlighted bidders to the Whyalla Steelworks have floated the push for a gas supply subsidy to improve the economics of a gas-based DRI facility. If the current \$13.18/GJ gas prices were held constant, a 10-year supply agreement would cost the operator of the steel mill \$3.97bn in opex. A subsidy to just halve the commercial gap between Australia and its gas-industry counterparts, would translate to a \$1.98bn taxpayer-funded gas transition. At forecasted methane gas prices under AEMO Gas Statement of Opportunities Step Change Scenario, **taxpayer-funded subsidies would cost an estimated \$1.7bn.**

If domestic methane gas prices continued to rise at their historical rate, a 10-year supply agreement, rising at 10% CAGR, would equate to \$9.3bn in gas feedstock costs. With a 50% subsidy, this would translate to \$4.6bn in subsidies.

Such a subsidy would be a direct contradiction to the Federal Government's green industrialisation and decarbonisation objectives for Australia, and would amplify the laggard position of Australia's industrial sector in contributing to Australia's nationally determined contributions under the Paris Agreement. Both the Whyalla Steelworks and BlueScope's Port Kembla steelworks were provided a trade-exposed concession to the Safeguard Mechanism, minimising its exposure to the declining baselines by 80%.

Furthermore, a short-term methane-gas based 'transition' period for the Whyalla Steelworks before renewable energy infrastructure and renewable hydrogen generation is developed, would see public interest capital deployed into subsidising new methane gas enabling infrastructure and a gas-based hydrogen plant. For a Midrex / Energiron plant to operate on methane gas, a steam methane reformer (SMR) or autothermal reformer (ATR) is required. **Australian and SA taxpayers risk a significant portion of the Whyalla Steelwork's \$1.9bn capital sub-allocation being used to subsidise the capital cost of the gas-based hydrogen facility given a restricted window of amortisation.**

Additionally, a **methane gas-based DRI facility would require significant investment in the expansion of gas pipeline infrastructure** across the Whyalla lateral pipeline from Whyalla to the Moomba to Adelaide Pipeline System (MAPS). The MAPS is an integrated gas transmission network across South Australia, covering 1,184km, with a mainline corridor from Moomba Processing Plant to Adelaide, with two major lateral pipelines to Angaston and Port Pirie/Whyalla. The MAPS mainline has a daily capacity of 249 TJ/day.

Since 2008, the MAPS has averaged a daily flow of 132 TJ from the Moomba gas facility.⁶² A 2.5Mtpa DRI facility, based on a MIDREX Flex platform (GH2-ready), would consume ~ 30 PJ of methane gas every year. With consistent production, this translates to a flow of ~ 82 TJ/day. While the MAPS pipeline could support one DRI plant, the Whyalla lateral pipeline has significantly less capacity.

A GPA Engineering study conducted in April 2011 revealed the pipeline capacity from MAPS (Whyte Yarcowie) to Port Pirie to Whyalla was 21 TJ/day, or 7.7 PJ/year.⁶³ To transport sufficient methane gas from Moomba to Whyalla for a **methane gas-based DRI facility would require a 390% expansion in pipeline capacity from Whyte Yarcowie to Whyalla, across a distance over 160km.**

Infrastructure SA's 20-year State Infrastructure Strategy released in 2025 reinforced the supply of methane gas into Whyalla is constrained by current infrastructure capacity through Port Pirie, with Port Augusta having no gas network. The current lateral pipeline is also largely contracted, meaning little availability for long-term contracts to be implemented without significant, long-term infrastructure investments that would lock-in gas to the Upper Spencer Gulf for decades.⁶⁴

⁶² AER, [Average Daily Flows - SA Demand Region \(Monthly\)](#), Updated June 2025

⁶³ GPA Engineering, [Increased Gas Supply to the Upper Spencer Gulf](#), 12 April 2011

⁶⁴ Infrastructure SA, [SA's 20-year State Infrastructure Strategy](#), 2025

The SA Government, Federal Government and taxpayers can ill-afford the subsidisation of a 'gas-based transition' and a long-delayed renewable energy and green hydrogen transformation. Given the significant enabling infrastructure required for a 'gas-based transition', there is a real risk strategic national interest capital allocated to investing in the future of Whyalla will be hijacked to fund this infrastructure, enabling lock-in of gas for decades.

CEF urges the Federal Government, SA Government and administrators to re-evaluate the planned phased approach to the Whyalla transformation, and direct public capital into market-forming mechanisms and enabling structures that support long-term economic viability of the Steelworks, not a short-term capitulation to Australia's gas industry for a critical, nation-building project that is Whyalla.

3.3. Ring-fencing Ownership Structure to Lower Project on Project Risk

As highlighted above in Section 3.0, the investment required to develop a 2.5Mtpa Midrex DRI facility, powered by firmed renewable energy, is estimated to reach \$23.3bn, according to TSI analysis.⁶⁵ For a private developer, without a long-term offtake agreement from a low-risk counterparty, e.g. government-backed contracts, infrastructure projects of this scale without a clear market formation mechanism are **unbankable**. This is amplified through **project-on-project risk**, with each large-scale investment interdependent on the development of other large-scale infrastructure and balance of plant.

Large-scale renewable energy projects, large-scale BESS projects, low-value add mining operations are bankable in isolation. However, the stacking of such projects significantly amplifies the risk profile for financiers. Through Section 4, CEF outlines possible strategic government market-forming mechanisms that can leverage the balance sheet and credit rating of the Federal Government to de-risk projects, providing concessional financing facilities, public-private partnerships, first-loss capital for FOAK projects, or revenue-underwriting schemes. However, unbundling the structure of the 'integrated' mine-to-steel operation can significantly de-risk the Whyalla transformation for private investors.

Within each ring-fenced entity, as CEF puts forward in Figure 3.8, there is a critical role and opportunity for Australia's special investment vehicles (SIVs) to deploy strategic, public-interest capital. The distribution of risk across multiple SIVs and mechanisms deployed can also ensure the Federal Government enables the transformation of the Whyalla Steelworks at least cost to taxpayers. A blended support package including:

- **Export Finance Australia (EFA)** concessional debt financing for investments into the expansion, value-add and partial export of magnetite concentrate from the Middleback Ranges and DRI exports. A winning consortium of Australian and North Asian steelmakers can also crowd-in export credit agency financing to complement EFA debt, including Japan's METI and JBIC, alongside Korea's K-SURE and KEXIM.
- **Clean Energy Financing Corporation (CEFC)** concessional debt financing for investments into the staged development of renewable energy infrastructure, transmission lines, BESS and hydrogen production, storage and transmission for the decarbonisation of the Whyalla DRI and EAF plants with a phase-out of methane gas-based hydrogen.
- **National Reconstruction Fund (NRF)** to take strategic, patient, public-interest, higher risk-tolerant equity interests into the ring-fenced entities across the green iron and steel value chain.

⁶⁵ The Superpower Institute, [A Green Iron Plan for Australia](#), 28 May 2025

BlueScope Consortium for Magnetite Resource and DRI Production

BlueScope, Australia

In August 2025, Australia's BlueScope, owner of the nation's largest steelworks in Port Kembla, announced it had formed an international consortium with Asian steelmakers to determine whether the re-industrialisation and decarbonisation of the Whyalla Steelworks would be possible. The consortium, *Project Wellington*, includes South Korea's largest steelmaker POSCO, Japan's Nippon Steel and India's JSW Steel.⁶⁶ As of August 2025, the consortium has submitted a non-binding and indicative expression of interest that outlines possible options for the Whyalla assets.⁶⁷

BlueScope has emphasised that should the consortium be invited to the next phase of the sales process, the consortium members will jointly conduct due diligence and engage with the SA and Federal Governments regarding the announced funding support allocated to the Steelworks.⁶⁸ An international consortium would also reduce the concentration of Australia's sovereign iron and steelmaking capacity.

POSCO, South Korea

While the current steel capacity (1.2Mtpa) of Whyalla is 13 times smaller than that of POSCO's flagship Pohang steelworks, POSCO flagged to investors in July 2025 that Whyalla had other advantages, primarily the iron ore resources within the Middleback Ranges. Additionally, POSCO highlighted the renewable energy potential of the region, emphasising the possibilities of exporting embodied decarbonisation through the exports of DRI/HBI that would emerge from an acquisition.⁶⁹

For POSCO, DRI/HBI exports could provide low-impurity DRI feedstock suitable for supply into its emerging EAF capacity. In June 2023, POSCO announced the selection of Tenova for the supply of a 2.5Mtpa EAF at its Gwangyang industrial precinct, South Korea.⁷⁰ POSCO announced it had commenced construction of the EAF in February 2024, with a targeted launch in 2026.⁷¹

The capital participation of POSCO would also significantly benefit from the magnetite iron ore resources within the Eyre Peninsula. POSCO, in partnership with global metals processing technology innovator Primetals Technologies, has co-developed the HyREX hydrogen-based fluidised bed (FB) DRI process. POSCO has commenced construction of a 0.3Mtpa demonstration plant of its HyREX technology in Pohang, Korea, set to begin production in 2027, followed by a commercial-scale plant to verify the technology by 2030.

The expansion of the Middleback Ranges, coupled with a ring-fenced, government-underwritten renewable energy and hydrogen industrial park, could be a world-leading opportunity for POSCO to apply its HyREX process in Australia, leveraging economies of scale and public-private partnerships to lower the cost of capital for the enabling infrastructure that largely determine the cost of green iron.

Nippon Steel, Japan

For Nippon Steel, Japan's largest steelmaker has an outward-oriented growth strategy, targeting the strategic acquisition and capital participation of integrated steel facilities. Following the acquisition of US Steel, Nippon Steel now operates 47Mtpa of domestic steel capacity, and 39Mtpa of international steel capacity. Nippon's long-term ambition is to scale international steel supply chains to over 60Mtpa.⁷² The joint capital participation in the transformation of the brownfield integrated

⁶⁶ AFR, [BlueScope Assembles Heavyweight Consortium for Whyalla Bid](#), 04 August 2025

⁶⁷ AFR, [Whyalla Buyer Faces Upgrade Bill of Up to \\$8b, KordaMentha Says](#), 14 August 2025

⁶⁸ AFR, [‘Formidable’ Whyalla Bid Could Mean More Government Cash](#), 04 August 2025

⁶⁹ AFR, [BlueScope Assembles Heavyweight Consortium for Whyalla Bid](#), 04 August 2025

⁷⁰ Tenova, [Tenova for POSCO: Towards a Decarbonised Future Together](#), 07 June 2023

⁷¹ POSCO, [Decarbonisation Roadmap](#)

⁷² Nippon Steel, [2024 Integrated Annual Report](#), 01 October 2024

Steelworks can provide the opportunity for Nippon to export low-emission magnetite and DRI/HBI to accelerate the decarbonisation of its Asian steel portfolio. In particular, DRI exports from Whyalla could provide critical feedstock to support the growth of Nippon's domestic EAF capacity in Japan.

On 30 May 2025, Nippon Steel announced the expansion, construction, and modification of 3 EAFs across its domestic operations in Japan. Nippon Steel was selected for major government assistance under the GX Roadmap's "2025-2029 Energy and Manufacturing Process Transformation Support Business", with Japan providing JPY 251.4bn (A\$2.6bn) in public capital support for the construction, expansion and modification of 3 EAFs across Nippon's portfolio.⁷³

The JPY 868.7bn (A\$8.98bn) investment will expand EAF capacity by 2.9Mtpa, with total production expected in the latter half of FY2029. Critically, the investment decision was enabled by a 29% capital support facility by the Japanese Government that led to Nippon's final investment decision. See Figure 3.7 for investment summary.

Figure 3.7: Nippon Steel EAF Investments 2025

Facility	Kyushi Works Yawata Area	Setouchi Works Hirohata Area	Yamaguchi Works (Shunan)	Total
Investment	New EAF	Expansion of EAF	Modification and Restart of EAF	3 EAFs
Investment Value	JPY 630.2bn AUD 6.52bn	JPY 140.0bn AUD 1.45bn	JPY 98.5bn AUD 1.02bn	JPY 868.7bn AUD 8.98bn
Government Support	JPY 179.9bn AUD 1.86bn	JPY 42.8bn AUD 440m	JPY 28.7bn AUD 300m	JPY 251.4bn AUD 2.6bn
Government Support	28.5%	30.6%	28.2%	28.9%
Production Capacity	2.0Mtpa	0.5Mtpa	0.4Mtpa	2.9Mtpa
Production	2HFY2029	2HFY2029	2HFY2028	FY2029

Source: Nippon Steel (2025)

Equity participation from Japanese steelmakers into the Whyalla Steelworks and green iron trade corridors will build upon the joint Australia-China statecraft and industrial relations that both nations have fostered in recent years. In August 2025, Australia selected Japan's Mitsubishi Heavy Industries (MHI) with a \$10bn contract for the supply of defence frigates to the Australian navy fleet, supporting ship-building facilities and workforces across both nations. This was a significant moment for the bilateral relationship between Australia and Japan, and a critical opportunity for Australia and Japan to further enhance the partnership with industrial collaboration on iron and steel, a critical component for Japan's industrial manufacturing and ship-building capabilities.⁷⁴

Role of Australian SIVs

CEF sees the strategic use of the NRF and EFA into the ownership structure of the magnetite resource and DRI/HBI facility as an imperative for the Federal Government under its FMIA objectives, leveraging the balance sheet and credit rating of the Federal Government to de-risk projects, providing concessional financing facilities, public-private partnerships, first-loss capital for FOAK projects.

⁷³ Nippon Steel, [Decision Made to Invest in Conversion from Blast Furnace to Electric Arc Furnace](#), 30 May 2025

⁷⁴ ABC, [Australia Picks Japan to Build \\$10b Frigates after Fierce Contest](#), 05 August 2025

Additional Potential Asian Offtake

On 10 April 2025, Japan's JFE Steel announced it had progressed through FID on its first large-scale EAF at its West Japan Works Kurashiki facility, investing JPY 329bn (A\$3.4bn) into a 2Mtpa facility. Production is expected to commence in the first quarter of FY2028.⁷⁵ The investment decision came immediately after the Japanese Government announced it would provide a maximum of JPY 104.5bn (A\$1.08bn) in support via a capital grant the day prior, on 09 April 2025.

Korea's first steelmaker, **Hyundai Steel**, has the largest portfolio of EAFs in Korea, with plants in Incheon, Pohang and Dangjin producing up to 12Mtpa of lower-emission steel.

Domestic Investor for Downstream EAF and Domestic Market

While the Whyalla Steelworks is one of two domestic primary steelmakers, Whyalla is the only domestic producer of long steel products and manufactures 75% of Australia's structural steel.⁷⁶

In April 2023, prior to GFG Alliance's forced administration, LIBERTY Steel announced the planned investment of a 1.5Mtpa Digimelter EAF from Danieli.⁷⁷ The \$500m EAF was originally announced to be completed in 2025, before being delayed to 2027.⁷⁸

The development of a Whyalla EAF to complement and provide a domestic-offtake source for a new DRI plant is critical to Australia's economic security, national security, minimising sovereign capacity risk, jobs creation and future-proofing of established Whyalla workforce, as well as being an economic multiplier for the region. Domestic production of critical long steel and structural steel products support downstream fabrication and distribution firms with sovereign supply chains for construction, rail and infrastructure projects.

The ring-fenced approach suggested by CEF – see Figure 3.8 – allows the alignment of capital from domestic and national investors with projects that maximises exposure to the preferred respective assets across the green iron and steel value chain. CEF sees the investment into a domestic EAF from an established, industrial/resources investor, with a minority stake in the DRI facility, as a pathway to ring-fence project-on-project risk for the domestic investor and dilute its exposure to the DRI facility that would largely service international markets.

Furthermore, the downstream EAF ring-fenced entity could facilitate the direct involvement of the **NRF** to take a strategic, nation-building equity interest whilst reducing its total exposure to the export-oriented DRI facility. The Whyalla EAF is a perfect investment case for the Government's Future Made in Australia objective, facilitating the decarbonisation of steelmaking in Australia and scaling sovereign capacity of critical industrial commodities.

Seven Group Holdings

Seven Group Holdings (SGH), the \$20bn ASX-listed industrial and media giant, has an extensive history of operating across Australia's mining, construction, industrial materials, and heavy equipment industries. In May 2025, people familiar with the matter flagged to the AFR the Stokes family's listed investment vehicle had taken interest in the Whyalla Steelworks, with a multi-day visit to the Steelworks by CEO Ryan Stokes and CFO Richard Richards.

CEO Ryan Stokes has highlighted that while SGH's interest in the Whyalla Steelworks remained very early-stage, SGH had the capability and credibility of running large industrial enterprises and could meet the Group's investment criteria. SGH's balance sheet is in a position to make another sizable

⁷⁵ JFE Steel, [JFE Steel to Introduce Advanced, High-Efficiency, Large-scale EAF in Japan](#), 10 April 2025

⁷⁶ SA Government DEM, [Australian and South Australian Governments Supporting Whyalla Steelworks and Local Jobs with \\$2.4 billion Package](#), 20 February 2025

⁷⁷ Danieli, [BF Technology Transition at Liberty Steel in Whyalla](#), 26 April 2023

⁷⁸ AFR, [Gupta's \\$500m Whyalla Steelworks Upgrade Delayed by Two Years](#), 15 May 2024

acquisition following its complete acquisition of Boral.⁷⁹ In FY25, SGH produced \$10.7bn in consolidated revenues, generating earnings before interest and taxes of \$1.5bn. SGH's industrial materials arm, Boral, generated \$3.6bn in revenues at a 19% return on capital in FY25.⁸⁰

SGH announced in May 2025 it was investigating merger & acquisition (M&A) targets in the industrial and energy sectors that would generate \$100-200m in earnings and have a 'turnaround pathway within 3-5 years'. The Whyalla Steelworks fits the bill.⁸¹

However, SGH CFO Richard Richards said while the Group had the financial capacity to purchase the operations, it would be disciplined in potential offers, highlighting Whyalla was one of a number of opportunities on the company's watch list.⁸²

SGH's capital allocation criteria outlines its focus on future acquisitions and strategic investments are targeted towards companies that benefit from sector tailwinds, favourable geography, privileged asset bases and with scalability. Furthermore, projects with identified value disconnects, performance gaps and actionable pathways to turnaround facilities are a key focus of SGH.

The Whyalla Steelworks and enabling established infrastructure and public capital support for the project make it an ideal investment for an entity such as SGH. In a May investor presentation, SGH emphasised the preference to obtain full ownership of such a project/facility.⁸³ The proposed SGH ring-fenced legal structure would allow SGH to take a majority, or full equity stake in the Whyalla EAF, enabling the BlueScope/Asian steelmaker consortium to focus capital allocation in the export-focussed value chains of magnetite concentrate/pellet and DRI exports

Bennett Family AMB Holdings / Wright VOC Group

The Bennett and Wright families, through AMB Holdings and VOC Group Ltd respectively, could potentially be a strategic investor into the Whyalla EAF. The family offices have an extensive history of investments and involvement in Australia's resources and industrial sectors, and specifically in Australia's iron ore industry. The Bennett family are also focussed on positive outcomes for climate change and the environment, with Todd Bennett, director of AMB Holdings, becoming director of the family's Climate and Environment Foundation in June 2025.⁸⁴

In February 2025, Japan's Mitsui acquired a 40% interest in Rio Tinto's Rhodes Ridge iron ore project through the purchase of VOC Group Ltd's 25% stake and 15% of AMB Holdings' 25% stake for a total US\$5.3bn (A\$8bn).⁸⁵ Prior to the sale of AMB Holdings' stake in Rhodes Ridge, AMB highlighted it was focussed on developing the project with a world-leading focus on climate, biodiversity and heritage.⁸⁶ AMB Holdings and VOC Group are both well capitalised to take a nation-building equity interest into the development of a Whyalla EAF in partnership with the NRF.

⁷⁹ AFR, [Ryan Stokes Flags Acquisitions for SGH, Attacks Abu Dhabi Bid for Santos](#), 12 August 2025

⁸⁰ SGH, [2025 Annual Results Investor Presentation](#), 12 August 2025

⁸¹ AFR, [Billionaire Stokes Family Check Out the Up-for-Sale Whyalla Steel Mill](#), 26 May 2025

⁸² AFR, [Whyalla Buyer Faces Upgrade Bill of Up to \\$8b, KordaMentha Says](#), 14 August 2025

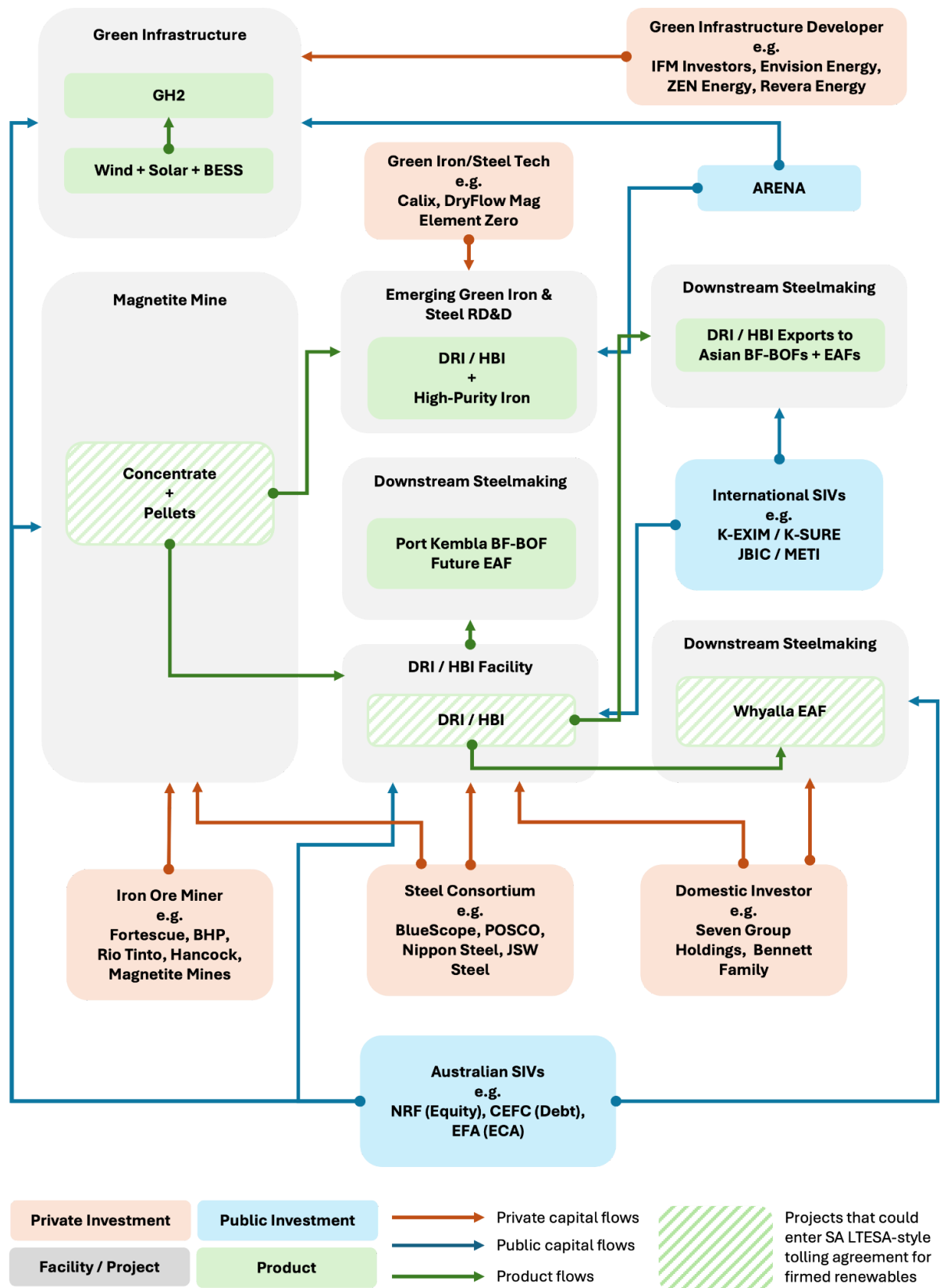
⁸³ AFR, [Ryan Stokes Opens Black Box to Reveal His Target Hit List](#), 21 May 2025

⁸⁴ AFR, [Investor Son of Secretive Mining Heiress Comes Back into the Fold](#), 08 July 2025

⁸⁵ Mitsui, [Acquisition of Interest in Rhodes Ridge Iron Ore Project in Australia](#), 19 February 2025

⁸⁶ AFR, [The Country's Most Secretive Billionaires are About to Get Much Richer](#), 16 February 2024

Figure 3.8: Possible Investment and Facility Structure for Whyalla Steelworks



Source: Climate Energy Finance (2025)

Section 4. Enabling Policy Mechanisms

Market-forming mechanisms are critical levers for the Federal Government to provide targeted support to address the key market failure of **unpriced emissions from fossil fuel consumption** in the industrial sector, and as a consequence, the failure for premiums for producers that internalise the market externality to materialise without government intervention bridging the value of embodied decarbonisation.

Additionally, the Federal Government must employ strategic interventions to address two other key market failures, both of which can be alleviated through public-private partnerships in enabling common-user infrastructure, infrastructure that can support innovation and research, development and demonstration of emerging green iron technologies.⁸⁷

The development of common-user infrastructure to connect renewable energy capacity with industrial hubs in Whyalla, Port Bonython, or Port Pirie has the potential to establish a strategic industrial hub for the commercialisation and scale-up of green iron technologies that can further enable Australia's green iron potential. A list of green iron technologies under development is available in Appendix B.

Box 6. Addressing market failures to crowd-in investment.

Government intervention is required through supportive budgetary and other measures to alleviate the cost premium of value-adding commodities via low-emission pathways – i.e., using renewable energy. This is vital to addressing the **market failure of unpriced externalised carbon emissions** and to developing green industrial capabilities. Market incentives level the playing field as carbon prices rise over time to correct this key market failure.

Additionally, Large-scale, value-adding industries require extensive, shared infrastructure – including roads, ports, transmission lines, pipelines, crown lands, and rail networks. These assets have significant spillover benefits that private investors cannot capture, and thus are often remain under-invested by the private sector relative to a scale of efficient resource allocation. **As a result, strategic public investment into common-user infrastructure ensures spillover benefits are realised.**

Furthermore, early-stage innovators in new technologies absorb the costs of technical learning and process optimisation, without capturing the spillover benefits associated with the broader adoption of improved technologies. Simply, innovators pay social costs without receiving the social benefits of RD&D. Governments have a key role in supporting innovation, bridging the gap between the private and social benefit of development. In addition to Australia's R&D tax incentive, **developing common-user infrastructure and employing a government-underwriting mechanism for the supply of firm renewables to an industrial precinct for the demonstration and commercialisation of new technologies can crowd-in significant capital** into addressing the limiting challenges to value-adding Australia's largest and most economic resource.

4.1. Clean Commodities Trading Initiative

Notwithstanding rising policy ambition and increasing private sector interest, commercial execution of low-emission value-adding facilities has not materialised. Clean commodity projects are massive in scale in terms of investment, jobs, GDP, and economic complexity, with the potential to entrench Australia's competitive advantage in the new energy and resource trade for many decades. Most of the industrial opportunities to embody decarbonisation in Australia's exports being explored by SA, including green hydrogen, ammonia, iron, steel and SAF, are technically feasible and readily scalable in a carbon-constrained economy, subject to the development of an adequate carbon price in Asian trade.⁸⁸

⁸⁷ The Superpower Institute, [A Green Iron Plan for Australia](#), 28 May 2025

⁸⁸ CEF, [A Price on Carbon: Building Towards an Asian CBAM](#), June 2025

The fundamental challenge that has limited the progression of such projects passed FID is the failure of demand-side market formation, with the inability to secure long-term offtake agreements at bankable prices necessary to catalyze investments. At its core, this is the global market failure of governments to not establish an economy-wide price on carbon, a regulatory failure that externalises the social cost of carbon pollution, a social cost that clean commodity projects re-internalise into their capital costs.

Current supply-side incentives introduced through the Federal Government's landmark Future Made in Australia policies provide fixed-rate support, aimed at artificially reducing production costs through grants, subsidies and tax incentives, as well as providing support for the RD&D of emerging low-emission technologies. Such policies, in isolation, are unable to provide revenue certainties that project developers require to lower risk-adjusted returns to unlock the scale of investment required.

To address this, UNSW Professor of International Political Economy Elizabeth Thurbon and Oliver Yates, inaugural CEO of the Clean Energy Finance Corporation (CEFC), have designed the **Clean Commodities Trading Initiative (CCTI)**, a fiscally-conservative, market-oriented cost-bridging mechanism to provide targeted support for FOAK facilities that mimics the effectiveness of a price on carbon for projects that will deliver outsized returns to the Australian economy.⁸⁹

The CCTI would be designed as a government-backed initiative that supports early-stage market formation by contracting for supply, then selling, holding, or redistributing the value of the commodity's environmental attributes as markets evolve. As an independent legal entity, the CCTI would be tasked with tendering highly tailored contracts with select, early producers of clean commodities. The CCTI would provide a guaranteed revenue per unit of production (strike price), with the producer taking on the risk that it can produce the commodity at below the contracted price.

However, the distinction of the CCTI to other cost-bridging mechanisms discussed in catalysing market formation is that the risk that the contracted strike price is higher than future market prices remains with the government. This price differential represents the value between existing black and grey traded commodities and the price required to produce their clean counterparts. This allocation of risk is appropriate as it is the government's market failure to not construct the regulatory framework that quantifies the value of clean attributes of commodities.

The CCTI provides support by accepting the risk of **Clean Commodity Credits** in a future regulatory scheme. The CCTI would separate a clean commodity into two components: the physical commodity itself and its 'clean attributes', i.e. the value of the embodied decarbonisation. This separation allows each component to be valued and traded independently, creating greater market efficiency and flexibility. This mechanism would build upon established market-forming mechanisms, such as the Large-Scale Renewable Energy Target in which the clean nature of electricity generation is routinely traded separately from the energy itself, and would operate similarly to the design of carbon markets introduced globally.

Establishing the CCTI as an independent entity would provide a pathway for clean commodity trading partners of Australia to share in the costs and benefits of market creation. The joint capitalisation from Australia, Japan and Korea would provide the directional green energy statecraft in the respective economies to develop trade corridors and unlock low-emission downstream industries.

A CCTI Proposal for Whyalla Steelworks

The Eyre Peninsula has all the necessary precursor potential for a nation-leading FOAK low-carbon iron and steel precinct: abundant renewable energy potential, existing industrial infrastructure, a skilled workforce, magnetite iron ore resources and port facilities. Fundamental issues that have

⁸⁹ Elizabeth Thurbon and Oliver Yates, [The Case for an Australian Clean Commodities Trading Initiative](#), AP4D Studies in Statecraft, June 2025

delayed the transformation of the Steelworks have, historically, been the sweating of infrastructure of critical sustaining capex, and a lack of offtake contracts that would underwrite the scale of investment required at a competitive cost of capital. Absent a policy mechanism to lower the risk-adjusted return of iron and steel products that would significantly lower counterparty risk to lower the cost of capital to develop competitively-priced renewable assets at scale, the Whyalla Steelworks will not undergo the transformation required.

The CCTI could be the enabling mechanism that provides long-term price guarantee for Whyalla's new owners and their financial partners to commit to the major capital investments required to not only transition to a DRI facility, but to enable the decarbonisation of the process. The potential benefits of this intervention extend far beyond preserving existing jobs. Transforming Whyalla into a green steel hub would position the region at the forefront of a global growth industry.

The multiplier effects would be substantial. Beyond the direct jobs in steel production, the transformation would create opportunities across the supply chain— from renewable energy development to advanced manufacturing, logistics, and professional services. These would be high-quality, future-proof jobs aligned with global decarbonisation trends rather than vulnerable to them.

4.2. Expansion of Bilateral CfDs from Hydrogen to Green Metals

The Australian and German governments have developed the H2Global Tender, a policy instrument to facilitate price discovery and improve the bankability for proponents developing projects in the renewable hydrogen and derivative product markets. Both governments have capitalised the H2Global Tender with €200m (A\$350m) to a total €400m (A\$700m).⁹⁰

The H2Global mechanism is a government-owned physical trading intermediary – the Hydrogen Intermediary Company (HINTCo). HINTCo simulates the existence of a functioning market on supply and demand through double-sided auctions, issuing tenders for the most competitive suppliers of renewable hydrogen derivatives, offering secure purchase agreements. Through securing long-term, government-backed offtake contracts, producers are able to obtain necessary pricing, markets, counterparties and legal security necessary to the bankability of a project, and thus accelerating the progression towards FID and into construction.

Concurrently, HINTCo conducts sales auctions, entering into short-term sales agreements with offtakers with the highest willingness to pay. The initial double-sided auctions will have a gap between unit costs of long-term offtake agreements and short-term sales agreement. This is covered by a government-issued CfD to bridge the cost-gap. As subsequent tenders are complete, auctions act as a price discovery mechanism for renewable energy derivative products, identifying clear pricing trends between grey commodities and their clean commodity counterparts.

CEF sees a critical role such a bilateral mechanism can play in green metals, expanding the HINTCo model to green iron, capitalised by joint funding between producer and offtaker governments. The HINTCo model can enable the trilateral green iron corridor between Australia, Japan and Korea.

4.3. De-risking Renewable Energy Deployment through Government-backed Underwriting Schemes

The opportunity to ring-fence and enable the development of the renewable energy generation, firming and hydrogen production required to decarbonise a re-industrialised Whyalla Steelworks as an imperative for the SA Government. To achieve this, the SA Government could adopt an LTESA/SFV-style government underwriting mechanism to unbundle the largest sub-allocation of capital for a green DRI/HBI facility, significantly reducing project-on-project risk for private investors

⁹⁰ DCCEEW, [Australia-Germany H2Global Joint Tender](#), 03 September 2025

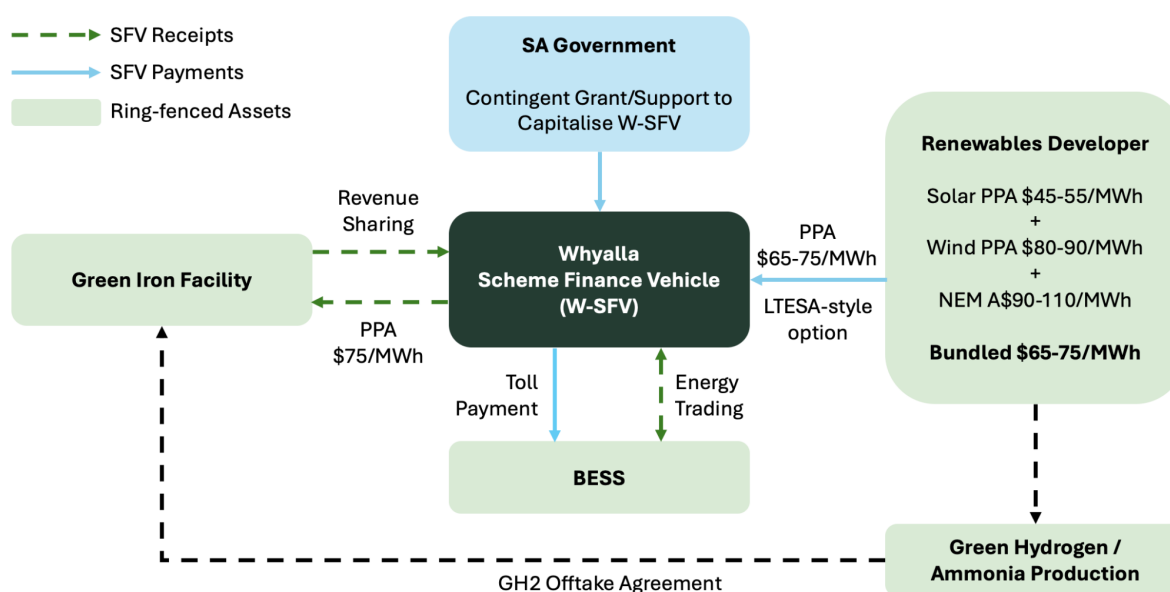
in the minerals processing infrastructure, and thus, lowering the cost of capital and improving the bankability of a DRI transformation for Whyalla.

NSW's **Long-Term Energy Service Agreements (LTESAs)** provide revenue certainty for private investment in new renewable energy generation, firming and long-duration storage that de-risks projects that enable proponents to secure financing at a lower cost of capital. LTESA's are a component of the NSW Electricity Infrastructure Investment Safeguard, a framework to ensure the orderly and efficient investment into firmed renewables is deployed to meet the needs of the electricity system.

LTESAs are options contracts, providing generators with the option to sell electricity at an agreed minimum fixed price to a government **scheme financial vehicle (SFV)**. A separate, government legal entity – the Financial Trustee – establishes, owns and administers the SFV. The LTESA guarantees revenue with the option to sell electricity to the SFV. In an industrial application, the SFV then sells the electricity to an industrial user of electricity at an agreed upon price. The capital-intensive nature of renewable energy projects means that the cost of capital largely determines the levelised cost of electricity a proponent can provide to recover the costs and necessary investment hurdle rates.

Government underwriting mechanisms, such as the LTESA/SFV structure, leverages the credit rating and balance sheet of the government, as opposed to the credit rating and balance sheet of the industrial electricity consumer that would ultimately offtake the electricity - see Figure 4.1.

Figure 4.1: Potential LTESA/SFV Structure for Whyalla Green Iron



Source: Climate Energy Finance (2025)

CEF sees government-underwriting mechanisms as a way to leverage significant economies of scale and provide significant de-risking strategic public-private partnerships to unlock firmed renewable energy and hydrogen. An LTESA/SFV-style underwriting scheme for the renewable energy capacity can significantly de-risk such projects, accelerating their progressions to FID and ultimately enabling the transformation of Whyalla to a world-leading DRI/HBI hub powered by firmed variable renewables.

Building on SA Firm Energy Reliability Mechanism for LTESA-style Support

The use of long-term government-underwriting mechanisms for the energy sector is not a novel policy pathway for the SA Government. In 2024, the SA Government announced the design of an LTESA-style underwriting scheme for long-duration storage, establishing an independent entity and

SFV as the counterparty to project developers, rather than individual residential and commercial/industrial customers.

As part of an annual Firm Energy Requirements Assessment (FERA), the state will define a rolling five-year Firm Energy Target (FET), prescribing the required volume of firming capacity required for the state. To meet the FET, eligible long duration firming capacity will be able to bid for contracts that underwrite a portion of their revenue through the Firm Energy Reliability Mechanism (FERM). **The SA Government could expand its design of the FERM mechanism to apply to renewable energy generation that will enable the decarbonisation of large-scale industrial facilities.**

SA is advancing the development of the FERM framework to provide support for long-duration firming capacity to ensure secure, reliable and resilient electricity for the state at least cost to consumers. The objective of the FERM is to provide, through competitive tenders, the opportunity for firm capacity providers to at least receive their efficient cost of operation and earn an economic return at least commensurate with the risks involved with its continued operation. The Scheme will be established as multiple independent entities to perform designated functions, including:

- A **Scheme Administrator** to conduct competitive tender processes.
- A **Scheme Financial Vehicle** as the contract counter-party with an investment grade credit rating to ensure contract bankability for generators.
- Establishment of a **Scheme Fund**, managed by the SFV, from which FERM contract payments are made, TNSP contributions are received, and Scheme administration costs are paid.

The FERM support mechanism is designed as a cap-and-collar model, with tenders requiring the submission of three financial bid variables: revenue floors, thresholds and ceilings. This limits the value of revenue support from the SFV and limits the returns back to the SFV in periods of high market prices.

- **Revenue floor**, the expected revenue from market and contracts. The SFV provides payments to the firming provider equivalent to the gap between the market price (above the revenue floor) and revenue threshold.
- **Revenue threshold**, in which the firming provider receives viable project revenue. When market prices are between the threshold and ceiling, the SFV is eligible to receive payments for the value between the market price and threshold price to recover revenues.
- **Revenue ceiling**, above which firming provider retains excess revenue. Once payments are made to the SFV of the value between the revenue ceiling and threshold, the firming provider maintains additional revenues above the ceiling.

Under the FERM proposal, the SFV will recover Scheme costs through SA's TNSPs, e.g. ElectraNet. TNSP's recover costs through passing on a cost or scheme refund to transmission customers through prescribed transmission services charger. For industrial loads, this ensures recovery payments are integrated into existing network regulation pricing processes.

Section 5. Renewable Energy Proponents to Power Whyalla DRI

5.1. Western Green Energy Hub

Western Green Energy Hub (WGEH) is a multi-GW scale clean energy and derivatives proposal in the southeast of WA. Phase 1 of WGEH aims to generate up to 8GW of hybrid wind and solar, producing up to 500,000tpa of zero-carbon green hydrogen. At full scale, WGEH aims to produce 3.5Mtpa of green hydrogen to feed into minerals processing, shipping fuel, heavy transport, and power generation.⁹¹

In October 2024, WGEH submitted the proposal to the WA EPA. In July 2025, the WA EPA approved WGEH's Environmental Scoping Document, outlining a timeline for finalisation of EPA assessment report and ministerial approval in June of 2028.⁹²

5.2. Envision Energy

Envision Energy has developed the world's largest renewable hydrogen and ammonia precinct globally in China, and is now looking to export its integrated renewable energy hub model globally. CEF sees the expansion of Envision Energy into Australia, and into SA, as a significant opportunity for Australia to partner in clean technology with its largest trading partner, leveraging the commercial expertise, industry knowledge, manufacturing scale and competitiveness of Envision's technologies and its IT infrastructure to enable the decarbonisation of the Whyalla Steelworks.

World's Largest Renewable Hydrogen and Ammonia Precinct

On 10 July 2025, Envision Energy announced it had officially commissioned the first stage of the Chifeng Net Zero Industrial Park in Chifeng City, Inner Mongolia, China. Stage 1 consists of a 500MW green hydrogen and ammonia plant, capable of producing 320,000tpa of green ammonia - the largest facility in the world by electrolyser capacity.⁹³

At full capacity, the Chifeng Industrial Park will produce 1.5Mtpa of green ammonia from 2.5GW of electrolyser capacity, projected to commence production by 2028. Envision Energy has developed the Industrial Park as a replicable model, with Envision Energy aiming to export the model to develop clean industrial precincts worldwide.⁹⁴

Going Global with Net Zero Industrial Parks

Envision Energy is looking to export its integrated net zero industrial parks model globally. In September 2024, Envision Energy announced a partnership with the Government of **Spain** to accelerate the nation's development of green hydrogen production.

In July 2025, Envision Energy signed up as the strategic partner for a 500 MW green hydrogen and ammonia precinct in Northeast **Brazil**. The hub, developed by Spain's Fotowatio Renewable Ventures (FRV) – owned by Saudi Arabian conglomerate Adbud Latif Jameel, selected Envision to develop the Pecem Port park due to Envision's 'leadership and proven expertise across a total renewable energy system, from renewables through to green hydrogen - all orchestrated by AI technology'.⁹⁵

⁹¹ WA EPA, [Western Green Energy Hub - Section 38 Referral Supporting Document](#), October 2024

⁹² WA EPA, [Western Green Energy Hub Final ESD Approved](#), 22 July 2025

⁹³ Hydrogen Insight, [World's Largest Green Hydrogen and Ammonia Plant Officially Commissioned - Powered Entirely Off-Grid](#), 10 July 2025

⁹⁴ Envision, [Envision Delivers on World's Largest Green Hydrogen and Ammonia Plant with Off-Grid Renewable System](#), 10 July 2025

⁹⁵ Hydrogen Insight, [Chinese Electrolyser Maker Envision Signed Up as Strategic Partner for 500MW Green Hydrogen/Ammonia Project in Brazil](#), 31 July 2025

Partnership with ANZ on Financing New Energy Trade

In Beijing, China on 24 September 2025, Envision Energy reaffirmed its commitment to Australia's renewable energy sector with Australian Ambassador to China, H.E. Scott Dewar. Envision emphasised its intent to make strategic investments in Australia to build resilient, sustainable and future-ready energy infrastructure, with a principal focus on energy generation, net zero industrial parks, green hydrogen, ammonia, localisation of renewable energy supply chains and strengthening domestic capability through the advancement of clean energy exports.⁹⁶

At the same time, Envision signed a long-term collaboration agreement with ANZ to deepen cooperation in financing the energy transition, sustainable finance, cross-border trade and investment and policy engagement.⁹⁷ ANZ is the largest Australian financial institution operating in China, long supporting Chinese enterprises investing in and providing technology solutions in Australia.

This strategic partnership, supported by engagement with the Australian government – including Australian Consul-General in Shanghai John Williams and Deputy CEO of Austrade Daniel Boyer – is a significant milestone for Envision's long-term strategy to export China's world-leading technological expertise and establishes a benchmark for China-Australian cooperation across the net zero transformation.

CEF views the development of a net zero industrial precinct, powered by a nation-building scale renewables and clean energy derivatives hub, as a critical step to enable SA's green iron opportunity at a global scale. The experience of Envision in developing the integrated industrial clean energy park, in conjunction with its renewed ambition to expand into the Australian market in partnership with one of Australia's largest financial institutions, would accelerate the timeline to decarbonisation and commercially-competitive green hydrogen that could phase-out taxpayer-funded cost-bridging subsidies. Subsidies that are otherwise required absent an economy-wide price on carbon across Australia and our key trading partners.

Partnership with Fortescue

Envision Energy has already made steps to deploying their technology and expertise in Australia's resources industry. In September 2025, Fortescue announced a nation-leading portfolio of green energy partnerships with global leaders in clean energy technologies and infrastructure. Among the list, Fortescue announced a partnership with Envision Energy to supply its state-of-the-art EN182-7.8MW wind turbines for the first stage of its Fortescue Pilbara wind project. Envision's turbines are engineered to perform in low-wind conditions and withstand extreme weather and cyclones.⁹⁸

Envision Energy's technology will be partnered with Fortescue's 100% acquisition of Nabrawind, the developer of a self-lifting tower design to be installed at greater heights, capturing stronger winds and generating greater power. Along with a solar PV supply agreement with world-leading Chinese integrated solar manufacturer LONGi, the renewable energy infrastructure will power zero-emission mobile mining equipment supplied by two of the top 4 leading mining OEMs, Liebherr and XCMG.

⁹⁶ Renew Economy, [Envision Energy Strengthens Australia Commitment Through New Strategic Partnership](#), 24 September 2025

⁹⁷ Renew Economy, [Envision Energy Strengthens Australia Commitment Through New Strategic Partnership](#), 24 September 2025

⁹⁸ Fortescue, [Fortescue Unites World's Best Technology and Manufacturing to Accelerate Decarbonisation Globally](#), 25 September 2025

5.3. Revera Energy

In May 2025, global investment firm Carlyle launched Revera Energy, an independent energy infrastructure developer, backed by Carlyle's \$7.6bn Global Infrastructure fund.⁹⁹

Revera has a development pipeline of +750MW BESS, 2.3GW solar, and 1.4GW wind across the NEM, as well as the 1GW Cape Hardy Green Hydrogen Project in SA. Revera currently manages and has provided financing to 158MW of operating solar capacity across NSW.

Given Revera Energy's regional focus and investment pipeline in SA, Revera has the potential and capability to deploy the renewables at the speed and scale necessary to enable the decarbonisation of a transformed Whyalla Steelworks.

5.4. Tilt Renewables

Tilt Renewables is an established renewable energy developer, operating 1.9GW of renewables across 12 assets in Australia, with a 3.5GW development pipeline. Tilt Renewables is well-capitalised and positioned to lead on enabling nation-building low-emission industries given 40% ownership stakes from the Future Fund and Queensland Investment Corporation (QIC) respectively, positions strengthened in November 2025 following the sale of 19.9% of AGL Energy's 20% stake in Tilt Renewables for \$750m.¹⁰⁰

With QIC now the largest shareholder, its 'next phase' focus is on breaking Australia's wind farm financing drought.¹⁰¹ Tilt Renewables has proposed the 1.2GW Nonowie Wind Farm and integrated 600MW/4.8GWh BESS in South Australia, 10km west of Whyalla. Tilt has signalled the project can support new industries that require clean energy sources in the region. The Nonowie wind project could provide a significant share of the energy requirements of a transformed Whyalla DRI facility.

5.5. Copenhagen Infrastructure Partners

In May 2023, Copenhagen Infrastructure Partners (CIP) announced a proposed \$30bn hydrogen hub in SA's Eyre Peninsula, backed by 4GW of solar, 10GW wind and 7GW of hydrogen electrolysis capacity.¹⁰² The project was initially centred on the SA's hydrogen plans, including the proposed Whyalla hydrogen hub. CIP's proposal has the potential to enable the decarbonisation of a new Whyalla DRI facility, securing long-term offtake with the future iron and steel producer.

⁹⁹ Revera Energy, [Revera Launches as Independent Energy Infrastructure Platform Backed by Carlyle](#), 19 May 2025

¹⁰⁰ AFR, [AGL Energy Agrees to Sell Tilt Renewables Stake for \\$750m](#), 10 November 2025

¹⁰¹ Renew Economy, [AGL Sells Most of its Stake in Tilt, to Use Windfall Gain to Focus on Batteries and Peaking Gas](#), 10 November 2025

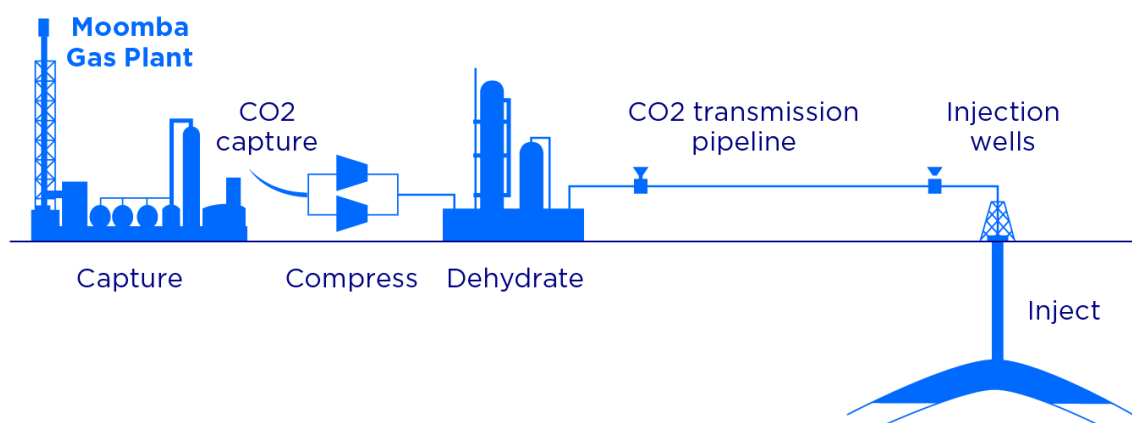
¹⁰² Renew Economy, [Danish Giant Adds Massive Green Hydrogen Hub to 30GW Australia Pipeline](#), 18 May 2023

Section 6. Moomba CCS for Whyalla Steelworks Would Undermine Progress

The SA Government has thrown their support behind the Moomba Carbon Capture and Storage (CCS) project, commissioned in October 2024, to enable industrial decarbonisation for companies for Australia and Asia. The Moomba CCS project is operated by Santos, with a minority joint venture partnership with Beach Energy (33%).

Beach Energy determines the Cooper and Eromanga basins in SA and QLD have the potential for injection of over 20 MtCO₂-e per annum for over 50 years.¹⁰³ In February 2022, Santos announced the booking of 100 MtCO₂ in the Cooper Basin.¹⁰⁴ The Moomba CCS project reached full capacity in October 2024, a month after start-up, storing 340 ktCO₂-e in the December 2024 quarter. The cost of Moomba CCS is estimated at under \$49/tCO₂-e,¹⁰⁵ with lower than average costs a result of the simpler technical design of injecting CO₂ into empty fields that held gas for millions of years.¹⁰⁶ The low marginal cost of Moomba CCS is in part due to the existing CO₂ separation process at Moomba, as high concentrations of CO₂ are removed to meet domestic gas specifications from inlet gas from the Cooper Basin.

Figure 6.1: Moomba CCS Project Representation



Source: Santos

Since October 2021, CCS projects have been able to register for ACCU generation following the creation of the methodology under the former Emissions Reduction Fund. However, changes implemented in 2023 alongside the safeguard mechanism reforms restrict the registration of new ACCU projects that reduce covered emissions for safeguard facilities to avoid duplication of carbon crediting and ensure eligible projects meet the additionality requirements of the scheme.¹⁰⁷ Currently, the Moomba CCS project remains the only CSS project eligible to generate ACCUs as its registration was finalised prior to the legislative amendments.

Institute for Energy Economics and Financial Analysis (IEEFA) analysis has highlighted through numerous reports and analyses the limited nature of the potential application of CCS in the iron and steelmaking sector. As of 2024, there are 6 commercial-scale CCUS projects for iron and steelmaking

¹⁰³ Beach Energy, [Reducing Emissions - Moomba Carbon Capture and Storage Project](#), accessed August 2025

¹⁰⁴ Santos, [Santos Announces Booking of CO₂ Storage Capacity](#), 08 February 2022

¹⁰⁵ SA Gov DEM, [Santos and Beach Energy on Track to Help Decarbonise Industry](#), 31 January 2025

¹⁰⁶ AFR, [Australia is Throwing Away a \\$600b Carbon Capture Opportunity](#), 10 February 2025

¹⁰⁷ Argus Media, [Australia's CCS Carbon Credit Pathway to Remain Limited](#), 22 July 2025

in the development pipeline, however one in operation. The Al Reyadah CCUS project by Emsteel has a nominal capacity of 800ktpa, transported to ADNOC wells for enhanced oil recovery.

According to Danieli/Tenova, a methane gas-based Energiron DRI-EAF pathway can reduce emissions by 53% compared to an integrated BF-BOF process. However, the CCS-equipped DRI-EAF pathway can only reduce emissions by 67% relative to a BF-BOF process.¹⁰⁸ The Al Reyadah CCUS project has a maximum abatement potential for 45%. In reality, from 2020-2023, the CCUS facility would have captured 19-27% of emissions on the assumption that the CO₂ removal was operating at full nominal capacity.¹⁰⁹

In August 2025, MIDREX Technologies highlighted that CCS remains a niche technology for steel decarbonisation and would work only in very specific locations and under particular circumstances. MIDREX emphasised that despite being promoted as a decarbonisation tool for heavy industry, CCS has delivered limited success in practice.¹¹⁰

One of the specific locations, under particular circumstances, is CCS-based DRI in the Gulf states of the US. In June 2023, Nucor announced a CCS agreement with ExxonMobil to capture, transport and store up to 800 ktpa CO₂ from its Energiron DRI plant in Convent, Louisiana.¹¹¹ The case for CCS in the US is a result of significant established enabling infrastructure, favourable economics for the continuation of gas-based production with ultra low-cost methane gas supply, and an implicit carbon price of US\$85/tCO₂-e (A\$130/tCO₂-e) via the 45Q Tax Credit with investment certainty, with the 45Q having an extensive history of bipartisan support for the application of CCS since 2008. This commitment was strengthened in 2022 under the Biden Administration and preserved in July 2025 by the Trump Administration.

In November 2023, ExxonMobil completed the acquisition of Denbury for US\$4.9bn for its CO₂ pipeline network. Following the acquisition, ExxonMobil now has the largest network CO₂ pipeline in the US, adding ~925 miles (~1,500km) of CCS pipelines across the Gulf states of Louisiana, Texas and Mississippi.¹¹² ExxonMobil's economics are also supported through economies of scale, with large-scale gas consuming industries leveraging the same pipeline, including DRI and ammonia production.

In 2025, Infrastructure SA recommended the SA Government undertake a feasibility study into increasing the supply of gas to the Upper Spencer Gulf to meet 'green iron and green steel' goals at scale, with decarbonisation achieved by the development of a carbon capture and aggregation hub in Whyalla with a pipeline to the Cooper Basin near Moomba.¹¹³

Infrastructure SA outlines the staged development of a CCUS hub in the Upper Spencer Gulf would be underpinned by CCS at the Whyalla Steelworks that would shift to a DRI facility powered by methane gas with eventual CCS *prior to a green hydrogen transition*. The report modelled a 1.8Mtpa CCS project for Whyalla Steelworks would require \$1.7bn in capital investments, generating \$6.9bn in value-add **over 25 years**, emphasising the value for carbon abatement and sequestration will exceed the cost of CCS for iron and steel by 2031. The value-add figures are dependent on Infrastructure SA's central scenario of its 2024 Infrastructure Australia Carbon Value report, in which a **A\$171/tCO₂-e carbon price is realised**.¹¹⁴

¹⁰⁸ Danieli, [Green Steel Production Through Hydrogen-Based Energiron DRI process](#), November 2021

¹⁰⁹ IEEFA, [Steel CCUS Update: Carbon Capture Technology Looks Ever Less Convincing](#), November 2024

¹¹⁰ MIDREX, [Is CCS a Solution for Iron and Steel? Only in the Right Conditions](#), 19 August 2025

¹¹¹ ExxonMobil, [ExxonMobil Signs Carbon Capture Agreement with Nucor Corporation](#), Reaching 5 MTA Milestone, 01 June 2023

¹¹² ExxonMobil, [ExxonMobil Completes Acquisition of Denbury](#), 02 November 2023

¹¹³ Infrastructure SA, [Carbon Capture, Utilisation and Storage: Infrastructure and National Supply Chain Study](#), 2025

¹¹⁴ Infrastructure SA, [Valuing Emissions for Economic Analysis](#), February 2024

The significant expansion of methane gas supply infrastructure, CO₂ pipelines to connect Whyalla to Moomba CCS, the construction of a gas reformer, and globally-high delivered gas prices that have consistently risen for decades, risks gas lock-in for decades that undermine the viability of Whyalla in the domestic and international context. Furthermore, the economics of this multi-billion-dollar capital investment into gas lock-in would only be viable with what would be **the world's highest price on carbon**, almost 5x higher than Australia's current carbon price.

South Australia does not have a comparative advantage in methane-gas based DRI, internationally or domestically. To catalyse the investment required in deploying CO₂ pipelines for the limited potential of CCS as well as the integration of CO₂ capture and purification infrastructure, Australia would have to introduce an equivalent tax credit mechanism to the US. This US\$85/tCO₂-e (A\$130/tCO₂-e) value for carbon abatement would dramatically shift the economics in favour of green hydrogen-based DRI.

The green iron opportunity for Australia and South Australia more specifically is the transformation of the global iron and steel sector to a decarbonised industry alongside the decarbonisation of economies to achieve legislated emissions reduction targets. Australia's opportunity lies in the future alignment with the valuing of embedded carbon in traded, energy-intensive commodities and SA's comparative advantage in new energy trade with high-grade magnetite and renewable energy resources.

While the Moomba CCS is an established facility that has successfully sequestered carbon since it began operations last year, the opportunity cost of the scale of investment required to enable the integration of a DRI industry in Whyalla to the Moomba site would result in tens of billions of lost investment into renewable energy infrastructure. Infrastructure that would be an economic multiplier for South Australia, enabling surrounding clean economy industries, scalability and diversification rather than facilitating the lock-in of gas for decades.

Appendix A: SA Magnetite Resources

Figure A: South Australia Magnetite Deposits

Project	Owner	Stage	Resource (Mt)
North Gawler Iron Region			2,249
Snaefell	Cu-River Mining Australia Pty Ltd	Scoping / PFS	569
Giffen Well	Maosen Australia Pty Ltd	Scoping / PFS	517
Hawks Nest Magnetite	Peak Iron Mines Pty Ltd	Environmental Assessments	620
Bulgunnia	OneSteel Manufacturing Pty Ltd	Resource Definition	471
Sequoia	Southern Exploration Pty Ltd	Scoping / PFS	72
Eyre Peninsula Iron Region			9,291
Warrambo (CEIP)	Iron Road Ltd	Lease Approval	4,510
Middleback Range	OneSteel Manufacturing Pty Ltd	Operating	2,064
Kimba Gap	OneSteel Manufacturing Pty Ltd	Resource Definition	643
Green Iron Magnetite Project	Lincoln Minerals Ltd	Scoping / PFS	1,244
Bungalow	Dragon Resource Investment Pty Ltd	Resource Definition	239
Wilcherry Hill	Alliance Resources Pty Ltd	Environmental Assessments	224
Hercules	Alliance Resources Pty Ltd	Resource Definition	194
Greenpatch	Silver Son Metals Pty Ltd	Resource Definition	55
Weednanna North	Alliance Resources Pty Ltd	-	9
Ultima Dam East	Alliance Resources Pty Ltd	-	6
Ultima Dam West	Alliance Resources Pty Ltd	-	3
Braemar Iron Region			7,989
Razorback Project	Magnetite Mines Ltd	Environmental Assessments	3,837
Muster Dam	Magnetite Mines Ltd	Resource Definition	1,550
Ironback Hill	Magnetite Mines Ltd	Resource Definition	1,187
Olary Flats	Lodestone Mines Ltd	Scoping / PFS	1,063
Grants	Havilah Resources Ltd	Resource Definition	304
Maldorky	Havilah Resources Ltd	Environmental Assessments	147
Grand Total			19,529

Source: SA DEM (2025); IEEFA Green Iron Tracker (2025)

Appendix B: Common-User Infrastructure Can Support Emerging Technologies

B.1. H2-DRI Technologies

Calix

Calix's Zero Emissions Steel Technology (ZESTY) is a renewable electricity and hydrogen-based flash ironmaking technology, building on Calix's extensive background in calcining technology, specifically its commercialised electrically-heated flash calcination technology. While flash calcination is pre-commercial in the iron reduction industry, flash reactors are well established in both cement and alumina calcination processes.¹¹⁵

Flash smelting refers to the process of rapidly reacting iron ore fines in a hot gaseous environment, distinctive from fluidised bed technology as particles fall through a shaft and are collected post-reaction at the bottom of a shaft, with no bed structure established in the furnace. Calix's ZESTY platform can provide significant advantages to other ironmaking processes, primarily through the direct electrification of process heat to reduce hydrogen demand to stoichiometric minimum, as well as the ability to process iron ore fines – eliminating pelletisation requirements. In summary, Calix's flash ironmaking process provides significant energy efficiency and cost savings via:¹¹⁶

- **Direct electrification.** As ZESTY is an application of Calix's commercialised flash calcination technology, inefficient fossil fuel combustion and process heat can be replaced with efficient, precise, renewable-based electrical heating. Removing combustion for process heat also reduces hydrogen demand to the stoichiometric minimum of 54kg/t-HBI for 100% metallisation of iron ore.
- **Processing fines.** ZESTY is compatible with lower-grade ore fines, like those mined in the Pilbara, removing the need for sintering (agglomeration of iron ore fines into a larger product). ZESTY also removes the requirement of pelletising magnetite concentrate ores, reducing capital intensity in pre-reduction processing.
- **Flexible operability.** The ZESTY platform is compatible with intermittent and renewable electricity, with electric heating providing a high degree of temperature control with fast start-up and shut down, and highly flexible production rates. This allows ZESTY to potentially be employed as a load balancing/demand response tool to the energy grid. The dynamic nature of flash ironmaking can provide a significant advantage in the South Australian context, in which an industry-scale DRI plant's electricity load is large relative to the existing grid capacity.
- **Versatility and scalability.** Calix's ZESTY platform is a modular design, allowing the platform to be integrated directly at the iron ore mine source for the value-add and export of green iron, scaled-up in as a multi-supplier green iron hub in industrial precincts, such as Whyalla, Kwinana, Port Hedland, Geraldton or Gladstone. The platform can also be co-located with an EAF for domestic steelmaking, or integrated into an existing BF-BOF facility to progressively reduce the emissions intensity of its output.
- **Verified pilot testing.** Calix has conducted extensive pilot-scale tests, including over 130 tests of nine Australian ores from multiple providers at a multi-purpose R&D plant. Calix's ZESTY platform has also been studied through the HILT CRC.

¹¹⁵ Metallurgical and Materials Transactions, [New Insights into Hydrogen Reduction of Hematite in an Indirectly Heated Flash Reactor from Measurement and First-Order Modeling](#), 10 February 2025

¹¹⁶ Calix, [Calix Submission to the Australian Government Green metals Consultation](#), 12 July 2024

In July 2025, Calix was awarded a \$45m grant from ARENA to build a novel demonstration plant using its ZESTY platform. Powered from renewable electricity and green hydrogen, the plant will aim to produce up to 30,000tpa of low-carbon H2-DRI/HBI.¹¹⁷ In February 2024, Calix announced the completion of its Front-End Engineering and Design (FEED) study for the 30,000tpa ZESTY demonstration plant.¹¹⁸

Calix aims to complete the required matching finance for the ZESTY demonstration plant (total project budget including commissioning and initial testing estimated at \$90m) in FY26 and commence its engineering, procurement and construction management through 2027, with construction completed in 1HFY29.¹¹⁹ The location of the plant remains commercial in confidence.

The ZESTY demonstration plant's toll processing of multiple ores and grades is designed to facilitate the testing of H2-DRI products by multiple steelmakers using varied technological pathways. This allows Calix to provide flexible decarbonisation pathways for steelmakers across the world, including the phased substitution of iron ore charge into BF's in the near term and charges into ESFs and EAFs in the long-term depending on impurity contents in ore feedstocks.

Calix is targeting a capital-light commercialisation model, licensing the ZESTY technology to third party iron and steelmakers, allowing producers to construct their own plants, reducing capital requirements for Calix and enabling the platform to be easily commercialised and scaled. Calix's licensing strategy undermines its approach to develop an industry-wide solution, collaborating with producers across the iron and steel value chain.

B.2. Electrolysis/Electrowinning Technologies

Direct Electrochemical Reduction (DER) is an emerging alternative to hydrogen-based shaft-furnace DRI technologies to enable the decarbonisation of iron making. DER technologies employ electricity directly to reduce iron ore with no molecular intermediary (i.e. hydrogen, methane, coal).¹²⁰ There are three main DER pathways currently in RD&D globally:

- **Electrowinning of iron in molten salts to form liquid iron.** The main process employed is continuous Molten Oxide Electrolysis (MOE) pathway, reducing iron in a molten oxide electrolyte at high temperatures (between 1,600 -2,000°C) to produce a liquid hot metal. There are commercial challenges to the viability of inert anodes in corrosive environments. Boston Metals is currently the most progressed proponent in developing MOE.
- **Acid-based ore digestion and electrowinning.** This process is employed by US-based Electra, dissolving iron ore in a water-based acid solution and using electricity to electroplate iron in a batch process. There are significant operational advantages to this process over MOE, principally the ability to operate at low temperatures (60-110°C).
- **Electroreduction of ores in an alkaline media and electrowinning.** Electrowinning in an aqueous alkaline solution at ~ 110°C to produce electroplated iron is currently under investigation by ArcelorMittal and John Cockerill. Alternatively, an aqueous alkaline solution can be employed at ~ 110°C to reduce iron ore and produce metallic iron in a slurry. This process has been demonstrated at pre-industrial scale by Fortescue.

Element Zero

Element Zero is an early-stage green metals start-up based out of Perth, WA, founded by Michael Masterman, previously CFO of Fortescue Future Industries, and Bart Kolodziejczyk OAM, former Chief Scientist of Fortescue Metals Group.

¹¹⁷ ARENA, [ARENA Backs Calix with \\$44.9m to Fire Up Green Steel Future](#), 24 July 2025

¹¹⁸ Calix, [Calix's ZESTY Study Finds High Potential for Economic Green Iron](#), 11 February 2024

¹¹⁹ Calix, [Calix Executes \\$44.9m ARENA Grant Agreement for ZESTY Green Iron Demonstration Plant](#), 23 July 2025

¹²⁰ Fortescue, [Low Temperature Direct Electrochemical Reduction for Zero Emissions Iron Project](#), 14 May 2025

Element Zero have developed a novel hydroxide electrolysis process that uses renewable energy to reduce iron ore fines directly, bypassing the need for green hydrogen or carbon-based reducing agents. The process uses a patented electrolyte that dissolves iron ore into a non-aqueous solution that is then reduced electrolytically.

Element Zero states their electroreduction technology is able to process low grade (30% Fe) to high grade (72% Fe) iron ore, producing a high-purity metallic iron product with up to 92% Fe content, whilst delivering a 30-40% lower energy intensity compared to traditional coal-based steelmaking.¹²¹ The process proposes to operate at a range of 250-300°C, which enables the plant to ramp up and down processing capacity depending on energy and material feedstock variations.

Given the company's technical ability to process low grade and high-grade ores, Element Zero expects to refine both hematite and magnetite ores into high grade briquettes for export. This is a critical step forward to realising the potential scale of Australia's green iron opportunity, commercialising technologies that can value-add Pilbara hematite ores.

In January 2024, Element Zero raised US\$10m in seed funding, led by Playground Global, to expand R&D, engineering and employ project development teams to scale the development of a pilot plant. Element Zero has commissioned a green iron pilot plant in Perth capable of processing up to 100 kg/day of iron ore.¹²²

Element Zero plans to undertake another capital raise in FY2025, targeting US\$50-100m. Beyond this, Element Zero aims to construct a US\$2.1bn (\$3.2bn) world-scale green iron plant in the Pilbara prior to 2030, with pending approvals to situate the plant in the Boodarie SIA, Port Hedland.¹²³ The initial stage of the project would be capable of processing 5Mtpa of iron ore feedstock into 2.7Mtpa of green iron. Element Zero has aspirations to expand up to 20Mtpa of iron processing, which is estimated to generate revenues of ~ US\$9bn pa.¹²⁴

CEF understands Element Zero is actively investigating the development of a 1Mtpa feedstock iron plant in Texas, USA. As part of the proposal, Element Zero would potentially receive subsidised land, water, globally-competitive grid tariffs and iron ore supply chains into the US from countries without border tariffs on iron ore, in addition to close proximity to Nucor – US' largest steelmaker and world leader in EAF deployments. CEF also notes the incredible speed in which large infrastructure and value-added facilities progress through environmental and planning approvals in the US, a significant advantage over the costs and time to receive all developmental approvals in Australia.

Fortescue

Fortescue is developing a Low Temperature Direct Electrochemical Reduction (DER) technology, an iron ore reduction process using a solid-state slurry electrolyser with an alkaline electrolyte. Fortescue's approach is to utilise the direct reduction of solid ore in a continuous-flow reactor in an alkaline media, achieved via a slurry process as opposed to traditional electrowinning approaches.

The DER technology is targeting the reduction of lower-grade iron ores, such as those in the Pilbara, at temperatures below 130°C. The direct use of electricity to reduce iron ore provides a pathway to maximise the energy efficiency of iron value-adding, with a theoretical energy requirement of 2.8MWh/t-iron, approximately 50% lower than the energy intensity of a H₂-DRI pathway.

Helios

Established in 2018, Helios is developing a novel process to produce iron from iron ore using sodium as a reducing agent; replacing coal, methane gas, and hydrogen. Helios has stated its process would

¹²¹ Element Zero, [Our Technology](#)

¹²² Business Wire, [Element Zero US\\$10m Seed Funding led by Playground to Scale up Platform](#), 17 January 2024

¹²³ SMH, [The Iron Men with a \\$4bn Plan to Save the Planet](#), 15 April 2024

¹²⁴ Element Zero, [Home](#)

operate at 250-350°C, producing high-purity metallic iron with an energy intensity between 3.6-5MWh/t-iron, 30% more efficient than traditional blast furnaces.

Helios has completed over 420 trials with 26 ore samples from across the world, with testing consistently producing metallisation degrees of 98-100% iron. Powered from renewable electricity, the process would emit just 30 kgCO₂-e/t-iron, a +98% reduction relative to traditional blast furnace operations.

In September 2024, BlueScopeX, the innovation and decarbonisation breakthrough technology arm of BlueScope, signed a preliminary agreement with Helios to trial its green iron technology from 2026.¹²⁵ With BlueScope leading the primary consortium bid for the Whyalla Steelworks, the development of a pilot-scale Helios facility to process additional magnetite ores could be a logical extension.

¹²⁵ Reuters, [Australia's BlueScope Steel Signs Green Iron Agreement with Helios](#), 18 September 2024