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CLIMATE ENERGY FINANCE

Green Metal Statecraft: Policy, Investment and Technology Trends in the Green Iron Evolution

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

About the Authors – Tim Buckley

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

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

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Climate Energy Finance acknowledges the Traditional Owners of the lands on which we work and live, and pay our respects to their Elders past and present. We recognise their continuing connection and custodianship to land, waters and culture, and acknowledge that this connection has sustained Australia's natural environment for tens of thousands of years.

Important information

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Executive Summary

The decarbonisation and electrification of the global iron and steel industry is undergoing a structural recalibration, shifting from a period of speculative optimism on the now deflated hype regarding the rapid deployment of green hydrogen, and into a measured, phased, and evolutionary decarbonisation trajectory.

The aim of this report is to provide a qualitative update of the investment, technology and enabling policy trends that will underpin the transformation of the iron and steel value chain, building on CEF's Green Metal Statecraft report of November 2024.

Whilst this report showcases points of decarbonisation advancing across the iron and steel value chain, in aggregate the global sector is advancing unevenly, haltingly, sporadically and at a pace that remains deeply misaligned with the speed and breadth of decarbonisation of the sector – which contributes 7-9% of global emissions – demanded by the climate science. For every step forward on an individual project or market-level, the broader investment pipeline showcases an equivalent case study of project delay, cancellation, and restructure in the face of unresolved structural headwinds, with US policy backsliding undermining global capital momentum.

Despite tens of billions in state aid, a strengthening carbon pricing mechanism, and supply-side and demand-side market forming mechanisms in the EU, the European investment pipeline has undergone a significant contraction in recent years. The investment trends, or lack thereof, of proposals progressing towards final investment decisions (FID) in Europe are indicative of structural headwinds. European electricity prices, even prior to the last two energy crises, remain 2-3x that of the US and domestic methane gas costs are 5x that of the US, and a similar order of magnitude higher than the rapidly emerging competing iron reduction region of the Middle East and North Africa (MENA).

There remains a clear bankability gap for near-zero carbon routes for iron and steel production. Across both the EU and China, deep decarbonisation means a structural shift away from coal-based production pathways in blast furnaces (BF) and basic oxygen furnaces (BOF). High upfront capital cost intensities, exposure to higher operating costs in electricity and renewable hydrogen – notwithstanding strong public capital support, decarbonising mature lower-emission pathways in hydrogen-based direct reduced iron (DRI) and electric arc furnace (EAF) smelting face major bankability gaps.

The MENA region is emerging as a strategically important DRI production corridor, with significant methane-based DRI capacity operational, and the largest development pipeline of new gas-based capacity. MENA's competitive advantages in lower-emissions iron and steel production extend further into near-zero emissions manufacturing with some of the world's best renewable energy resources, low costs of capital and less stringent regulations and approvals processes than the EU. MENA's geographic proximity to Europe, existing DRI infrastructure, and access to competitive renewable energy position the region as the most credible near-term supplier of lower-emission primary iron to Europe's growing need for decarbonised iron and steel.

At the current pace of decarbonisation, demand for DRI is expected to grow by 50%, or 80-85Mtpa, to reach 224Mtpa by 2035.[1] Globally, DRI capacity under construction now exceeds new coal-based BF capacity for the first time, at 53.5Mtpa versus 51.9Mtpa respectively. However, fossil hydrogen-based reduction accounts for all existing production of DRI, and without a significant step change in coordinated enabling policy and improvement in underlying energy dynamics, the vast majority of this new capacity will be powered by fossil gases.

[1] Midrex CEO KC Woody, Shaping the next era of low-carbon ironmaking: MIDREX'S PATH FORWARD IN 2026, March 2026

Low returns on capital, continued margin compression as a result of global overcapacity, insufficient demand pull from lack of consumer willingness to pay clean premiums – particularly from the automotive sector, given it is likewise suffering extreme margin pressures at a time of massive capital reinvestment demands[2] – as well as insufficient investments through market intervention to surmount structural challenges in low-emissions energy and enabling infrastructure has meant the business case for low-emissions primary iron and steel production remains insufficient to crowd-in capital.

Electrolyser cost deflation outside China has not materialised at the pace anticipated, and this economic reality has forced a recalibration of the global investment pipeline away from speculative ambition toward a phased, evolutionary approach centred on incremental electrification through EAFs. EAF steelmaking capacity under construction of 109Mtpa is 164% of new BOF capacity in the pipeline. These capacity change dynamics highlight the directional shift in the industry, even if the pace remains insufficient relative to climate targets.

While progress remains incremental, CEF urges policymakers to recognise that this remains a global race. China remains the central variable in global iron and steel decarbonisation. Despite 90% of China's steel production deriving from BF-BOF pathways, China is the world's largest EAF operator by installed capacity. This report showcases that China is systematically building commercial-scale DRI demonstrations, expanding its national emissions trading scheme (ETS) to cover steel, cement, and aluminium in 2026, building international taxonomy collaborations and positioning itself to scale green hydrogen and electrolyser manufacturing at costs a fraction of Western equivalents.

Implications for Australia

For Australia, the structural conditions that made the Pilbara region in Western Australia the epicentre of iron ore globally will not persist into low-emissions iron value-adding without a significant step change in political will, coordination and speed of execution, along with sustained investment in technology innovation - in short, a Team Australia approach to move beyond the myopic short -termism and self-interest of individual corporations like BHP or Rio Tinto.

China is moving at a speed and scale orders of magnitude higher than Australia in scaling the enabling infrastructure of a low-carbon iron and steel economy. Additionally, Australia's potential green iron hubs are facing increasingly favourable competing offers from Saudi Arabia, Oman, Libya, and the emerging hydrogen valleys of the MENA region. Australia needs to capitalise on the supply chain security risks of the Middle East to highlight our strategic value and policy leadership so as to attract bilateral and multilateral support for first-of-a-kind (FOAK) deployments in DRI and subsequently green iron here.

Australia's window of comparative advantage – including its iron ore endowment, renewable energy potential, phenomenal capital base, potential for world-scale deployments and established trade relationships with key steelmaking markets across Asia – is real but is increasingly time limited.

[2] CREA / Wuppertal Institut, Near-Zero Steel by Policy Design: China and the EU, with a focus on Germany, April 2026

Section 1. Investment and Production Trends in Global Iron and Steel Decarbonisation

As demand growth for steel continues to slow, driven predominantly by the slowdown in construction material demand from China's property sector, steel production globally dropped 2% in 2025 to 1,849Mt. China produced 52% of the world's steel in 2025, with the top 15 steel producers accounting for 89% of global supply - see Figure 1.1. China's production dropped 4.4% in 2025 to 961Mt, a significant decline given China's world-leading scale. The decline, from 1,005Mt in 2024, translates to a 44Mtpa reduction in steel production, more than the 7th largest producer (Turkiye) produced in 2025 (38Mt).[3]

India's and Vietnam's steel industries continued to burgeon in 2025. India, the second largest producer globally, expanded steel production by 16Mtpa to 165Mt in 2025, up 10.4%. Outpacing India's growth, Vietnam's steel industry expanded 12.3% to 25Mtpa. Of the largest steelmakers globally, Taiwan and Germany experienced the largest declines in production over 2025, producing 17Mt and 34Mt, down 10.9% and 8.6% respectively.

Figure 1.1: Global Steel Production in 2025 and Change from 2024

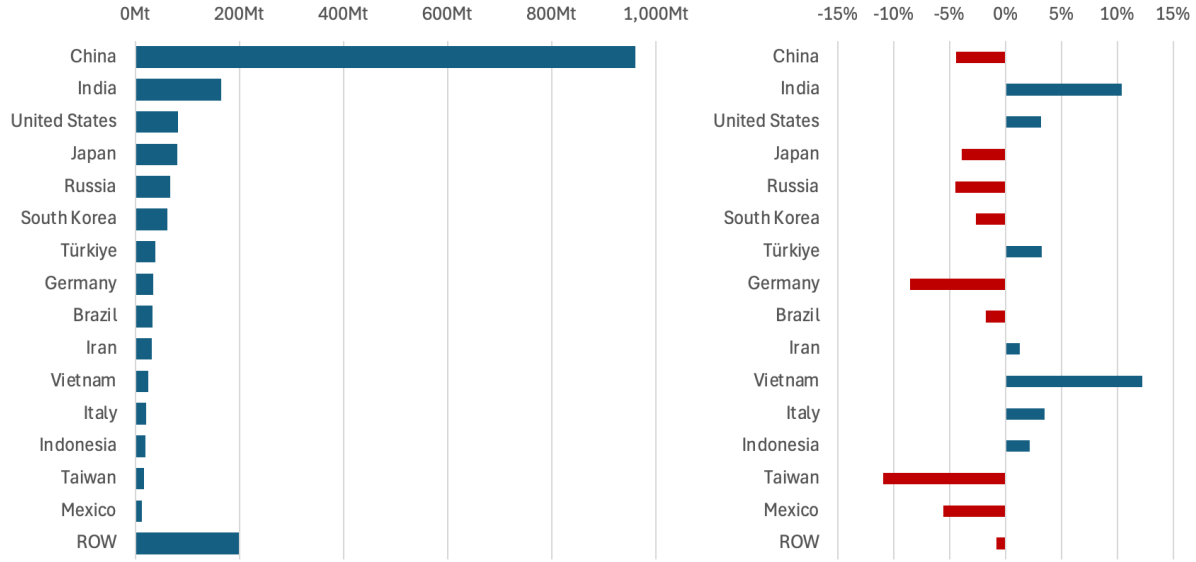

Chart: Climate Energy Finance
Source: WorldSteel (2026)

In the first quarter of 2026 (Jan-Mar), global steel production continued the trends of 2025, dropping 2.3% to 459.2Mt. The top 10 largest steel-producing nations produced 398.5Mt in the first quarter, down 1.3% year-on-year, accounting for 86.8% of global production. China continued to produce more steel than the rest of the world combined in 1Q2026, producing 247.6Mt and accounting for 53.9% of global production. China's steel sector continues to see demand slowly decline, falling a further 4.6% in 1Q2026 year-on-year, having peaked in 2020. China's significant excess capacity continues to intensify global pressures steel market equilibriums as domestic producers dump excess production into export markets, which has in turn created a wave of anti-dumping steel duties being imposed on China's exports, led by the US, following in the EU and UK and now disseminating across large steel markets in Southeast Asia.

[3] WorldSteel, December 2025 Crude Steel Production and 2025 Global Steel Production Totals, 23 January 2026

India has cemented its position as the second largest steel-producing nation. In 1Q2026, India produced 44.7Mt, growing 10.8% year-on-year and is now more than double that of the United States – the third largest producer globally - see Figure 1.2.

India's steel production is set to continue growing strongly over the coming decade. For steelmakers, India is rapidly emerging as a key growth market backed by resilient domestic demand, large-scale infrastructure investments, and favourable policy tailwinds. India's steel consumption is expected to grow at a compounding annual growth rate (CAGR) of 5-6%, rising to 240-260Mtpa by 2035, driven by GDP expansion, a US$1.4 trillion National Infrastructure Pipeline and rising consumption from renewable energy and defence.[4] This is underpinning a significant construction pipeline of primarily BF capacity, with installed capacity expected to reach 260-280Mtpa by 2035.

Figure 1.2: Top 10 Nations for Steel Production YTD2026

Country	YTD March 2026 Production (Mt)	YTD March 2025 % Change	Global Share of Production
China	247.6	-4.6%	53.9%
India	44.7	10.8%	9.7%
United States	21.0	5.7%	4.6%
Japan	20.1	-1.7%	4.4%
South Korea	15.8	1.8%	3.4%
Russia	15.8	-10.7%	3.4%
Turkiye	9.7	5.3%	2.1%
Germany	9.3	9.0%	2.0%
Brazil	8.1	-3.1%	1.8%
Vietnam	6.4	10.0%	1.4%
Top 10 Producers	**398.5**	**-1.3%**	**86.8%**
Global Production	**459.2**	**-2.3%**	**100.0%**

Source: WorldSteel (2026) [5]

In 2026, global installed ironmaking and steelmaking capacity reached 1,674Mtpa and 2,216Mtpa respectively, with a significant investment pipeline of new capacity announced and under construction. As of March 2026, Global Energy Monitor (GEM) estimates a further 636Mtpa of ironmaking capacity and a further 846Mtpa of steelmaking capacity is in development globally.[6]

China continues to dominate global capacity across the technological landscape. As of March 2026, GEM estimates China has 918Mtpa of operational ironmaking capacity, with a further 88Mtpa in development, as well as 1,073Mtpa of operational steelmaking capacity with a further 11Mtpa in the pipeline.

[4] McKinsey, Strengthening the Future: Steel for Growth and Resilience, 12 December 2025
[5] WorldSteel, March 2026 Crude Steel Production, 23 April 2026
[6] GEM, Global Iron and Steel Tracker, March 2026

In the 12 months to March 2026, GEM estimates global DRI operating capacity expanded by 35.9Mtpa, outpacing the expansion of BFs (9.5Mtpa) by 278%. Similarly, global operating capacity of EAFs rose 50.6Mtpa in the 12 months to March 2026, exceeding growth of BOFs (25.8Mtpa) by 96%.

BFs continue to dominate installed and operational production capacity, but as of 2026, remain the largest ironmaking technology pathway in the construction pipeline with an estimated 51.9Mtpa of capacity. However, across all DRI pathways, including coal-based, methane-gas based and 100% hydrogen reduction projects, GEM estimates DRI capacity under construction to now reach 53.5Mtpa, outpacing that of coal-based BFs - see Figure 1.3.[7]

Figure 1.3: Global Ironmaking Capacity, Operating and in Development

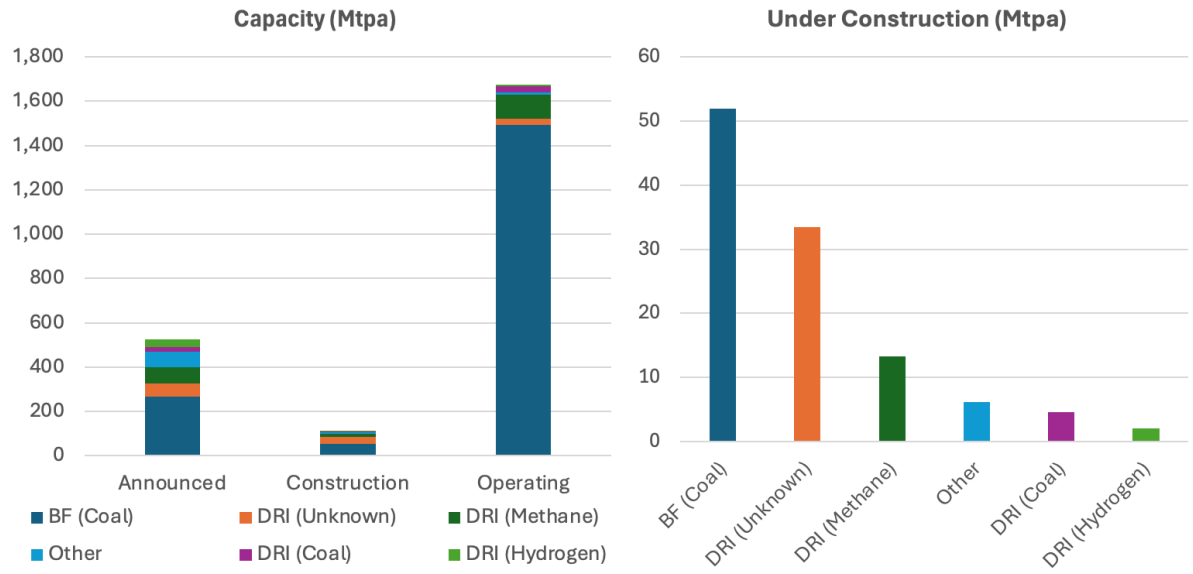

Chart: Climate Energy Finance
Source: Global Energy Monitor (2026)

Current investments into lower-emissions production pathways for steel showcase a very different landscape to that of iron production. As of March 2026, an estimated 41.4Mtpa of new BOF steel capacity is under construction, adding to the 1,440.7Mtpa of operating BOF capacity. EAF capacity under construction in 2026 is estimated at 109.2Mtpa, adding to the 726.9Mtpa of operating EAF capacity globally. The global EAF pipeline under construction is 164% that of BOFs in 2026.

The trajectory of global iron and steel decarbonisation has undergone a structural recalibration in recent years. The hydrogen hype and deployment ambition has collided with the economic challenges and difficult reality of the buildout of the enabling hydrogen infrastructure to decarbonise iron production as forecasts of electrolyser cost curve deflation have failed to materialise. As a result, we have seen a realignment of capital flows that are defining a measured, phased, evolutionary trajectory to steel value chain decarbonisation. EAFs provide a proven, commercially-viable and increasingly cost-competitive pathway to achieve incremental decarbonisation.

[7] GEM, Global Iron and Steel Tracker, March 2026

1.1. European Investment Pipeline

In October 2024, Fastmarkets identified a more than 50Mtpa iron and steelmaking investment pipeline, which at the time was planned to be commissioned over 2025-27, representing €100bn's worth of private investment, supported by significant public capital.[8] CEF tracked 13 large DRI-EAF projects across the UK and European Union (EU) that had received over €12.8bn (A$21bn) in public subsidies and grants in our November 2024 Green Metal Statecraft report.[9] Since 2024, the EU market has seen a significant pull-back in ambition for iron decarbonisation, with many of the 2024 proposals either cancelled, delayed, or significantly restructured. The ongoing high cost of energy in the EU is a key factor undermining progress, and CEF expects EU steel firms to look to import DRI and green iron as the most realistic decarbonisation solution that retains EU steel capacity.[10]

Figure 1.4: Announced European DRI Investment Pipeline

Project	Country	Mt	Technology	Description	Status
Blastr Green Steel	Finland	2.5	H2-DRI-EAF	Second round of financing secured for steel mill.	On Track
Hydnum Steel	Spain	1.5 - 2.6	H2-DRI-EAF	Construction to commence 1H2026.	On Track
Stegra	Sweden	2.5	H2-DRI-EAF	Funding secured for DRI-EAF.	On Track
Salzgitter	Germany	1.9 - 4.7	DRI-EAF	DRI-EAF delayed to 2027, and hydrogen delayed to post 2030.	Delayed
HYBRIT	Sweden	1.3	H2-DRI-EAF	Delayed until 2029.	Delayed
thyssenkrupp	Germany	2.5	DRI-EAF	DRI-EAF expected 2027, hydrogen has been paused.	Delayed
ArcelorMittal	Germany	3.5	DRI-EAF	Cancelled project, handed back €1.3bn subsidies.	Cancelled
ArcelorMittal	France	2	DRI	DRI component cancelled. AM will construct an EAF in Dunkirk.	Cancelled
ArcelorMittal	France	2	EAF	DRI component cancelled. AM will construct an EAF in Dunkirk.	On Track
ArcelorMittal	Spain	2.3	DRI-EAF	DRI delayed, EAF constructed.	Delayed
SHS	Germany	2	DRI-EAF	Still in development.	On Track
Tata Steel	Netherlands	2.5	DRI-EAF	Still in development.	On Track
Tata Steel	UK	3	EAF	Under construction.	On Track

Source: Fastmarkets (2025) [11]

[8] Fastmarkets, European Steel Sector Committed to Decarbonisation Despite Economic Woes, 02 October 2024
[9] CEF, Green Metal Statecraft: Forging Australia's Green Iron Industry, 15 November 2024
[10] Future Cleantech Architects, Policy-Brief - Decarbonizing-Iron-and-Steel, April 2026
[11] Fastmarkets, The Future of Europe's Green Steel Market: Challenges and Catalysts, 14 November 2025

Updates on ArcelorMittal DRI Projects

ArcelorMittal, France

July 2025 saw reports ArcelorMittal had cancelled plans to construct a GH2-DRI plant at its steel complex in Dunkirk, France, with ArcelorMittal France CEO confirming plans had been shelved in a finance committee hearing in France's lower house of parliament.[12]

In February 2026, ArcelorMittal confirmed the construction of a new 2Mtpa EAF at Dunkirk. The €1.3bn investment will be fed by 60% scrap, with the remaining supplied through a mix of imported DRI and liquid pig iron produced from Dunkirk's existing BFs. The steel produced via the new EAF will have an estimated 0.6tCO_2-e/t-ls, far below existing BF-BOF operations at Dunkirk but above that of the IEA's green steel benchmark due to the embodied carbon in pig iron feedstock.[13]

The funding for the EAF will be supported by Energy Efficiency Certificates (CEEs), a French regulatory mechanism to promote energy savings and GHG emissions reductions. Support via the certification scheme is expected to provide 50% of the total investment.[14]

While the EAF represents a step forward in the right direction for ArcelorMittal France, the new EAF will deliver a fraction of the decarbonisation outcomes that would have been realised through the GH2-DRI-EAF pathway originally planned for Dunkirk. Dunkirk's current BF-BOF complex is the single most polluting industrial facility in France, emitting 8.5Mtpa CO_2-e in 2024, equivalent to 14% of France's total industrial emissions.[15]

ArcelorMittal, Germany

In June 2025, ArcelorMittal confirmed that it would no longer progress DRI and EAF plans for the decarbonisation of its flat steelmaking sites in Bremen and Eisenhüttenstadt, Germany. The announcement came after ArcelorMittal announced in November 2024 that it was unable to progress FID on DRI-EAF investments across Europe given policy, energy and market environments had not moved in favourable directions.[16]

ArcelorMittal had received €1.3bn in financial assistance for the development of the DRI-EAF proposals by the Federal Government of Germany. However, the subsidy was conditional on construction commencing by June 2025. ArcelorMittal has since informed the German Government it will not proceed with these investments.

ArcelorMittal has indicated it will explore a phased approach to the decarbonisation of its assets across Europe, with a near- to medium-term focus on detailed planning for the construction of EAFs at Bremen and Eisenhüttenstadt.

ArcelorMittal, Spain

November 2024 saw ArcelorMittal delay the development of a DRI facility at its steel operations in Gijon, Spain, highlighting that green hydrogen is evolving very slowly towards being a viable fuel source and natural gas based DRI production in Europe is not yet competitive as an interim solution.

ArcelorMittal commenced a phased approach in Spain, constructing a new €213m EAF that would lift production of semi-finished steel products, to be refined into rail and wire-rods, to 1.1Mtpa.[17]

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[12] GMK Center, ArcelorMittal Confirms Suspension of Plans for DRI Plant in Dunkirk, 23 July 2025
[13] ArcelorMittal, ArcelorMittal Confirms the Construction of an EAF in Dunkirk, 11 February 2026
[14] ArcelorMittal, ArcelorMittal Confirms the Construction of an EAF in Dunkirk, 11 February 2026
[15] SteelWatch, A Step Forward in Dunkirk – but Far from Deep Transformation Once Promised, 11 February 2026
[16] ArcelorMittal, ArcelorMittal Europe Urges Faster Implementation of Steel and Metals Action Plan, 19 June 2025
[17] ArcelorMittal, ArcelorMittal Starts the Construction of an EAF at its Gijon Plant, 2024

Stegra, Sweden

Stegra is developing the world's first industrial-scale, 100% green hydrogen integrated DRI-EAF steel project in Boden, Sweden. Stegra has based its 2.1Mtpa DRI production facility on the Midrex platform, jointly constructed by Midrex Technologies and SMS Group (via Paul Wurth).[18] The DRI will feed into a 2.5Mtpa EAF, which will deliver up to a 95% reduction in emissions compared to the traditional BF-BOF pathway.

In May 2023, Stegra announced a technical partnership with Thyssenkrupp Nucera, a leading western electrolyser OEM, to supply 700 MW of alkaline water electrolysers, comprising 20 MW Scalum electrolyser modules.[19]

Since 2023, Stegra has also formed partnerships with a diverse range of high-grade iron ore suppliers including Anglo American,[20] Rio Tinto,[21] and Vale.[22]

In September 2025, Stegra announced it had entered into two new agreements for offtake with Microsoft. The first agreement will supply steel produced from near-zero emissions from the Boden facility to be used in Microsoft's datacentres. The second agreement will see Microsoft purchase environmental attribute certificates tied to the production of steel from Boden. This partnership – marking the first book-and-claim agreement for a commercial-scale green iron and steel facility – allows Stegra to supply steel produced from its near zero-emissions Boden facility to offtakers with no obligations for procuring green steel, with Microsoft covering the green premium and low-emissions attribution without taking delivery of the physical steel.[23]

The book-and-claim emissions accounting system is a new market-based mechanism for green commodities, following global adoption and success in energy and transportation markets. The decoupling of low-emissions attribution with physical product delivery allows ambitious buyers and sellers to decarbonize their value chains together, when physical offtake options don't exist or would be prohibitively complex.

US-based think tank RMI, who kickstarted the Sustainable Steel Buyers Platform – a first-of-its-kind buyers' group accelerating steel decarbonisation through collaborative procurement and market formation – advised Stegra and Microsoft on the deal, both of which are members of RMI's initiative to track, validate and account for environmental attribute certificates. In response to the announcement, RMI emphasised that "agreements like this one signal a wider demand pool for lower-carbon steel, expanding the offtake beyond conventional direct steel purchasers and into sectors where steel is a critical yet buried part of the supply chain. The deal serves as a proof-of-concept for the role that [certificates] can play in getting first-of-a-kind, near-zero steel projects off the ground."[24]

January 2026 saw Stegra announce a multi-year partnership with Thyssenkrupp Materials Services for the offtake of non-prime steel – steel that does not meet highest quality standards that certain applications require. Importantly, non-prime steel delivered to Thyssenkrupp will not be considered low-emission as Stegra will sell the green value as environmental attribute certificates to other customers in the prime steel market.[25]

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[18] Stegra, H2GS Partners with MIDREX for Technology and Kobe Steel for Equity, 11 October 2022
[19] Stegra, Thyssenkrupp Nucera and H2GS Partner for huge Electrolysis Plant, 22 May 2023
[20] Stegra, H2GS to Work with Anglo American on Low Carbon Steelmaking, 04 April 2023
[21] Stegra, H2GS Signs Agreement with Rio Tinto for DRI Ore Pellets and HBI, 09 August 2023
[22] Stegra, H2GS and Vale in Agreement for the Supply of DRI Ore Pellets, 10 August 2023
[23] Stegra, Stegra Announced Agreement with Microsoft, Driving Demand for Near-Zero Emission Steel, 23 September 2025
[24] Canary Media, Sweden's Stegra to Supply Green Steel for Microsoft's Data Centres, 25 September 2025
[25] Stegra, Thyssenkrupp Materials Services and Stegra Agree on Significant Multi-year Non-prime Steel Supply, 12 January 2026

Despite all the myriad risks associated with a first-of-a-kind deployment of this scale, Stegra has received strong financial backing from global financial institutions, public financing agencies, and steel end users that have signed long-term supply agreements for green steel before the plant has even commenced production. Stegra commenced construction with total funding facilities of:

- **€4.2bn** in debt financing, €3.5bn of which is senior debt and €600m in junior debt.
- **€2.1bn** in equity financing.
- **€262m** in grant funding from Swedish Recovery and Resilience Facility.
- **€250m** in grant funding from EU Innovation Fund.
- **€137m** in grant funding from Swedish Energy Agency Industrial Leap program.

In the second half of 2025, reports emerged of a funding crunch for Stegra in its race to complete construction of its Boden facility. These reports carried global significance, not only for the viability of iron and steel decarbonisation, but as this was materialising similarly to the struggles and failure of Northvolt. Stegra was formed by the same Swedish investment group that founded Northvolt, the now bankrupt and collapsed Swedish battery venture despite having raised US$15bn.[26]

October 2025 saw Stegra announce it will commence a new financing round. At the time, the Boden facility had progressed through 60% of its construction.[27]

Stegra had not fully drawn on its credit lines. Institutions including Svensk Exportkredit (Swedish export credit agency), European Investment Bank, BNP Paribas, ING and German KfW IPEX-Bank had provided the senior debt. However, Stegra had not met certain conditions and milestones to access the full funding, coupled with delays in state grants from the Swedish Government and higher-than-expected project costs. By March 2026, Bloomberg reported Stegra was just weeks away from running out of cash required to sustain construction and commissioning of Boden.[28]

April 2026 saw Stegra announce it had secured an additional €1.4bn of capital led by Wallenberg Investments AB, which contributed €250m. The announcement came at a critical time after months of fraught negotiations with shareholders and lenders to provide a lifeline to the steelmaker.[29] The funding round brings Stegra's total capital commitments to €8,352m (US$9.85bn or A$13.87bn), a significant capital intensity given the contracting of existing hydro-electricity from third-party suppliers meant Stegra did not have to construct new energy infrastructure as part of the total capital deployment.

Stegra is now on track to complete construction of the Boden facility in 2026. In April 2026, Stegra and Thyssenkrupp Nucera completed installation of all 37 electrolyser modules at the Boden facility. Combined, the 740MW installation is Europe's largest green hydrogen production facility.[30]

Tata Steel, Netherlands

In January 2026, Tata Steel submitted its final environmental impact assessment approvals application for its proposed 2.5Mtpa DRI plant featuring Danieli and Tenova's Energiron technology, to feed into a new 3Mtpa EAF to replace an existing BF in Ijmuiden, Netherlands. A subsidy package of €2-3bn is being sought for this €4-6.5bn investment proposal prior to a potential FID by end 2026.[31]

[26] FT, Swedish Start-up Races to Avoid Northvolt-style Collapse, 21 October 2025
[27] Stegra, Stegra in New Financing Round, 13 October 2025
[28] Bloomberg, Time is Running Out for Swedish Green Steelmaker Stegra, 08 March 2026
[29] Bloomberg, Stegra Gets €1.4bn Rescue from Wallenberg-led Group, 14 April 2026
[30] FuellCellWorks, Stegra Completes Installation of 37 Electrolyser Modules at Hydrogen Plant, 02 April 2026
[31] Renewables Now, Tata Steel plans multi-billion euro greener steel project in IJmuiden, 3 Oct 2025

thyssenkrupp Steel, Germany

thyssenkrupp Steel is building its Midrex-flex 2.5Mtpa DRI facility at Duisburg, Germany with commissioning delayed to late 2027. The project received €2bn in state aid from the German federal government and the state of North Rhine-Westphalia.[32] The state aid is split into a €550m direct grant and up to €1.45bn to cover additional operating costs over the first decade as the plant transitions to an increasing ratio of green hydrogen.

March 2025 saw thyssenkrupp suspend its tender for green hydrogen (GH2) due to high prices, substituting in methane gas that will result in a 50% GHG emissions reduction from its existing BF-BOF operations at Duisburg.[33]

HyFOR and Hy4Smelt

Primetals Technologies, founded in 2015 and bought out by Mitsubishi Heavy Industries in 2023, is a technology provider for the global metals industry, providing turnkey systems, as well as upgrades, engineering, construction and metallurgical services to other technology OEMs and end users.

Primetals have developed the Hydrogen-based Fine Ore Reduction (**HyFOR**) platform, a low-temperature fluidised bed technology capable of reducing low-grade, high-impurity iron ores without agglomeration, allowing the processing of established hematite, magnetite, and limonite operations in a decarbonised process.

In June 2021, Primetals announced the first successful tests of the HyFOR system at a pilot plant in Donawitz, Austria, at Voestalpine's Stahl Donawitz steel mill.[34]

In April 2025, Primetal Technologies announced a strategic partnership with Mitsubishi Corporation, Voestalpine, and Rio Tinto to cooperatively fast-track the development of fluidised bed and electric smelter technologies. Rio Tinto replaced Fortescue as a strategic partner to the HyFOR project.

Following the success of the HyFOR pilot at Donawitz, the joint venture (JV) will implement an industrial-scale prototype plant at Voestalpine's steel mill in Linz, Austria. The demonstration plant, with a capacity of 3tph (26ktpa), is expected to commence production in mid-2027.[35]

The project, **Hy4Smelt**, will integrate the HyFOR fluidised bed technology[36] and an electric smelter[37] also developed by Primetals Technologies. Rio Tinto will supply 70% of the iron ore for the Hy4Smelt industrial-scale demonstration plant and provide technical support to the project. Rio Tinto will also support the development and future commercialization of the HYFOR and Smelter technologies. Construction commenced in September 2025.[38] Voestalpine forecasts a total cost of €130m.[39]

The JV received support funding from the Austrian Government via Kommunalkredit Public Consulting (KPC)'s 'Transformation of Industry' program and Austria's Wirtschaftsservice's 'Twin Transition' initiative. The project also received support through the EU Research Fund for Coal and Steel within the Clean Steel Partnership (CSP) and the EU Clean Hydrogen Partnership within the Hydrogen Valleys, i.e. areas where hydrogen serves more than one end sector or application in the mobility, industry, and energy sectors.

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[32] Thyssenkrupp Steel, Decarbonizing steel: The new direct reduction plant from thyssenkrupp Steel
[33] GMK Center, Thyssenkrupp Steel suspends tender for green hydrogen due to high prices, 30 March 2025
[34] Primetals, HYFOR Pilot Plant Under Operation, 24 June 2021
[35] Rio Tinto, Primetals Technologies with Strategic Partner Mitsubishi Corporation, Voestalpine, and Rio Tinto to Implement Hydrogen-based Ironmaking Plant, 08 April 2025
[36] Primetals Technologies, HYFOR: Hydrogen-based Fine Ore Reduction
[37] Primetals Technologies, Smelter: Melting of Direct Reduced Iron
[38] FuelCellWorks, Construction Begins on Hydrogen-based Ironmaking Plant in Linz, Austria, 25 September 2025
[39] Voestalpine, Hy4Smelt: Construction on Australia's Largest Climate Action Research Project Starts at the Voestalpine Site in Linz, 25 September 2025

HYBRIT, Sweden

The Hydrogen Breakthrough Ironmaking Technology (HYBRIT) initiative was formed in 2016 as a JV of Swedish firms across the green steel value chain, including steelmaker SSAB, state-owned iron ore miner LKAB, and state-owned energy gen-tailer Vattenfall.

The HYBRIT pilot plant began production of sponge iron for testing in August 2020. In June 2021, the world's first pilot-scale production of hydrogen-reduced sponge iron was made by HYBRIT. Over the pilot plant's study across 2020-2024, HYBRIT has produced more than 5,000 tonnes of fossil-free sponge iron, achieving 98-99% metallisation and zero carbon in the process.[40]

Using biogenic carbon in an EAF alongside HYBRIT sponge iron, HYBRIT has successfully produced steel at an emissions intensity of 0.042tCO_2-e/t, a 98% reduction compared to BF-BOF pathways, and well below the IEA's green steel benchmark of 0.4tCO_2-e/t.

In February 2026, HYBRIT announced it had been granted an extension of its building permit for the Luleå pilot's hydrogen storage facility to operate until 2031. The hydrogen storage facility is a geological hydrogen storage facility built into a rock cavern 30m below ground, with a capacity of 100Nm^3. HYBRIT has successfully operated the facility over 5,700 hours, and reduces variable operating costs of hydrogen production by 25-40% compared to normal storage methods.[41]

The HYBRIT JV originally estimated the construction of a 1.35Mtpa DRI demonstration plant at LKAB's Gällivare complex to be completed in 2025-26. In February 2024, LKAB announced it had partnered with Danieli and Tenova for the engineering of the DRI plant, based on HYBRIT's technology combined with Energiron components and engineering designs of Danieli.[42]

In April 2024, LKAB reported the €4.5bn 1.3Mtpa demonstration plant would require 5TWh of fossil-free electricity and 500MW electrolyser capacity. Then CEO Jan Moström announced on the same day the demonstration plant had been postponed to 2027/28, following lengthy permitting processes.[43] In March 2025, LKAB announced further delays to the project, with an updated timeline to complete the plant in 2028, with ramp-up 2029.[44]

Prior to this, in April 2022, the HYBRIT project was awarded a total of €143m from the EU Climate, Infrastructure and Environment Executive Agency (CINEA) – a grant funding vehicle to support decarbonisation and sustainable growth.[45] The funding was distributed as:

- **€108m** for the demonstration plant of HYBRIT hydrogen reduction at Gällivare.
- **€5m** for the demonstration of fossil-free DR-grade pellet production.
- **€30m** for the demonstration of electric melting of DRI in Oxelösund. This supported an EAF between HYBRIT partners SSAB and LKAB with SMS Group now delayed until 2027.[46]

In April 2026, LKAB announced it had returned €113m (€108+5m) to CINEA after failing to meet conditional funding requirements of time-bound milestones. LKAB has signalled the HYBRIT venture will prepare a new application to the EU.[47] The HYBRIT DRI plant at Gällivare is vertically integrated into a 2.5Mtpa EAF plant at Luleå with the planned addition of a cold rolling and strip processing complex built by SSAB with SMS Group.[48]

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[40] HYBRIT, Fossil-free Steel Production Ready for Industrialisation, 27 August 2024
[41] HYBRIT, Decision on Extended Operation of HYBRIT's Pilot Facility for Fossil-Free Hydrogen Storage in Lulea, 24 February 2026
[42] Danieli, LKAB Selects Energiron for Demonstration Plant in North Sweden, 12 February 2024
[43] LKAB, Comments Concerning SSAB's Decision to Invest in Lulea, 02 April 2024
[44] LKAB, Environmental Permit Application - Important Milestone for LKAB's Development, 18 March 2025
[45] LKAB, HYBRIT Receives Support from the EU Innovation Fund, 01 April 2022
[46] SSAB, Third Quarter 2025 Interim Report, 22 October 2025
[47] LKAB, First Quarter Interim Report 2026, 23 April 2026
[48] SMS Group, SSAB Luleå: Pioneering the future of fossil-free steel, 23 April 2026

GravitHy, France

GravitHy have proposed the development of France's first HBI plant in Fos-sur-Mer. The proposal comprises 2Mtpa HBI production reduced by renewable hydrogen generated from 720MW of electrolysers. GravitHy have estimated, prior to FEED design, a total investment of +€2.5bn.[49]

November 2024 saw Rio Tinto enter into agreements with GravitHy to accelerate the Fos-sur-Mer project, supplying high-grade DR-grade iron ore pellets from its Iron Ore Company of Canada operations. As part of the agreement, Rio Tinto will also manage the sales and marketing of the low-carbon HBI produced from the project.[50]

In March 2025, GravitHy completed a €60m fundraising round to support progression towards advanced engineering studies, permits, approvals and an FID.[51]

In April 2026, GravitHy selected Hatch to deliver the FEED for its low-carbon iron proposal in Fos-sur-Mer. Hatch will lead the design of the technical configuration, process integration, costings, constructability, energy and tender packages to support project funding.[52] GravitHy is targeting FID by 4QCY2026, commissioning the HBI plant by June 2029 and ramping-up production through 2030.

[49] GravitHy

[50] Rio Tinto, Rio Tinto & GravitHy Join in Decarbonisation of Steelmaking in Europe, 15 November 2024

[51] GravitHy, GravitHy Raises €60m to Accelerate Steel Industry Decarbonisation, 26 March 2025

[52] Hatch, GravitHy Selects Hatch to Deliver FEED for its Low Carbon Iron Plant in Fos-sur-Mer, 07 April 2026

1.2. MENA Investment Pipeline

Middle East

With its strategic geographic location, renewable energy potential, existing DRI infrastructure and pragmatic ties with Europe and Asia, the MENA region is well-placed to take advantage of policy incentives for green steel production such as the EU's CBAM, entering into force on 1 January 2026.[53]

Europe imports 38-42Mtpa of steel, however more than 90% of Europe's imports are flat products. MENA's existing steel production is primarily long steel products.[54] The growth of Europe's EAF capacity, coupled with need for high-quality primary iron to reduce impurity-levels for high-quality flat steel products, positions MENA as a favourable geographic location and partner of choice to supply lower-emission iron products in DRI and HBI to Europe's steel industry. This model not only incentivises the scaling of lower-emissions iron production to displace retiring BF infrastructure in Europe, but provides European industries a mechanism to maintain a significant portion of their sovereign manufacturing capacity.

Figure 1.5: DRI/HBI Facilities Proposed and Under Construction in Middle East

Project	Entity	Location	Technology	Mtpa	Progress
Essar Green Steel Arabia (GSA)	Essar Group	Ras Al Khair, Saudi Arabia	DRI-EAF	5	Announced
BAP Al-Khair	Saudi Aramco, PIF, Baosteel	Ras Al Khair, Saudi Arabia	DRI-EAF	1.5	Construction
Tosyali Flat Steel	Tosyali, NIDC	Ras Al Khair, Saudi Arabia	DRI	2.7	Announced
Emsteel DRI	Emirates Steel, Itochu, JFE Steel	Abu Dhabi, UAE	DRI	2.5	Construction
Jindal Steel Duqm	Jindal Steel Group	Duqm, Oman	DRI-EAF	5	Construction
Green Hydrogen Pilot	Emirates Steel, Masdar	Abu Dhabi, UAE	GH2-DRI	0.005	Commissioned

Source: Company Accounts, CEF Tabulation

Essar GSA, Saudi Arabia

2021 saw Essar Green Steel Arabia first announce their plans for a US$4.5bn, 4-5Mtpa DRI and EAF facility in the Ras Al-Khair Industrial City, Saudi Arabia. To-date, the proposal is yet to reach FID.[55]

Baosteel, Aramco, PIF Joint Venture, Saudi Arabia

May 2023 saw the world's largest steelmaker, Baowu Group (through its subsidiary Baoshan Iron & Steel Co.), partner with state-owned Saudi Aramco and Saudi Arabia's sovereign wealth fund Public Investment Fund (PIF) to develop a 1.5Mtpa DRI-EAF facility in the Ras al-Khair Industrial City of Saudi Arabia, due for commissioning late 2026.[56]

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[53] Green Hydrogen Organisation, MENA's Green Iron Opportunity, February 2026
[54] Fastmarkets, Global Green Steel Markets: Regulation, Costs and Regional Divergence, 16 January 2026
[55] Essar Case, Green Steel Ecosystem: Essar Group's Vision for a Sustainable Future, 10 December 2024
[56] Aramco, Aramco, Baosteel and PIF Sign Agreement to Establish First Integrated Steel Plate Manufacturing Complex in Saudi Arabia, 01 May 2023

Operating on methane gas, the flat steel output is expected to reduce emissions by 60% against traditional BF-BOF production. The DRI plant will be compatible with 100% hydrogen from the outset without the need for major modification. The utilisation of green hydrogen could reduce the produced steel by up to 90%.

This is China Baowu's first steel processing plant outside of China.

Tosyali, Saudi Arabia

In 2024, Tosyali Holding of Turkiye and Saudi Arabia's National Industrial Development Centre (NIDC) announced an MoU to develop a US$5bn commercial-scale integrated DRI-EAF precinct in Saudi Arabia. The planned investment includes the deployment of two Midrex flex DRI platforms with a capacity of 2.7Mtpa, integrated with a steel mill to produce 4Mtpa of hot-rolled coil and 1.6Mtpa of cold-rolled coil.[57] To-date, the proposal is yet to reach FID and start construction.

Emsteel, UAE

Emsteel's proposed JV with JFE Steel and Itochu of Japan to build a 2.5Mtpa DRI plant in Abu Dhabi, UAE is long delayed, and yet to reach FID.[58] JFE Steel has committed to taking 50% of the plant's output to feed its under construction 2Mtpa EAF in Kurashiki, Japan.[59]

Jindal Group, Oman

Jindal Steel Duqm (formerly Vulcan Green Steel) – a subsidiary of India's Jindal Steel and Power – is constructing a 2.5Mtpa DRI-EAF facility in Duqm, Oman. Commencing construction in November 2023, the facility will deploy an Energiron zero-reformer DRI platform that will charge hot DRI into an integrated EAF.[60] The DRI facility is expected to be completed in 2026.

In September 2025, Jindal Steel Duqm announced its plan to develop a second 'hydrogen-ready' DRI plant in Duqm, utilising 80% hydrogen and 20% fossil gas, also operating on the Energiron ZR platform. The second proposed plant will add a further 2.5Mtpa HBI capacity.[61]

Meranti Green Steel, Oman

Meranti Green Steel (MGS) is proposing a US$3bn, 2.5Mtpa DRI plant in the Special Economic Zone at Duqm (SEZAD), Oman, with an aligned steelmaking proposal by Meranti Green Steel in Rayong, Thailand to take 50% of the HBI output, with the balance covered by offtake MoUs of 1Mtpa to Thyssenkrupp Materials Trading and 0.25Mtpa to Interfer Edelstahl & Interfer Austria.[62] The proposal calls for an initial 85% methane gas, 15% GH2 blend. We have not included this proposal in Figure 1.5 as the proposal is pre-FID and yet to clarify its funding, although MGS references Germany's KfW IPEX-Bank as lead arranger.[63]

January 2026 saw reports that Brazil's Vale is moving towards a FID on a proposed US$5bn investment in iron ore concentration and briquetting facilities at the Duqm SEZAD,[64] building on a June 2024 sale by Vale of a 50% stake in their Oman port and distribution facilities to US private equity giant Apollo Global Management (US).[65] This US$5bn iron ore plant is a potentially key support of MGS's DRI proposal.[66]

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[57] Tosyali, Giant Investment Planned by Global Green Steel Producer Tosyali Holding in Saudi Arabia, 2024
[58] Argus, Itochu, ESA to produce direct reduced iron in Abu Dhabi, 25 June 2024
[59] GMK Center, Decarbonization of the industry is receiving strong financial support from the government, 9 September 2025
[60] Danieli, Vulcan Green Steel Orders DRI Plant from Danieli and Tenova, 05 December 2023
[61] Hydrogen Insight, Indian Steel Giant Plans Second Hydrogen-ready DRI Plant in Oman, 17 September 2025
[62] Eurometal.net, Green steel projects update: The momentum builds, 3 February 2026
[63] Oman Observer, Meranti advances key milestones for Duqm iron project, 24 March 2026
[64] SteelOrbis, Vale to make FID on low-carbon steel mega-hub in Oman in 2026, 14 January 2026
[65] Vale, Vale and Apollo enter into a JV partnership related to the Vale Oman Distribution Center, 8 June 2024
[66] The Energy Year, From Oman, investing in minerals and steel value chains, 8 January 2026

This is a second Oman proposal involving Vale. Back in October 2024 Vale and Jinnan Steel & Iron Group of China announced a US$627m investment (split US$400m for Jinnan, US$227m for Vale) proposal at the Sohar Port of Oman. This plant will process 18Mtpa of low-grade iron ore to produce 12.6Mtpa of high-grade concentrate for production of pellets and briquettes.[67] June 2025 saw Jinnan Iron & Steel Group award a significant contract to Finnish manufacturer Metso to supply core process equipment,[68] and July 2025 saw China Metallurgical Group (MCC) selected as the general contractor. This plant is under construction and due for commissioning mid-2027.[69]

North Africa

Tosyali, Libya

In February 2025, joint venture partners **Tosyali** and **Libya United Steel Company** (SULB) announced a partnership with Midrex Technologies and Paul Wurth (now part of SMS Group) for the construction of a 2.5Mtpa cold DRI plant in the Benghazi region of Libya.[70]

The announcement follows Tosyali's partnership with Midrex Technologies that constructed two DRI plants for Tosyali in Bethioua, Oran, Algeria. Tosyali Algerie I commenced production in November 2018 and Tosyali 2 was commissioned in December 2024. Tosyali 2 is integrated into a new EAF through a hot transport conveyer, allowing hot DRI to be continuously charged into the EAF, improving productivity and delivering significant energy savings and reduced emissions through the displacement of methane gas used to re-heat cold DRI/HBI.

In January 2026, Midrex reported Tosyali 2 achieved a world record output of 2.43Mtpa over 2025 in its first year of operation. Tosyali 1 also ranked 3rd globally in output over 2025. Tosyali 2 was the first installed Midrex Flex platform with the ability to operate on a blend of methane gas to 100% hydrogen.[71]

April 2024 saw state-owned Libyan Iron and Steel Company (LISCO) and Danieli sign a memorandum of understanding (MoU) for the construction of a 2Mtpa Energiron DRI and hot-briquetted iron (HBI) plant to be used by LISCO and sold to Italian steelmakers thanks to an off-take agreement. Ownership is proposed to be 51% Danieli and 49% LISCO, and the location confirmed at Misurata, Libya, but FID has not yet been reached.[72]

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[67] Vale, Vale and Jinnan Steel & Iron Group announce investment in iron ore concentration plant in Oman, 28 October 2024

[68] International Mining, Metso to supply Vertimills and more to Jinnan Iron & Steel Group Oman iron ore concentrator plant, 17 June 2025

[69] The Energy Year, From Oman, investing in minerals and steel value chains, 8 January 2026

[70] SMS Group, Tosyali SULB Awards Order to Midrex and SMS Group for DRI Complex, 25 February 2025

[71] Midrex, Tosyali Algerie Sets New World Record DRI Production Record in 2025 with Second Module, 26 January 2026

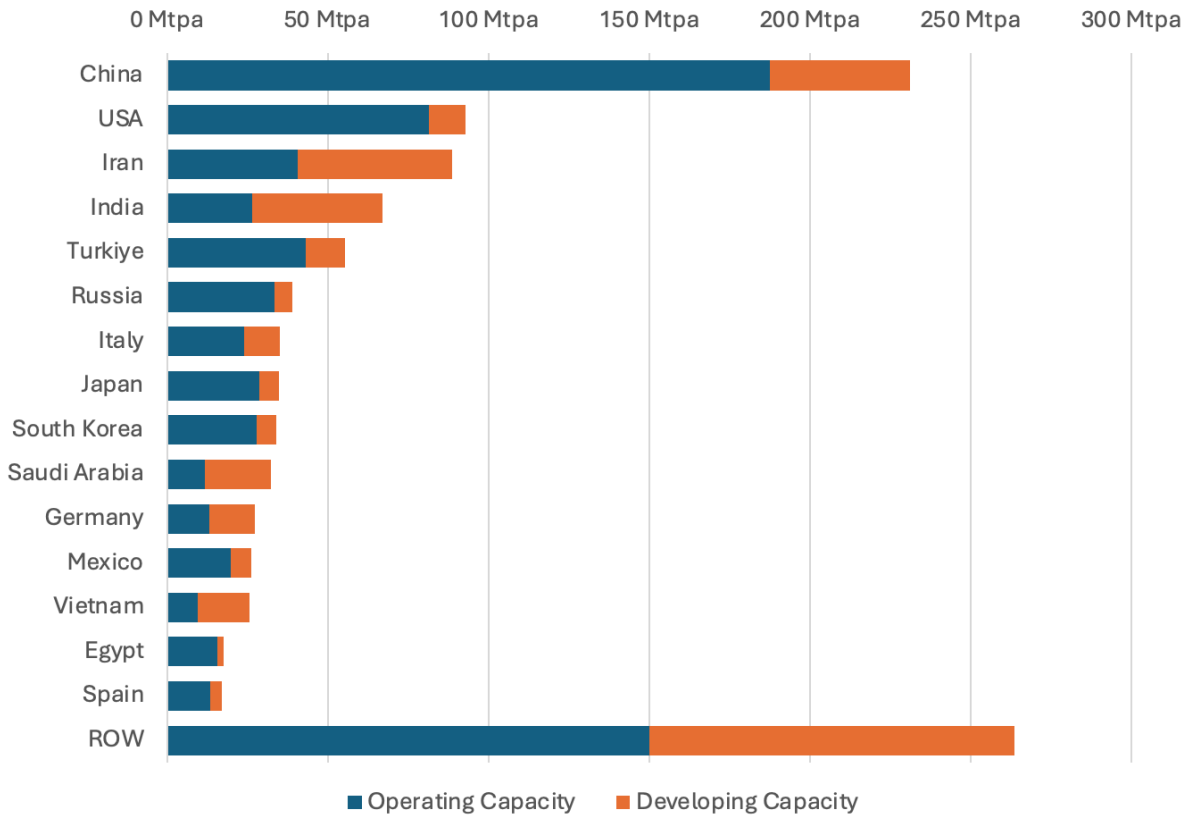
[72] Danieli, Libyan Iron and Steel Company signs a MOU with Danieli, 26 April 2024

1.3. Asian Investment Pipeline

China

China continues to produce more than half of the world's iron and steel. Whilst the vast majority of this is produced via high-emissions BF-BOF pathways, operating 886Mtpa of BOF steelmaking capacity as of March 2026, China enters 2026 as the world's largest producer of secondary steel through the scrap-EAF pathway, and more than double that of the second-largest producer in the US - see Figure 1.6.

Figure 1.6: Top EAF Steelmakers Globally (Mtpa)



Source: Global Energy Monitor, Global Iron and Steel Tracker (March 2026)

China's position as already the world's largest EAF operator is a point often missed given EAFs represented just 10% of China's steel production in 2025, with its production share remaining consistent over the last six years. As of March 2026, China's construction pipeline of new EAF capacity slightly outpaces new BOF capacity under development, with 23.9Mtpa and 23Mtpa respectively.[73] [74]

In 2022, China's policy framework set targets for EAFs to produce 20% of national steel by 20% by 2030. However, falling utilisation rates indicate EAFs likely accounted for 10% of production in 2025, well short of the earlier 15% share by 2025 target. With waning domestic demand in the residential sector that has supported long steel production – products that secondary steel manufacturers primarily produce due to lower impurity thresholds than high-quality steel flat steel products –

[73] Global Energy Monitor (GEM), Global Iron and Steel Tracker, March 2026
[74] Discovery Alert, Pilbara China Steel Decarbonisation: Industrial Transformation and Green Technology, 25 February 2026

China's EAF capacity utilisation has fallen to as low as 50% in recent years whilst China's BFs continue to operate at utilisation rates over 80-90%.

The highly modular nature of EAFs, allowing production to vary with shifts in electricity supply and costs, mean EAFs have supported the reduction in global over production of steel in recent years.

But as Figure 1.7 details, there is every possibility that EAFs will grow to almost 70% of China's steel production by 2050, even as steel production declines by a cumulative 30% vs 2025 levels - as per CREA's recent analysis.[75]

Figure 1.7: Estimated Decline in Production in China Steel and Rising EAF Use

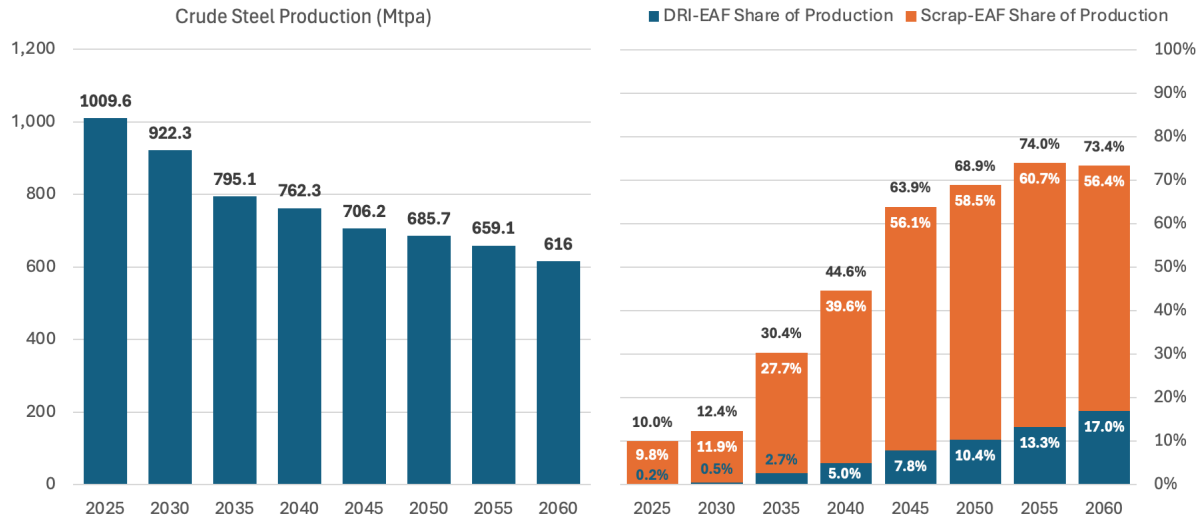


Chart: Climate Energy Finance
Source: Centre for Research on Energy and Clean Air (2026)

April 2026 saw Luo Tiejun, Vice President of the China Iron and Steel Association (CISA) highlight the expected improvement in China's EAF focus, including prioritisation in national support policies, the introduction of carbon pricing for the steel sector and new green finance support, including for the use of GH2 and increased scrap recycling. CISA also highlights the ability of EAFs to run at 50-60% capacity utilisation rates to leverage peak-valley electricity pricing for staggered production. CISA also noted the core direction in the Chinese steel industry is to reduce excess capacity and prioritize the orderly exit of outdated and inefficient production capacity.[76]

Supporting the pipeline of EAFs in the Chinese market is a growing portfolio of DRI projects commissioned and under development in recent years. Normally this involves moving at China Speed, China scale. To-date this is not the case in DRI, green hydrogen, green ammonia and EAFs, rather China is building commercial scale demonstration plants to build capacities and understanding, and to enhance the technology so when it is commercially viable, China will then step up and move at 'China Speed and China Scale', as it has already done in hydro, wind, solar, batteries, NEVs and grid transmission.

[75] Centre for Research on Energy and Clean Air, Reclaiming Credibility in China's Steel Industry, 31 March 2026
[76] China Metallurgical News, Luo Tiejun: Under the general trend of green and low-carbon development, the environment for electric arc furnace steelmaking will continue to improve, 01 April 2026

Baosteel Zhanjiang Iron & Steel 1Mtpa DRI, Guangdong Province

In December 2023, China Baowu Steel Group subsidiary Zhanjiang Iron and Steel commissioned its 1Mtpa Energiron hydrogen-based DRI demonstration plant in Zhanjiang, Guangdong Province.[77] The demonstration plant commenced construction in February 2022, with the shaft furnace constructed in April 2023, and commissioned in December 2023. The demonstration plant marked the largest DRI installation in China, and the second deployment of Danieli's Energiron DRI platform in China, following HBIS.[78]

Hydrogen is sourced from coke oven gas from 3 of Zhanjiang Iron and Steel's BFs within the Zhanjiang complex, with plans to produce low-carbon hydrogen supply to achieve low-emissions iron and production, including hydrogen produced from renewables. Leveraging waste gas from its BF that comprises primarily hydrogen and methane, SASAC reports carbon emissions reductions of 50-80%.[79]

In January 2026, Baowu announced the 1Mpta DRI furnace was now integrated into its EAF and steel mill at its Zhanjiang, Guangdong province complex. The combined DRI-EAF utilisation can reduce embedded emissions in Zhanjiang's steel by over 60%.[80]

HBIS's Hebei Zhangxuan High Tech Co 0.6Mtpa DRI plant, Hebei Province

May 2023 saw commissioning of Hebei Iron & Steel Group (HBIS)'s Hebei Zhangxuan High Tech Co Ltd (HBZX) 0.6Mtpa DRI plant using a gas feed over 60% hydrogen. A second phase to double capacity to 1.2Mtpa is planned.[81] It incorporates Danieli and Tenova's Energiron technology. HBIS has a proposal to recover CO2 for reutilisation in downstream processes i.e. CCUS (to produce dry ice or methanol) to give a final net emissions of just 0.12t per tonne of DRI (half the 0.25t/t currently reported), but this has not yet reached FID.[82]

Xingtai Steel Low Carbon Hydrogen-rich Iron Making Technology Transformation Project, Hebei Province

Xingtai Iron and Steel Co., Ltd's Xingtai Steel Low Carbon Hydrogen-rich Iron Making Technology Transformation Project is a Rmb13.2bn (US$1.85bn) relocation and upgrade to the Chengdong Industrial Zone in Wei County, Hebei Province, due for commissioning mid-2026 with ~1.65Mtpa of iron-making capacity using the HiSmelt process, and 2.25Mtpa of EAF capacity.

Shandong Iron and Steel Group Rizhao Co Ltd 0.5Mtpa DRI, Shandong Province

Shandong Iron and Steel Group Rizhao Co Ltd (48% owned by China Baosteel Group) is integrating a new 0.5Mtpa DRI plant at it existing 8.5Mtpa BOF, 8.1Mtpa BF and 1.3Mtpa EAF steel works in Rizhao, Donggang, in Shandong Province. The 1.3Mtpa EAF was commissioned in 2024.[83]

CISRI Baotou 1.1Mtpa DRI, Inner Mongolia

The CISRI Baotou 1.1Mtpa DRI project is a green hydrogen-based DRI demonstration facility at Baotou in Inner Mongolia. It is a collaboration between the China Iron and Steel Research Institute (CISRI), the Beijing Tsinghua Industrial Research and Development Institute (TIDRI) and the Mintal Group. Production is due to commence in 2027 (delayed from 2025). The facility relies on a 1.5GW

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[77] Jian Wu, China's first 1 million ton hydrogen-based shaft furnace began production at Baosteel Zhanjiang, 28 December 2023

[78] Danieli, New Energiron® DRI plant starts production at Baowu, 17 January 2024

[79] SASAC, China Launches First Million-Tonne Near-Zero-Carbon Steel Production Line, 7 January 2026

[80] Hydrogen Insight, Chinese steel giant starts up 'near-zero-carbon' production line, based on hydrogen for direct-reduced iron, 6 January 2026

[81] HBIS, HBIS Inaugurated the World's First Hydrogen Metallurgy Green Automotive Sheet Continuous Casting Line, 20 December 2024

[82] Danieli, HBIS is producing DRI by using more than 60% of hydrogen, 1 June 2023

[83] GEM, Shandong Iron and Steel Group Rizhao Co Ltd

wind and solar cluster developed in partnership with Huadian Group and Mingyang Smart Energy that feeds a 390,000tpa green ammonia facility, built with Denmark's Topsoe as the key technology provider,[84] which is to be used as a direct carbon-free reductant, lowering the emissions profile by a reported 80% vs BF output.

January 2026 saw the Baotou Rare Earth High-Tech Zone, which hosts these metallurgical innovations, designated as a National Pilot Region for commercialising government-funded R&D, accelerating the transfer of CISRI's lab-scale research into the Baotou industrial line as a key pillar of Inner Mongolia's 15th Five-Year Plan (2026–2030).[85]

Kizilsu, 1.2Mtpa DRI, Xinjiang Autonomous Region

The Rmb5bn (US$730m) Kizilsu Xinjiang GH2 powered 1.2Mtpa DRI project by Xinjiang Hengtai Green Energy Metal Casting Co., is located in the Kizilsu Kirghiz Autonomous Prefecture, Xinjiang. China Minmetals is overseeing the technical implementation of the solar-to-hydrogen DRI system.

October 2025 saw the issuing of a notice of proceeding to public consultation, showing the proposal is progressing through its approval requirements, after ground-breaking was reported in March 2025, with phase 1 commissioning due July 2027.[86]

Zhongjin Metallurgical Technology 0.3Mtpa DRI, Shanxi Province

Zhongjin Metallurgical Technology commissioned its 0.3Mtpa DRI facility in Jinzhong City, Shanxi Province in December 2022. It operates on 100% coke oven gas (COG) as the reducing agent, which is rich in hydrogen.[87]

[84] Topsoe, Topsoe signs agreement on first commercial size dynamic green ammonia plant in China, 18 January 2023
[85] Rare Earth Exchange, China Designates Baotou Rare Earth High-Tech Zone as National Commercialization Pilot–Downstream Focus, 30 January 2026
[86] Jian Wu, Progresses of Hydrogen-Based Shaft Furnace DRI in China, 30 October 2025
[87] Fastmarkets, How China's largest coal-producing province is on its way to becoming a green steel leader, 16 May 2023

Korea

POSCO HyREX Demonstration Plant, South Korea

The **FINEX** fluidised bed process was jointly developed by POSCO and Primetals Technologies, using iron ore fines and non-coking coal. The FINEX process has an advantage over BFs in its ability to utilise low-cost raw materials, with no requirement for iron ore sintering, and the use of typically lower-cost thermal coal instead of coking coal, eliminating the need for a coke oven. Primetals claims a 1.5 Mtpa FINEX plant can more economically produce hot metal than a modern 3Mtpa BF, with capex per unit of output of a FINEX plant ~ 20% lower, and opex ~ 15% lower compared to BFs.[88]

POSCO's commercial-scale FINEX 1.5Mtpa plant in Pohang, South Korea began production in 2007. Following successful operations, POSCO built a second 2Mtpa plant, commencing production in January 2014 (closing the first 1.5Mtpa facility in 2025). The FINEX process has surpassed POSCO's BFs, which are considered among the most modern and economic BFs in the world.[89] In 2017, POSCO announced it had produced a cumulative 20Mt of hot metal (liquid iron) using the FINEX process.

February 2024 saw POSCO open its Hydrogen Reduction Ironmaking Development Centre at its Pohang steelworks.[90] The centre develops POSCO's **HyREX** process, which adopts the multi-stage fluidised bed reactor technology of FINEX, using GH2 as the reducing agent, replacing non-coking coal. POSCO will construct a 300,000tpa demonstration plant of the HyREX platform at its Pohang Steelworks.

In June 2025, it was reported POSCO's KRW 815bn (US$600m) demonstration plant would be supported by KRW 309bn (US$227m) of public funds to support the progression of the national strategy of carbon neutrality in Korea's steel sector by 2050.[91]

October 2025 saw BHP and POSCO announce an MoU to jointly advance POSCO's HyREX process, consisting of the fluidised bed DRI of HyREX and an electric smelting furnace to refine BHP's Pilbara iron ores at the demonstration plant in Pohang.[92]

In March 2026, the South Korean Government approved a revised development plan to host POSCO's HyREX pilot and future hydrogen-based ironmaking infrastructure on coastal reclamation land adjacent to POSCO's existing Pohang Steelworks hub with an expected completion by 2028.[93]

New 2.5Mtpa EAF at POSCO's Gwangyang Steel Plant

POSCO is making final preparations for the commissioning of its new 2.5Mtpa EAF at the Gwangyang plant in June 2026, using steel scrap as its feedstock. The total capex is KRW 600bn (US$450m).[94]

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[88] Primetals, FINEX: Innovative and Environmentally Friendly Ironmaking
[89] POSCO, Discover the Technology that is Making Steel Production More Sustainable, 06 May 2017
[90] POSCO, POSCO Takes a Significant Step Towards Realising the Dream of Hydrogen Reduction Ironmaking, 02 February 2024
[91] FuelCellsWorks, South Korea Advances Hydrogen-based Steelmaking with $277m Investment in FINEX Technology, 27 June 2025
[92] BHP, BHP and POSCO Partner to Advance Hydrogen-based Ironmaking Technology, 30 October 2025
[93] SteelOrbis, South Korea Government Approves POSCO's Hydrogen-based DRI Plant in Pohang, 1 April 2026
[94] GMK Centre, Posco to launch new electric arc furnace with 2.5 million tons per year capacity in June, 11 March 2026

Japan

Nippon Steel EAFs, 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 251bn (A$2.6bn) in public capital support for the construction, expansion and modification of 3 EAFs across Nippon's portfolio.[95]

The JPY 869bn (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 FID – see Figure 1.8 for investment summary.

Figure 1.8: 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 869bn AUD 8.98bn
Government Support	JPY 179.9bn AUD 1.86bn	JPY 42.8bn AUD 440m	JPY 28.7bn AUD 300m	JPY 251bn 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)

JFE Steel EAF, Japan

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 and the associated retirement of Blast Furnace No.2 at the Kurashiki site by 2028. Production is expected to commence in the first quarter of FY2028.[96] 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.

JFE Steel's strategy is to produce steel in EAFs, utilising scrap and importing gas based hot briquetted iron (HBI) from the Middle East.[97]

[95] Nippon Steel, Decision Made to Invest in Conversion from Blast Furnace to Electric Arc Furnace, 30 May 2025
[96] JFE Steel, JFE Steel to Introduce Advanced, High-Efficiency, Large-scale EAF in Japan, 10 April 2025
[97] Transition Asia, JFE Takes a Decisive Step Towards Green Steel with New EAF, 15 April 2025

India

Tata Steel

In June 2024, **Tata Steel** announced a partnership with SMS Group's Paul Wurth subsidiary for the deployment of Coke Oven Gas (COG) EASyMelt (electrically-assisted syngas smelter) Injection technology at one of its BFs in Meramandali, Odisha, India.[98] The process captures byproduct COG from the steel mill's coke oven, utilising the hydrogen and hydrocarbons within the gas to displace coke consumption in the BF and introducing electrification for pre-heating of the gas. The partnership marked the first adoption of this technology in India.

Paul Wurth's COG injection technology saves 650kg of coke for every tonne of COG injected (a ~50% emissions reduction), significantly improving opex and reducing GHG emissions in the process. The technology was expected to be commissioned in the first quarter of 2026.

SMS Group and Tata Steel recommitted to this agreement for the deployment of the EASyMelt technology in April 2026, however its deployment has been shifted to a different site in Blast Furnace 'E' at Tata Steel's Jamshedpur Works with a proposed investment in the HIsarna technology pathway of ₹4,000 crore (US$425m).[99] Tata Steel flags this is a key step in its journey towards achieving net zero emissions by 2045.[100]

March 2026 saw Tata Steel inaugurate its first EAF at Ludhiana, India. This involved capex of ₹3,200 crore (A$580m) for a 0.75Mtpa EAF aimed to run on 100% scrap steel and sourcing half its electricity from renewable energy, giving it a target emissions intensity of just 0.3tCO_2-e/t of steel.[101]

AM/NS Partnership

ArcelorMittal and Nippon Steel formed a 60:40 partnership, AM/NS India, with plans to build the two largest new steel plants in India, locking in exceptionally high emissions steel capacity for decades to come.

January 2026 saw confirmation that AM/NS India's construction of its Hazira steel plant in Gujarat to lift capacity from 9Mtpa to 15Mtpa (by the addition of two new BFs) is due for completion by end 2026, involving capex of ₹60,000 crore / A$11bn.[102] AM/NS India in May 2025 signed a PPA for 1GW of solar and wind, supported by a pumped hydro storage (PHS) facility to deliver 250MW of round-the-clock electricity supply equal to 20% of the total energy requirements. AM/NS India plans to develop 7GW of renewable energy capacity by 2032 as part of a plan to reduce emissions intensity from 2.2t/t of crude steel down to 1.8tCO_2/t.

March 2026 saw construction commence on the development of an 8.2Mtpa greenfield integrated steel plant in Anakapalli district, Andhra Pradesh for commissioning by 2030, with plans to expand up to 17.8Mtpa with a long-term investment of over ₹1.47 lakh crore (A$27bn).

[98] Paul Wurth, Tata Steel Selects SMS Group to Spearhead Decarbonisation Initiative with Innovative Coke Oven Gas Injection Technology, 06 June 2024
[99] The Hindu Businessline, Half the capex, less carbon: The molten magic inside Tata Steel's HIsarna bet, 20 April 2026
[100] Tata Steel, Tata Steel Partners SMS Group to Deploy World-First EASyMelt Decarbonisation Technology, 21 April 2026
[101] Tata Steel, Tata Steel Inaugurates its first Scrap-based Electric Arc Furnace in India, 20 March 2026
[102] SMM, AM/NS India begins Phase 2 expansion at Hazira to 15 million tons per year, 2 January 2026

1.4. Australian Investment Pipeline

Australia has a growing list of large-scale iron production proposals and increasing development of a low-emission steel industry through EAFs - see Figure 1.9. Australia's domestic steel industry has, for decades, been characterised by duopolistic, emissions-intensive incumbents that have restricted new investments into decarbonised secondary steelmaking.

Australia's proposal investment pipeline has seen little progression in recent years with structural challenges in high labour costs, low value-add producers dominating upstream production of iron, high methane gas costs and far lower-than-required deployments of large-scale renewable energy that can enable the build out of green iron. The bankability of capital-intensive, low-margin iron proposals in Australia is further limited by insufficient carbon pricing mechanisms both domestically and internationally within the jurisdictions of Australia's key trading partners across Asia. Enhancing carbon pricing in industrial sectors across North Asia, in particular China, Japan, and Korea, will be the critical enabling policy mechanism to shift the economic viability of domestic value-add in Australia.

While Australia is yet to see a commercial-scale primary iron production proposal move through a FID, as detailed below, Australia has seen a recent emergence of multiple RD&D pathways to commercialise iron reduction technologies that significantly improve energy efficiency and capital intensity through minimisation or elimination of hydrogen.

Figure 1.9: Summary of Announced Iron and Steel Proposals

Company	Project	Capacity (ktpa)	Technology	Energy	TRL
Calix	Kwinana Pilot	30	ZESTY	Fossil H2 / GH2	5-6
Progressive Green Solutions	MidWest Green Iron	2,500	Midrex	GH2	9
Fortescue	Christmas Creek Green Iron	1,500	DRI-ESF	GH2	5-6
Fortescue	Perth Pilot	Lab-scale	DER	Electricity	5
POSCO	Port Hedland Iron	2,500	Midrex	Fossil H2	9
QIP	Gladstone Green Iron	-	-	-	-
TBD	Whyalla Steelworks	TBD	DRI-EAF	Fossil H2	9
BlueScope, Rio Tinto, BHP, Mitsui, Woodside	NeoSmelt	30-40	DRI-ESF	Fossil H2	5-6
Green Steel WA	Collie	450	EAF	Electricity	9
Alter Steel	Pinkenba, Brisbane	500	EAF	Electricity	9
Future Forgeworks	Swanbank, Brisbane	350	EAF	Electricity	9

Source: Company Accounts, CEF Tabulation

Calix, ZESTY Kwinana Pilot

Calix's Zero Emissions Steel TechnologY (ZESTY) is a renewable powered H_2-DRI technology for the production of green iron, and subsequent production of green steel. The ZESTY platform employs an indirect heating approach, replacing the inefficient combustion of hydrogen with precise, zero-emission electric heating. This is a key differentiator of Calix to other shaft furnace based green hydrogen platforms, ensuring hydrogen is separated from the heat source and used only within the chemical process of iron reduction.

The total energy requirement of the process is expected to be 4.2-4.6 MWh/tonne HBI, inclusive of hydrogen production energy requirements.[103] The plant's energy requirements excluding hydrogen is projected to be 0.9-1.3 MWh/tonne HBI. Calix's ZESTY platform has demonstrated the production of HBI for $630-800/tonne (US$410-520/tonne), competitive to that of current carbon intensive methods, whilst reducing emissions by 80-85% compared to traditional BF-BOF routes.[104]

- **Reduced hydrogen consumption** by leveraging indirect heating to ensure hydrogen is only used as a reducing agent in the processes. As the cost dynamics of renewable hydrogen continue to be a challenge, the minimisation of hydrogen through the ZESTY process provides a significant advantage over other platforms, including Midrex and Energiron. Furthermore, the ZESTY platform captures and recycles unreacted hydrogen into the reduction process, reducing energy losses.
- **Reduced pre-processing requirements** with the ability to charge iron ore fines and low-grade ores, such as those dominant in the DSO operations of the Pilbara. This provides significant operating cost and energy savings, as well as capital cost savings by mitigating the requirement for sintering or pelletising iron ore feedstock upstream prior to reduction.
- **Ability to modulate energy demand and operate flexibility** means the ZESTY platform has a significant advantage in the Australian context over technology counterparts, better integrating with the intermittency of renewable electricity, lowering energy storage capital costs and benefitting from demand-side management capabilities for grid-connected facilities. ZESTY's electric heating provides a high degree of temperature control with fast start-up and shut-down times, resulting in highly flexible production rates. The ability to leverage load balancing/demand response mechanisms and energy trading into electricity markets significantly improves the economic viability and bankability of green iron projects in Australia.

Analysis conducted by The Superpower Institute and BIVIOS in 2025 identified that in the high-renewable energy penetration grid of South Australia – with renewables contributing 73.3% of total energy demand in 2025 – a green iron facility on a ZESTY platform could lower levelised cost of production by A$133/tonne through revenues generating from energy trading. The resulting levelised cost of $668/tonne was modelled to be 17% lower than if the same platform was not integrated into the National Electricity Market.[105]

In February 2024, Calix announced completion of its Front-End Engineering and Design (FEED) study for a 30,000 tpa ZESTY demonstration plant.[106]

In July 2025, Calix was awarded a $44.9m grant from the Australian Renewable Energy Agency (ARENA) to develop the ZESTY Green Iron Demonstration Plant.[107] The ARENA grant comes after Calix

[103] Calix, Calix's ZESTY Study Finds High Potential for Economic Green Iron, 11 February 2024
[104] Calix study assumed cash cost of A$54/t iron ore (based on average production costs), A$36-48/MWh wholesale electricity costs, effective LCOH of A$5.5-6.2/kg-$H_2$.
[105] TSI, A Green Iron Plan for Australia: Securing Prosperity in a Decarbonising World, 26 May 2025
[106] Calix, Calix's ZESTY Study Finds High Potential for Economic Green Iron, 11 February 2024
[107] Calix, Calix Executes $44.9m ARENA Grant for ZESTY Green Iron Demonstration Plant, 23 July 2025

successfully completed Pre-FEED and FEED studies for a ZESTY demonstration-scale facility, in part funded by ARENA's Advancing Renewables Program.

The $44.9m ARENA grant will contribute towards the:

- Construction, commissioning and operation of the 30,000tpa H_2-DRI/HBI ZESTY Demonstration Plant.
- Delivery of a Pre-FEED/FEED study for a commercial-scale ZESTY plant.

In November 2025, Calix announced it had executed a Joint Development Agreement (JDA) with Rio Tinto for $8m in cash and $35m in in-kind support for the Calix Demonstration Plant in Kwinana, WA.[108] Rio Tinto's in-kind support included the site in Kwinana, previously earmarked for the now shelved BioIron Research and Development Facility and associated pilot plant. The site is in close proximity to the NeoSmelt joint venture, as well as established utilities and port infrastructure. Rio Tinto will also provide up to 10,000 tonnes of Pilbara iron ores to the project.

Calix is targeting a licensing fee revenue model for the adoption of the ZESTY platform. Calix's JDA with Rio Tinto is non-exclusive, allowing Calix to partner and collaborate with other iron ore producers and researchers, including Fortescue, Grange Resources, Roy Hill, Liberty Steel Group (former owner of the Whyalla Steelworks), University of Adelaide, Swinburne University and the HILT CRC.[109]

In March 2026, Calix completed its first milestone under its ARENA grant agreement for the ZESTY Demonstration Plant, triggering the first $2m payment (subject to matching funding) of the $44.9m total grant funding.[110] The ARENA grant instalment followed a $3m payment from Rio Tinto following the completion of due diligence in December 2025.

Calix currently expects engineering, procurement and construction (EPC) of the demonstration plant to run through 2027, with commissioning and operation of the demonstration plant from 2028 onwards.[111]

Progressive Green Solutions, MidWest Green Iron

Progressive Green Solutions (PGS) is developing the Mid-West DRI project, located east of Geraldton, WA. The midwest region of WA has over 5 billion tonnes of proven magnetite reserves, sufficient to support decades of high-grade green iron production, aided by a highly complementary/diurnal profile for wind and solar generation that can enable high capacity factors to improve the capex intensity of green iron production.

Since CEF's Green Metal Statecraft report in November 2024, PGS has continued to progress the proposal. In August 2025, Thyssenkrupp Nucera announced PGS had selected the firm as its preferred supplier for 1.4GW of modular Scalum electrolyser units, the same units deployed at Stegra's Boden green iron project, for the midwest green iron proposal. The 1.4GW will support the production of 7Mtpa of green iron pellets, half of which will be reduced to produce 2.5Mtpa of HBI.[112] Thyssenkrupp Nucera will work with PGS towards an engineering, procurement and fabrication (EPF) contract, subject to a FID. PGS will also partner with SMS Group for the engineering, procurement and construction of the Midrex DRI platform.[113]

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[108] Calix, Calix and Rio Tinto Execute Joint Development Agreement ZESTY Green Iron Demonstration Plant, 17 November 2025
[109] Calix, Presentation: ASX SMIDcaps Conference March 2026, 25 March 2026
[110] Calix, Calix Completes First ARENA Grant Milestone for ZESTY, Triggering $2m Cash Payment, 16 May 2026
[111] Calix, ZESTY Deep Dive Presentation, 31 July 2025
[112] Thyssenkrupp Nucera, PGS Selects Thyssenkrupp Nucera as Preferred Supplier for 1.4GW Electrolyser for Flagship Green Iron Project in Australia, 28 August 2025
[113] CSIRO, Mid-West Green Iron Project, updated 29 September 2025

In September 2025, Thyssenkrupp Materials Trading GmbH announced a 100% off-take agreement with PGS for its midwest green iron proposal.[114]

In April 2026, PGS announced it had completed Aboriginal Heritage Surveys for its green iron proposal, following the completion of its Environmental Assessment and lodgement of its Development Application. PGS' Heritage Surveys were supported by the Yamatji Southern Regional Corporation.[115]

PGS's project financing is led by German state-owned KfW IPEX Bank, supported by the German export credit agency Euler Hermes. PGS and Thyssenkrupp expect these letters of intent to be further supported by syndicated global export credit agencies.

The proposal previously aimed to reach FID in 2025, with operations commencing in 2028. A FID decision is now expected in 2H2026.

Fortescue, Christmas Creek Green Iron Pilot

In August 2024, Fortescue announced it had begun construction of the $75m Christmas Creek Green Metal Project in the Pilbara. The 1,500tpa Christmas Creek project, supported by a 1.5MW hydrogen electrolyser, is still under construction and is expected to commence production in the June quarter of 2026.[116]

The Green Metal Project forms an integral component to Fortescue's 'green pit to product' supply chain, using a green mining fleet and renewable energy to produce a high-purity pig iron (~95% Fe) product from Pilbara hematite ores with a decarbonised supply chain. The facility will use green hydrogen to reduce the iron, and further refine in an electric smelting furnace. Fortescue plans a follow-on step in creating a green iron industry to demonstrate the method at commercial scale via a 1-2Mtpa green iron plant that will employ the same technology used in the Christmas Creek Green Metals Project.

The Christmas Creek Green Metal Project has employed Metso's Circored fluidised bed DRI process and electric DRI Smelting Furnace. Metso's Circored process utilises solely green hydrogen rather than fossil reductants and is capable of processing iron ore fines without pelletisation.[117] Metso's pilot smelting furnace is capable of smelting ~1tph of DRI, with a full scale modular ESF able to produce over 1.2Mtpa of hot metal.

In January 2026, Metso divested its ferrous business – including travelling gate pelletisation (magnetite concentration) and Circored DRI – to German SMS Group.[118]

ArcelorMittal constructed the world's only commercial-scale Circored facility in Point Lisas, Trinidad and Tobago in 1999, operating at 500,000tpa. In 2016, ArcelorMittal shut down the facility before liquidating in 2023. The plant was sold to TT Iron Steel Company with plans to invest US$150-200m to restart operations. As of March 2025, the plant has yet to recommence operations.[119]

April 2026 saw Fortescue's Pilbara decarbonisation plans take a significant step up in scale and speed of ambition, moving ahead of its target to reach "real zero" emissions and eliminate the burning of all fossil fuels for power and transport by 2030 with a total investment of US$6.88bn (raised from US$6.2bn previously).[120] Fortescue expects to have 290MW of installed renewable capacity by early

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[114] PGS, LinkedIn: Progressive Green Solutions, September 2025
[115] PGS, LinkedIn: Progressive Green Solutions, April 2026
[116] Fortescue, FY25 Annual Report, 26 August 2025
[117] Metso, Fortescue's Christmas Creek Green Metal Project Under Construction in Australia uses Metso's Game Changing DRI Technology, 18 November 2025
[118] Metso, Metso Completes Divestment of the Ferrous business, 05 January 2026
[119] Trinidad & Tobago Guardian, TT Iron Start-up Delayed, 19 March 2025
[120] Renew Economy, "Cheaper and faster:" Fortescue to create a $1 billion green grid to power data centres, 24 April 2026

2027, meaning it will be able to meet the fixed energy requirements of its ore processing facilities, enabling daytime "green processing" across its Pilbara operations. By the end of 2028, it expects to complete its Pilbara green grid with 1.2GW of solar capacity, more than 600MW of wind generation, and 4-5 gigawatt hours (GWh) of battery energy storage systems (BESS), plus the addition of 620km of transmission lines. Fortescue expects to reduce its mining costs by US$2-4 per wet metric tonne as a result by 2030.[121] [122]

Fortescue, Low-Temperature DER Pilot

In addition to its Christmas Creek Green Iron Project, Fortescue is actively researching and developing a novel Low-Temperature Direct Electrochemical Reduction (DER) pathway to decarbonise the reduction of iron ore, primarily those dominant in Fortescue's current portfolio in the Pilbara. Fortescue's collaborative research initiative, in partnership with Curtin and Deakin Universities and funded by ARENA's Transformative Research Accelerating Commercialisation Program, aims to develop and optimise low temperature DER technologies to reduce iron ore utilising a solid-state slurry electrolyser with an alkaline electrolyte. The DER process can reduce Pilbara iron ores at temperatures below 130°C.

The Fortescue process consists of two chambers separated by a solid-state membrane that lets charged particles pass. When electricity is channelled through the electrolyser, oxygen is released at the anode and metallic iron forms on the cathode side. Rather than building up as a thick layer of metallic iron on an electrode, such as the result of electrowinning processes, the metallic iron forms as iron-bearing particles in a sodium hydroxide solution that can be separated from the liquid in a continuous process.[123]

Fortescue's project with ARENA will be delivered in two stages, comprising a core research stage (Stage 1) and a research commercialisation stage (Stage 2), the latter focussed on refining the core electrochemical process and developing a complete balance of plant system that can be integrated with the iron ore electrolyser. ARENA provided a $5m grant to the project, with total project costs of $42.57m.

Lab- and benchtop-sized electrolysers have validated the DER technologies concept, and will progress towards a 100kg-feed pilot that would be capable of converting at least half the feedstock into metallic iron.[124] Once the Stage 2 electrolyser and balance of plant have completed construction and commissioning, Fortescue's DER technology will have achieved a TRL6.

Following the publication of the Stage 1 core research report in December 2025, Fortescue highlighted a key limitation of results thus far have been the restriction of operational run times of up to 5 hours. It is expected increasing operating temperatures, cell velocities and increased sodium hydroxide concentration will accelerate system degradation. Thus, an important priority moving forward is the validation of obtained performance results through long-duration testing.[125]

NeoSmelt Joint Venture

The NeoSmelt joint venture is a project under development by equal equity participants BlueScope, BHP, Rio Tinto, Woodside Energy and Mitsui Iron Ore Development, designed to validate the DRI-ESF

[121] Renew Economy, Fortescue fast-tracks "world's first" large scale green grid to eliminate diesel and other fossil fuels, 10 April 2026
[122] Renew Economy, Do Fortescue's plans to eliminate gas and diesel stack up? The big win comes from electric trucks, 14 April 2026
[123] Renew Economy, Fortescue's Green Iron Bet in a €300 per Tonne Iron World, 23 February 2026
[124] Renew Economy, Fortescue's Low Temperature Green Iron Process Ready for Real World Testing, 02 February 2026
[125] ARENA, Low Temperature Direct Electrochemical Reduction for Zero Emissions Iron Project, 22 December 2025

technology pathway for lower-emissions steelmaking. Managed by BlueScope, Australia's largest steelmaker, the project is currently undergoing feasibility studies, with current estimates of producing up to 30-40,000tpa of hot metal. The pilot will operate on methane gas as a reducing agent.

In December 2024, NeoSmelt selected the Kwinana Industrial Area, south of Perth WA, to host the pilot DRI-ESF facility following a $75m grant from the WA Government, of which a proportion will be directed into project infrastructure within the Strategic Industrial Area (SIA).[126]

In June 2025, the NeoSmelt joint venture received a $19.8m grant from ARENA to support the FEED-study for NeoSmelt.[127] A FID is expected in 2026.

Green Steel of WA, Collie EAF

Green Steel of WA is a green steel recycling EAF plant proposal in Collie, situated in the southwest of WA. The Green Steel Mill will consist of an EAF facility to recycle scrap steel into long steel (rebar/rod) products for local and international markets.

In CEF's November 2024 report, the Collie EAF proposal comprised a $400m investment to produce up to 400,000tpa of long-steel products, utilising 500,000tpa of locally sourced steel scrap. At the time, the proposal had received a $2.7m grant from the WA Government to support the progression towards a FID. In August 2024, Green Steel of WA was granted Works Approval by the Department of Water and Environmental Regulation, and State Planning Approval in May of 2024.[128] The proposal had aimed to begin construction in 2HCY24, with operations commencing in 1HCY26.

Green Steel of WA has completed its FEED for the 450,000tpa EAF, with a FID now expected in 2026. Green Steel of WA has partnered with Danieli for the procurement of its MIDA QLP (Quality Long Product) to produce long steel products.

In September 2025, Green Steel of WA received an Access Offer[129] from Western Power to connect the Collie EAF to the South West Interconnected System (SWIS).[130] Following this, Green Steel of WA announced it had executed a PPA Term Sheet with Tonic Renewables for the supply of firmed renewables to power the Collie EAF. The PPA secured 134GWh pa of renewable energy from Tonic's 75MW Binningup Solar and 55MW/220MWh Battery facility.[131]

Through 2025-26, Green Steel of WA have announced multiple scrap supply agreements for ferrous scrap feedstock to power the Collie EAF, including:

- October 2025: MoU with **South32**'s **Worsley Alumina** to recycle scrap steel from South32's alumina operations in WA.[132]
- December 2025: Customer partnership with **Lendlease**.[133]
- March 2026: MoU with **Birdon Group** to establish a pathway for connecting offshore and maritime decommissioning to establish a ferrous scrap supply from Birdon into low-emissions steel production at Collie.[134]

[126] WA Government, Nation's Largest Ironmaking Electric Smelting Furnace Set for WA, 17 December 2024
[127] BHP, NeoSmelt Welcomes Federal Government Support and Signs Two New Participants, 17 June 2025
[128] Green Steel WA, Works Approval in Hand, 29 August 2024
[129] Formal proposal outlining the terms, costs, and technical requirements of grid connection to the SWIS.
[130] Green Steel WA, LinkedIn: Green Steel of WA, September 2025
[131] Green Steel WA, LinkedIn: Green Steel of WA, September 2025
[132] Green Steel WA, LinkedIn: Green Steel of WA, October 2025
[133] Green Steel WA, LinkedIn: Green Steel of WA, December 2025
[134] Green Steel WA, LinkedIn: Birdon Group, April 2026

- March 2026: A non-binding MoU for **Hazer Group** to supply 8,500tpa of graphite (produced from separating methane gas into carbon and hydrogen) over 10 years from 2030 onwards to Green Steel of WA.[135]

In November 2025, the WA Government announced an Expression of Interest (EOI) for locally-produced green steel procurement to be used within major government infrastructure projects. To support the State's procurement capabilities, the WA Industry Participation Strategy will publish an addendum for steel, introducing stronger expectations for local sourcing of recycled and low-emission steel, as well as issue directions to Western Power, Synergy and Horizon Power to drive local content procurement.[136]

The EOI, designed with industry input through a consultation round, will develop a comprehensive strategy for local content procurement, including mapping the project pipeline of green steel facilities, potential capacity and timelines, and level of government support sought to facilitate green steel manufacturing in WA.[137] Demand-side support through public procurement will provide significant support for Green Steel of WA as the leading proposal for low-emissions steel produced in WA. This EAF could also create demand pull for DRI or green iron from the Pilbara or Midwest WA.

POSCO, Port Hedland Iron

Korea's POSCO (51%), in partnership with Taiwan's China Steel Corp. (24.5%) and Japan's Marubeni (24.5%), have proposed the Port Hedland Iron project (formerly Port Hedland Green Steel). The US$3bn capex proposal comprises a 2Mtpa Midrex DRI furnace alongside a 3.5Mtpa pellet feedstock facility in the Boodarie SIA, 10km southwest of Port Hedland.

At the time of CEF's November 2024 Green Metal Statecraft report, POSCO had reported plans to scale via a 4-stage development, culminating in 6 trains of MIDREX Flex HBI furnaces to produce a combined 12Mtpa of HBI, with a total investment of $27bn in addition to the capital costs of the enabling hydrogen and renewable energy infrastructure.[138]

In January 2025, Port Hedland Iron received a $15m grant from the WA State Government.[139]

In the proposal's latest environmental applications, POSCO highlighted Stage 1 of the project would use 100% methane gas as its reducing agent, generating 1.1Mtpa CO_2-e in Scope 1 emissions at an intensity of 0.55tCO_2-e (Scope 1 only). Under the Safeguard Mechanism's best practice production variable emissions intensity of 1.77tCO_2-e/t, Port Hedland Iron would represent a 69% reduction in unit emissions from its baseline without baseline reductions.[140] The proposal aims to be 'GH2 ready', once GH2 can be procured at a commercially viable price.

In April 2026, WA State Environment Minister Matthew Swinbourn approved the initial $4.3bn (US$3bn) stage of Port Hedland Iron.[141]

Whyalla Steelworks

In CEF's November 2024 report, Green Metal Statecraft, CEF highlighted the widely reported need for recapitalisation of the Whyalla Steelworks to deliver on the Steelworks' passive future potential to decarbonise iron and steel production in Australia.[142]

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[135] Hazer Group, Hazer Signs Graphite Offtake LOI With Green Steel of WA, 19 March 2026
[136] WA Government, Government Projects to be Built with Green Steel that's Made in WA, 09 November 2025
[137] WA Government, Supply of Local Manufactured Green Steel for Major Government Projects: EOI, 19 March 2026
[138] ABC, Multi-billion-dollar South Korean Investment Could Make a Green Iron Centre, 16 December 2023
[139] Port Hedland Iron, PHI Recognised Through WA Government Funding, 17 January 2025
[140] WA EPA, Port Hedland Iron Project - Stage 1, Report 1789, August 2025
[141] Bloomberg, Western Australia Approves POSCO's Low-carbon Iron Plant, 08 April 2026
[142] CEF, Green Metal Statecraft: Forging Australia's Green Iron Industry, 15 November 2024

CEF emphasised that any move into administration of assets under GFG Alliance in Australia could provide an excellent opportunity to bring in a credible, well capitalised consortium with Asian steel expertise and synergies, as well as patient public interest equity and debt capital from the NRF and/or CEFC. This would provide access to the existing steel mill and port infrastructure to facilitate a major investment in both the new renewables powered, scrap and/or DRI fed EAF, a DRI or green iron processing plant, with strategic public capital being tied to a credible decarbonisation and domestic value-add strategy that enhance the investment opportunities for South Australia dramatically.

In February 2025, 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.

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 applauded 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.

At the time of publishing, the Whyalla Steelworks would have been in administration for 14 months. In February 2026, the ABC reported five consortiums remain at the negotiating table for the Whyalla Steelworks as the administrative process continues into its second year. The ACCC has acknowledged its awareness of the entities involved and will review any proposed acquisitions for risks to the competitiveness of Australia's domestic industry and mitigate concerns surrounding monopolistic or duopolistic outcomes.[143]

In November 2025, CEF published an in-depth analysis on the technology and enabling policy pathways to secure the long-term viability of the Whyalla Steelworks.[144] The SA Government and Federal Government have announced significant support packages for the Whyalla Steelworks, discussed in Section 3.4 below.

CEF questions if the Whyalla Steelworks can or should even be allowed to come out of administration and advocates for the greenfield development of a new EAF and downstream steel fabrication plants as a first step, recognising the dilapidated end-of-life state of the steelworks.[145]

Alter Steel, Brisbane EAF

Alter Steel has proposed the construction of an EAF and downstream rolling mill in Pinkenba, Brisbane QLD. Alter Steel's proposed plant would produce 500,000tpa of reinforcing bar, wire rod, hot-rolled mesh, spooled coil and bar. The integrated casting and rolling mill is estimated to have a total investment of $750m, creating more than 220 permanent jobs.

Alter Steel is a subsidiary of private-owned Westview Group – one of Australia's larger steel businesses – that has established steel bar and thick wire operations for the construction industry, with Lendlease, John Holland and CPB Contractors among its customer base. Westview Group operates Bestbar, Wire Industries, Unipod and Alter Steel.

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[143] ABC, BlueScope Remains in Race for Whyalla Steelworks as Analyst Warns of Market Concentration, 19 February 2026

[144] CEF, A Strategy for Whyalla: Enabling the Transformation and Decarbonisation of the Steelworks, 17 November 2025

[145] AFR, Whyalla steelworks five-week shutdown causes chaos for builders, 27 April 2026

InfraBuild currently supplies 70% of the steel products Westview distributes. With growing uncertainties of the continued operation of InfraBuild under the Sanjeev Gupta-led GFG Alliance, Westview made the decision to progress the Pinkenba EAF proposal to ensure long-term stability of steel feedstock to its steel distribution businesses.[146]

In July 2025, Alter Steel announced a non-binding MoU with Sims Limited to establish a scrap supply and services agreement to supply the Pinkenba EAF. Under the terms of the MoU, Sims would exclusively supply up to 550,000tpa of ferrous scrap and provide access to port and rail infrastructure given Alter's proposed site is located just 1km from Sim's Pinkenba site.[147]

In October 2025, Alter Steel announced the selection of Danieli as its technology partner for the proposed steel mill in Pinkenba. The proposed technology stack would see Danieli deploy a MIDA QLP mini-mill with Digimelter and Q-One power feeder with a completion date suggested at end 2027.[148] The integrated mill means continuous casting and rolling, eliminating the need for billet reheating, reducing energy use by up to 75% compared to conventional mills, saving Alter Steel 330kWh/t-steel compared to conventional mills, and cutting carbon emissions 80% to just 0.37t/t of steel.

In April 2026, Alter Steel announced a partnership with Hatch to become Alter's engineering partner, leading the development of the proposal.[149]

Future Forgeworks, Brisbane EAF

December 2024 saw Future Forgeworks announce plans to construct a 350,000tpa EAF and rolling mill to produce reinforcing bars to Queensland's construction industry. Future Forgeworks targeted FID and construction to commence in early 2026, with first steel produced in 2027.[150]

In February 2025, Future Forgeworks announced the selection of Germany's SMS Group to deploy SMS' Continuous Mill Technology (CMT350) mill, coupled with an EAF, ladle furnace and caster in an integrated engineering, procurement and fabrication contract.[151]

In September 2025, Future Forgeworks completed all pre-FID concept, feasibility and design engineering. Forgeworks partnered with engineering firm Aurecon to complete technical assessments, as well as receiving formal approval from Powerlink for a grid connection concept and an MoU with renewable energy supplier for dedicated zero-emissions energy supply to the facility.[152] Following this, Forgeworks received full development approval from local and state governments in November of 2025.[153]

March 2026 saw Forgeworks break ground on the Swanbank Green Steel Mill. Forgeworks now expects first steel to be produced in early 2028. At full capacity, the project could meet up to 90% of Queensland's rebar demand with green steel, positioning to become a key supplier of locally-produced, low-emissions steel to the infrastructure buildout ahead of the 2032 Olympics.[154]

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[146] AFR, Westview Plans $750m Steel Mill for Brisbane as Gupta Woes Worsen, 09 December 2024
[147] Sims Limited, Sims Limited and Alter Steel Collaborate to Help Grow Queensland's Clean Steel Industry, 31 July 2025
[148] Danieli, Alter Steel Selects Danieli for New, Green Steel Mill in Australia, 30 October 2025
[149] Hatch, Alter Steel Advances Pinkenba Steel Mill toward Final Investment Decision with Hatch, 07 April 2026
[150] Future Forgeworks, Future Forgeworks Chooses Swanbank, Ipswich to Ignite Australia's Green Steel Revolution, 02 December 2024
[151] SMS Group, Future Forgeworks Awards SMS Group Contract for Australia's First Sustainable CMT Mill to Produce Rebar Steel in an Endless Process, 07 February 2025
[152] Future Forgeworks, Swanbank Green Steel Mill hits Major pre-FID Technical De-risking Milestone, 22 September 2025
[153] Future Forgeworks, Swanbank Green Steel Mill Given Green Light for Development, 07 November 2025
[154] Future Forgeworks, Queensland wins the Green Steel Race as the Swanbank Steel Mill Project Breaks Ground, 18 March 2026

Element Zero, WA

Element Zero, an early-stage green metals startup based in Perth, WA, is developing a novel hydroxide electrolysis process that uses variable renewable energy to reduce iron directly, without the need for green hydrogen in the reduction process. 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.[155] The process proposes to operate at a range of 250-300ºC, which enables the plant to ramp up and down processing capacity depending on energy and material feedstock variations.

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. In November 2025, Element Zero commissioned its green iron pilot plant in Malaga, Perth, capable of processing up to 100 kg/day of iron ore.[156]

In November 2025, Fortescue settled its legal battle with Element Zero with a dismissal by consent from both parties. Element Zero acknowledged that Element Zero had continued to make significant technical and commercial progress throughout the legal process, but this decision now frees up focus to advance the deployment of its technology in Port Hedland and the US.[157]

Element Zero's growth plans include the Pilbara Iron Super Hub, with the first stage of 5Mtpa iron ore feed and eventual scaling to 20Mtpa feedstock. The WA State Government Industrial Lands Panel has approved land allocation for Element Zero in the Boodarie Strategic Industrial Area (SIA) in Port Hedland. The Boodarie SIA has also approved the hosting of POSCO's Port Hedland Iron, Australian Renewable Energy Hub and Fortescue, as well as hosting Alinta Energy's 210MW gas station.

Element Zero has secured land and power agreements to construct a 2.6Mtpa commercial-scale facility in Sinton, Texas, situated in close proximity to Steel Dynamic's 2.7Mtpa EAF and flat steel rolling mill. Element Zero has partnered with American Electric Power (AEP) Texas for commitments of up to 1GW, providing renewable electricity at ~US$46/MWh. The Sinton site also provides access to the Port of Corpus Christi.[158]

Warradarge Energy, Athena & Fenix, Midwest WA Green Iron

The Mid-West Green Iron Project, is a Midwest, Western Australia JV proposing to develop a 2.5Mtpa of green iron plant. Warradarge Energy is proposing to be the primary supplier of green hydrogen and renewable energy via its 750MW Booloogoo Hydrogen Project proposal powered by wind, solar and BESS proposals. ASX-listed Athena Resources is proposing to supply ore from its Byro Magnetite Project and ASX-listed Fenix Resources aims to leverage its existing mine-to-port logistics and infrastructure.[159] [160]

[155] Element Zero, Our Technology
[156] Business Wire, Element Zero US$10m Seed Funding led by Playground to Scale up Platform, 17 January 2024
[157] AFR, Fortescue Shoulders Hefty Costs after Settling Element Zero Case, 26 November 2025
[158] AIST, Element Zero Presentation to Scrap Supplements and Alternative Ironmaking Conference, 9 March 2025
[159] Warradarge Energy, Warradarge to Collaborate on Mid-west Green Iron Project, 14 July 2025
[160] Athena Resources, Global Iron Ore and Steel Conference, March 2026

Hazer Group

The ASX-listed Hazer Group in March 2020 received A$9.4m ARENA grant funding in support of its $22.6m capital investment in a commercial demonstration plant at Munster, WA. Hazer's proprietary hydrogen production technology originated by the University of WA converts biogas from sewage treatment into hydrogen and graphite.[161] As of February 2026 this pilot continues to achieve progressive ARENA funding milestones.[162]

April 2026 saw Hazer Group and NYSE-listed KBR announce completion of commercial scale design for its proprietary methane pyrolysis technology to produce hydrogen and graphite, resulting in zero carbon emissions.[163] Hazer estimates it can produce zero emissions hydrogen at US$1/kg using methane without CCS.

It will be interesting to see potential linkages of Hazer to supply zero emissions hydrogen to Calix's ZESTY plant at Kwinana and graphite to the Green Steel of WA EAF at Collie. Hazer Group, in partnership with Queensland coal producer M Resources, were in the five groups shortlisted for the Whyalla steelworks bailout.[164]

Quinbrook Infrastructure Partners, Gladstone Green Iron

In May 2024, Quinbrook Infrastructure Partners (QIP) announced its intentions to develop a $3.5bn green iron proposal in Gladstone, QLD. QIP had partnered with Central Queensland Metals (CQM) to conduct detailed testing of the Eulogie deposit, the largest known magnetite resource in QLD.[165]

QIP has secured exclusive rights over the land adjacent to the $14bn proposed Central Queensland Hydrogen Project CQ-H2, with plans to leverage over-the-fence hydrogen supplied from CQ-H2 to reduce iron ore into metal. However, the CQ-H2 project was scrapped in June 2025 following the withdrawal of support from state-government owned Stanwell Corporation. QIP has provided no further updates to the development of the project.

In December 2025, QIP signed an MoU with Stanwell Corporation granting Stanwell exclusivity over Quinbrook's proposed Gladstone State Development Area Energy Hub Project. The Energy Hub is a proposed development of up to 1,080MW of open-cycle methane gas turbines, coupled with integrated synchronous condensers and complemented by a 780MW/6,240MWh BESS to support grid firming in the QLD energy system.[166]

[161] ARENA, The Hazer Process: Commercial Demonstration Plant, 13 March 2020
[162] Hazer Group, Hazer achieves ARENA Funding milestone, 17 February 2026
[163] Hazer Group, Hazer and KBR complete commercial-scale design enabling global deployment, 15 April 2026
[164] Hazer Group, A New Pathway for Industrial Decarbonisation, March 2026
[165] QIP, Quinbrook Sponsors Development of Green Iron Project in Gladstone Queensland, 20 May 2024
[166] QIP, Stanwell and Quinbrook Strengthen Partnership with Gladstone SDA Energy Hub Agreement, 3 Dec 2025

Section 2. Technology Trends in Hydrogen for Iron and Steel

2.1. Hydrogen Economics

The low carbon hydrogen sector has gone through a massively hyped boom into 2022, followed by a crushing collapse. The absence of a high regulated price on carbon emissions in international trade is a huge headwind. While the EU has its world leading ETS, and has elevated its EU CBAM structure significantly into 2026, Putin's invasion of Ukraine has highlighted that the EU will need to electrify everything to build energy security, and the EU is going to be a high energy cost region for some time to come, undermining the path to green hydrogen.

The IEA estimates 2.9GW of new renewable hydrogen capacity will be installed in 2025, bringing total installed capacity to 4.9GW, more than doubling the 2GW of cumulative installed capacity from 2024.[167] The IEA estimates the installed capacity represents US$7.9bn in cumulative renewable hydrogen investments through 2025. Electrolyser manufacturing capacity continues to far outpace installations. In 2025, electrolyser manufacturing is expected to grow to 57GWpa, a 50% increase from the 38GWpa capacity in 2024 - see Figure 2.1.

Figure 2.1: Renewable Hydrogen Annual Manufacturing and Installation Capacity

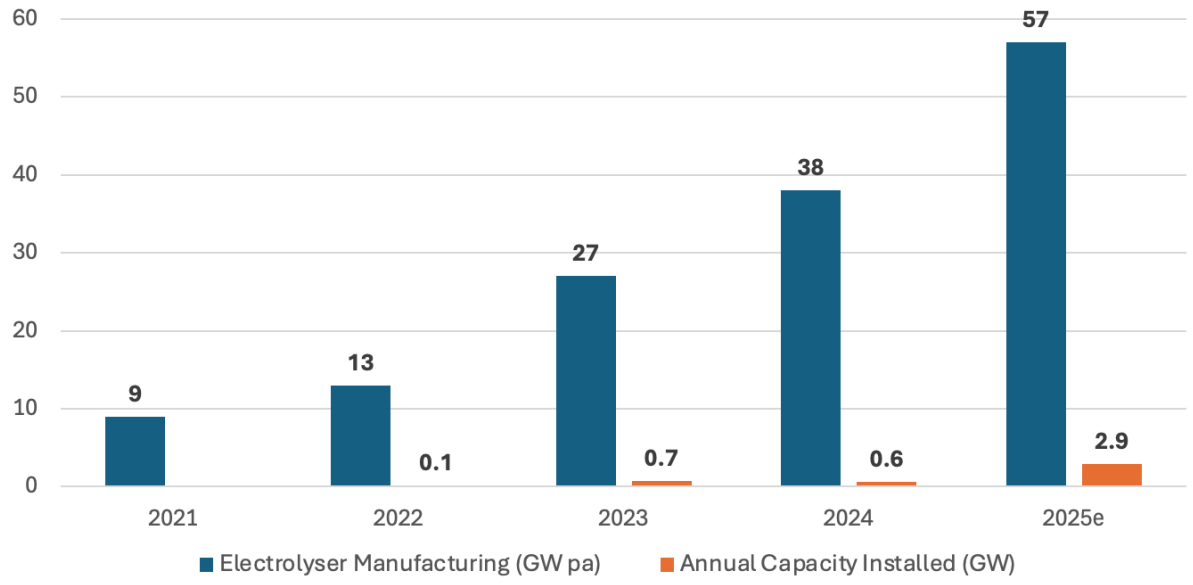


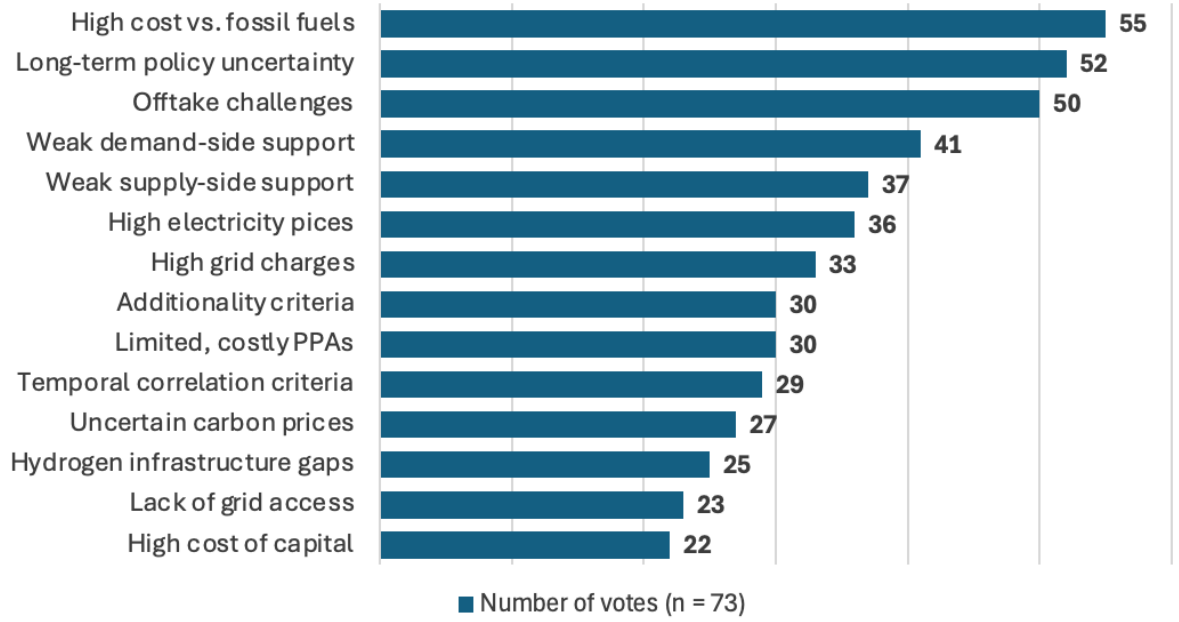
Chart: Climate Energy Finance
Source: International Energy Agency (2025)

The US war against Iran has yet again demonstrated the value of energy independence, and the extreme volatility and hence risks of being dependent on imported fossil fuels, including grey hydrogen and pivot to domestic zero emissions manufactured energy resources, supporting the continuation of government policies and financial supports to incentivise learning by doing in deploying these new technologies.[168]

[167] IEA, Global Hydrogen Review 2025, 12 September 2025
[168] South China Morning Post, Whyalla steelworks five-week shutdown causes chaos for builders, 23 April 2026

March 2026 saw BloombergNEF report the key barriers to renewable hydrogen production in the EU are mostly cost related - both directly and due to the high cost of EU electricity, even with the high carbon pricing of the EU ETS and the EU CBAM, and resulting lack of demand offtake - Figure 2.2.

Figure 2.2: Key Barriers to the Ramp-up of Renewable Hydrogen Production in the EU



Note: ICF project developer survey. Data accurate as of 10 March 2026.
Source: BloombergNEF (2026) [169]

BloombergNEF identified a total 526ktpa of new 'clean' hydrogen capacity was commissioned in 2025 - see Figure 2.3.[170] Chinese installations dominated the deployment of renewables-based electrolysis, however more than half of new capacity commissioned was blue hydrogen from CF Industries' Donaldsonville Complex in Louisiana, USA – the world's largest ammonia production facility.

Blue hydrogen was hyped by the fossil fuel vested interests as a distraction, noting that absent a high regulated price on carbon pollution, CCS makes zero economic sense. In the Asian region, the absence of a path to an Asian CBAM any time soon means the green hydrogen hype has totally dissipated as countries like Australia realised the path was difficult and expensive, absence both scale and sufficient public support.

The case for CCS in the US is a result of the combination of three factors: 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 subsidy of US$85/tCO2-e (A$130/tCO2-e) through the 45Q tax credit. The US has had extensive bipartisan support for the continuation of the 45Q tax credit since 2008, with 45Q strengthened in 2022 under the Biden Administration and preserved in July 2025 by the Trump Administration's One Big Beautiful Bill Act'.

[169] BloombergNEF, Hydrogen Lifted by AccelerateEU, But Expect No Miracles, Excerpt from LinkedIn: Martin Tengler, BloombergNEF Head of Hydrogen, April 2026
[170] BloombergNEF, Hydrogen Supplier Market Shares 2026: US Blue in the Lead: Excerpt from LinkedIn: Martin Tengler, BloombergNEF Head of Hydrogen, March 2026

Figure 2.3: Top 10 Clean Hydrogen Projects Commissioned in 2025

Parent Entity	Parent Entity Region	Method	Capacity (tpa)
CF Industries	USA	Thermochemical	334,400
Envision Energy	China	Electrolysis	54,000
CDDC Energy China	China	Electrolysis	45,320
SPIC	China	Electrolysis	22,990
Goldwind	China	Electrolysis	10,000
RWE	Germany	Electrolysis	8,680
BASF	Germany	Electrolysis	8,000
China Dafang Corporation	China	Electrolysis	5,420
JSW Energy	India	Electrolysis	3,800
Shanghai Electric	China	Electrolysis	3,560
Other		Electrolysis	29,900
Total			**526,070**

Source: BloombergNEF (2026)

In November 2023, ExxonMobil completed the US$4.9bn acquisition of Denbury 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.[171] 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. CF Industries, JERA and Mitsui's $4bn CCS investment in Donaldsonville, commissioned in July 2025, uses ExxonMobil's CCS pipelines.[172]

China

To CEF, China is capitalising on this slow journey globally across the valley of death for the GH2 and green iron sectors, looking to grow into the world leader in GH2, and the associated green ammonia, e-methanol and green steel sectors, leveraging its manufacturing scale and cost leadership to build electrolyzers and associated capital facilities reportedly at a fraction of the western costs. This is part of China's wider pursuit of long term strategic national goals of energy independence and a growing dominance in most zero emissions industries of the future leadership.

January 2025 saw China's Ministry of Industry and Information Technology (MIIT), the National Development and Reform Commission and the National Energy Administration jointly unveil a plan to accelerate the application of low-carbon hydrogen in the industrial sector.[173]

[171] ExxonMobil, ExxonMobil Completes Acquisition of Denbury, 02 November 2023
[172] CF Industries, CF Industries Announced Start-up of Donaldsonville Complex CO_2 Dehydration and Compression Unit, Permanent CO_2 Sequestration, 14 July 2025
[173] SCMP, Low-carbon hydrogen to get more support in 2025 from Beijing's new policy push, 02 January 2025

September 2025 saw several key ministries including the State Administration for Market Regulation jointly issued the "Steel Industry Steady Growth Work Plan (2025–2026)". This included stronger industry management to implement capacity reduction and replacement, control incremental capacity to promote supply-demand balance (including survival of the fittest!) and technological innovation, including “green and low-carbon transformation”. Carbon footprint accounting standards implementation and better measurement to ensure quality data was highlighted, given the inclusion of steel into the national ETS in 2026. A final priority is to “Stabilize the foreign trade market and improve the level of international development.” [174]

In April 2026, Vice Chairman of the National Development and Reform Commission (NDRC) Mr. Wang Changlin flagged a new target to double the supply of non-fossil energy by 2035.[175]

Envision Energy, Inner Mongolia

Envision Energy currently holds the title for the "world's largest" commissioned green ammonia facility, having officially opened its off-grid Chifeng Net Zero Industrial Park in Inner Mongolia Phase I in July 2025. This facility has a capacity to produce 320,000tpa of green ammonia (from 500MW of electrolyser capacity), with plans to scale to 1.5Mtpa by 2028. Envision uses an innovatively designed off-grid renewable system managed by AI to balance volatile wind/solar inputs. May 2025 saw Envision Energy secure a long-term agreement with Japan’s Marubeni to supply green ammonia from its Chifeng project. Envision aims to achieve price parity for its green ammonia and methanol with fossil-fuel-based alternatives by 2028.[176] [177]

The mainstream price of Chinese-made alkaline electrolysers is reported to have fallen below US$150/kW. Furthermore, the cost of renewable electricity in China’s Northern and Western regions is falling to as low as US$25/MWh, moving hydrogen-based low-carbon fuels towards commercial viability.[178]

In February 2026 Envision Energy undertook its first green ammonia international shipment to LOTTE Fine Chemical in South Korea for maritime fuel.[179]

Approximately 20Mtpa of ammonia is shipped internationally. This represents a massive global market opportunity to decarbonise grey ammonia production with the phased substitution with green ammonia. This market opportunity would have received significant support from the International Maritime Organisation’s (IMO) Net Zero Framework’s baseline-and-credit GHG emissions pricing mechanism. If adopted, the Net Zero Framework would have seen the introduction of a marginal price on emissions of US$380/t$CO_2$-e – by far the highest price on carbon internationally. The delay to this mammoth opportunity to introduce a price on carbon in international trade has effectively nullified the economic viability of hundreds of ammonia and methanol projects globally.

China Energy Investment Corporation, Inner Mongolia

The Chinese SOE China Energy Investment Corporation (CEIC) is looking to replicate and extend Envision’s work with its new 13bn yuan (US$1.8bn) Songyuan Project in Inner Mongolia, which officially began operations in December 2025. This is designed for a capacity of 800,000tpa of green ammonia and green methanol combined, which, if and when, phase 2 is operational at 1.35Mtpa

[174] SMM, China issues action plan to promote steady growth in the steel industry, 23 September 2025
[175] China.com, The State Council Information Office held a press conference on promoting high-quality economic and social development in the 15th Five-Year Plan, 17 April 2026
[176] SCMP, Envision launches world’s largest green hydrogen, ammonia plant in Inner Mongolia, 11 July 2025
[177] Jian Wu, The world's largest green hydrogen-ammonia project is now in operation, 11 July 2025
[178] Jian Wu, Review of China’s Hydrogen Industry in 2025, 31 December 2025
[179] Hydrogen Insight, Envision ships first cargo of green ammonia from China to South Korea, 27 February 2026

(2.2GW of electrolyser capacity) would be the world's largest integrated green hydrogen-ammonia-methanol project.[180]

China Energy Engineering Group Co., Jilin Province

The China Energy Engineering Group Co. (CEEC) Songyuan Hydrogen Energy Industrial Park in Jilin Province is a landmark "Power-to-X" facility and currently stands as one of China's most ambitious decarbonisation projects that held its operational launch in December 2025. The park is designed for massive scale, integrating the production of 45,000tpa of green hydrogen with downstream chemical synthesis into 200,000tpa of green ammonia: 20,000tpa of green methanol. The project is backed by 800MW of wind and solar power. The project is designed to more than treble in size in subsequent phases, with an eventual capacity of 800,000tpa of green ammonia and methanol powered by 3GW of renewables.[181] December 2025 saw CEEC sign a green ammonia offtake agreement with Belgium's NYSE-listed CMB.TECH, a global first mover in ammonia-powered shipping.[182]

India

India has one of the more progressed hydrogen development strategies globally, one focussed on energy independence through domestic investment in zero emissions infrastructure and capacity building. To-date India has commissioned 6 pilot green hydrogen (GH2) projects with a combined installed capacity of 70MW of electrolysers. Solar Energy Corporation of India (SECI) has an intent to undertake 13 green ammonia tenders over the next 36 months to build out 1,4385MW of new electrolyser capacity to produce 637,000Mtpa of GH2 as key to its National Green Hydrogen Mission's target of 5Mtpa by 2030. Most of this is set to meet the mandated 10% Grey H2 replacement by India's massive fleet of oil refineries.[183]

April 2026 saw Japanese conglomerate Itochu sign a firm offtake agreement for 300,000tpa of green ammonia starting in 2028 from a new yet-to-be built project led by India's Larsen & Toubro at the port of Kandla in Gujarat, India for Itochu's use as a green shipping fuel. The capex is estimated at ₹8,000 crore (US$1.0bn).[184]

[180] Hydrogen Insight, Second-largest in China | State-owned firm to build giant 2.2GW green hydrogen-to-ammonia project, 18 August 2025
[181] SASAC, Energy China Launches Flagship Green Project in Jilin, 24 December 2025
[182] Hydrogen Insight, European shipowner signs offtake deal for Chinese green ammonia, 18 December 2025
[183] India Hydrogen Alliance, Green Hydrogen and Ammonia Project Development, 23 April 2026
[184] Gasworld, Itochu to offtake 300,000 tonnes of Indian green ammonia for maritime fuel in Asia, 24 April 2026

2.2. Emerging Non-Hydrogen Pathways

There are a number of non-hydrogen iron reduction technologies under development globally. Research, development and demonstration (RD&D) of non-hydrogen based direct reduction is currently focussed on harnessing renewable electrons to directly reduce iron ore without a chemical intermediate, such as hydrogen or carbon monoxide. Technologies in active development include:[185]

1. **Molten Oxide Electrolysis (MOE)**.

The MOE process involves using electricity to reduce iron ore in a molten oxide electrolyte at temperatures of up to 2,000°C, producing liquid hot metal. MOE is capable of reducing a wide array of ore qualities, including low iron content and high-impurity hematite ores. However, the commercial viability of inert anodes capable of sustaining a corrosive environment remains uncertain. The leading developer of the MOE technology pathway is Boston Metal which announced a major downsizing of its Woburn, Massachusetts facility, retrenching 71 staff in February 2026 after a critical failure at its niobium pilot facility at its Araxá Project in Brazil that saw its funding curtailed.[186] This comes despite having raised over US$400m for R&D since 2013.[187]

2. **Low-Temperature Alkaline Electrolysis**.

This process involves using electricity to reduce iron ore in an aqueous alkaline solution at a low- to medium-temperature to produce metallic iron in a slurry. Fortescue is developing an alkaline electrolysis process and has demonstrated at pre-industrial scale and designed to be compatible with lower-grade hematite iron ores prevalent in the Pilbara.

3. **Low-Temperature Acid-based Electrowinning.**

This process involves using electricity to reduce iron ore in a water-based acid solution, resulting in electroplated iron. Acid-based electrowinning can operate at temperatures of ~60°C and utilise intermittent renewable electricity. The leading developer of acid-based electrowinning is Electra, a US startup founded in 2020. Electra has commissioned a small pilot facility in the US and is constructing a 500-tpa demonstration plant in 2026, with ambitions to construct a commercial-scale project to be operational by 2029.[188]

On 28 April 2026, POSCO and Electra announced a joint development agreement to develop low-carbon ironmaking, combining POSCO's HyREX technology with Electra's proprietary electrochemical reduction technology. The agreement will see POSCO and Electra jointly verify technical and economic feasibility for commercial production.[189]

POSCO's corporate venture capital (CVC) arm will also invest into Electra, marking POSCO's inaugural overseas venture capital investment. The funding builds on Electra's US$186m capital raise in April 2025, a US$50m grant from Breakthrough Energy Catalyst Program, US$30m venture debt facility from J.P Morgan and advanced commitments from Nucor, Toyota Tsusho and Interfer.[190]

4. **Low-Temperature Alkaline-based Electrowinning.**

This process involves using electricity to reduce iron at temperatures of ~110°C, producing metallic iron plates. The leading developer of this pathway is ArcelorMittal, in partnership with John Cockerill. The technology was previously developed within ArcelorMittal's SIDERWIN pilot plant.

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[185] ARENA, Low Temperature Direct Electrochemical Reduction for Zero Emissions Iron Project, 22 December 2025
[186] The Boston Globe, Woburn green steel maker laying off more than 70 workers, 23 February 2026
[187] Canary Media, Green steelmaker Boston Metal to cut jobs following equipment failure, 23 February 2026
[188] The Economist, A trio of firms want to clean up steelmaking, 01 April 2026
[189] POSCO, POSCO to Jointly Develop Low-carbon Ironmaking Technology with US Innovator Electra, 29 April 2026
[190] Canary Media, Electra Announces Deals with Meta, Nucor to Scale its Clean Iron Tech, 21 October 2025

Section 3. Policy Trends in Enabling Iron and Steel Decarbonisation

3.1. European Policy

European Union

Clean Industrial Deal

Launched in February 2025, the European Clean Industrial Deal (CID) aims to mobilise over €100bn to support EU-made clean manufacturing, designed to catalyse decarbonisation and drive green growth across European industries. The CID has a primary focus on energy-intensive industries – in steel metals, and chemicals – and the clean-tech sector.[191]

The CID aims to deploy strategic public capital into enabling sectors, reforming regulatory frameworks and co-investment into critical projects, including:

- Establishing the **Affordable Energy Action Plan**[192] to speed up the roll-out of clean energy and accelerate electrification, complete the internal energy market with the buildout of grid infrastructure, and support energy efficiency to reduce dependence on imported fossil fuels.
- Boosting demand for clean products through the **Industrial Accelerator Act** to increase demand for low-carbon, European-produced technologies and products. The Act introduced low-carbon requirements for public procurement and public support schemes in key strategic industries.[193]
- Financing the transformation, **mobilising over €100bn** to support EU-made clean manufacturing, including:
    - €450m under **Horizon Europe** to stimulate research and innovation in energy-intensive, strategic industries.
    - Adopting the new **Clean Industrial Deal State Aid Framework**[194] to accelerate approvals of state aid for renewables, industrial decarbonisation and cleantech manufacturing.
    - Amending the **InvestEU** Regulation to increase the number of financial guarantees that InvestEU can provide, mobilising up to **€50bn** for the deployment of cleantech.

For Europe, which depends on imported fossil fuels, clean industrialisation is the most advantageous avenue to create jobs, support European living standards and create globally competitive companies.[195]

European Steel and Metals Action Plan

In March 2025, the European Commission published its joint communication of the European Parliament, European Council and European Economic and Social Committee to establish a European Steel and Metals Action Plan.[196]

Low returns on capital, continued margin compression as a result of global overcapacity and insufficient consumer willingness to pay clean premiums, as well as insufficient investments through market intervention to surpass structural challenges in fossil energy as well as low-emissions energy

[191] European Commission, Clean Industrial Deal, 26 February 2025
[192] European Commission, Affordable Energy Action Plan
[193] European Commission, Commission Proposes New Measures to Boost EU Industry and Jobs, 04 March 2026
[194] European Commission, Clean Industrial Deal State Aid Framework (CISAF), 25 June 2025
[195] Bruegal, Europe's Clean Industrial Deal: Four Priorities to Fulfil its Promise, 29 September 2025
[196] European Commission, A European Steel and Metals Action Plan, 19 March 2025

has meant the business case for low-emissions primary iron and steel production in the EU is insufficient to attract in investors and customers. Failure to act with speed and robustness on strengthening the policy landscape, as well as incentivising transformational investment means the EU remains at high-risk of continued plant closures and industrial decline.[197]

The European Steel and Metals Action Plan aims to create the framework to address the above structural challenges, complementing broader initiatives introduced by the Commission into industrial decarbonisation and sustainable growth, with new and enhanced positions across 6 primary pillars.

1. **Ensuring access to clean and affordable energy for the metals industries**.

Prior to the last two international energy crises since 2022, electricity costs accounted for ~17% of the cost base for the steel sector. Increasing electrification and electricity derivatives, such as hydrogen, mean lowering electricity prices is critical to enabling the transformation of primary metals production and secondary steelmaking. As of 2025, EU electricity prices are 2-3x that of the US, and methane gas prices are 5x that of the US.

The EU Action Plan for Affordable Energy provides support measures to improve efficiency of network charges, reduce energy taxes and levies, government facilitation of PPAs, accelerated permitting and investments into modern and flexible grid infrastructure. The Commission will evaluate further measures to support deflation in electricity prices specifically for energy-intensive industries.

2. **Preventing carbon leakage.**

The implementation of the EU CBAM from January 2026, in alignment with the gradual phase-out of free allowances for emissions-intensive industries under the EU ETS by 2030, introduces the most efficient policy measure to safeguard decarbonising domestic industries from high embodied-carbon imports, whilst not limiting investments into domestic decarbonisation of industry.

The Plan highlights concerns from steelmakers that CBAM-covered goods could shift further downstream in the value-chain to circumvent CBAM financial obligations. The EU Commission has stated it is evaluating the potential extension of the EU CBAM to certain downstream products to address carbon leakage while minimising administrative burdens.

3. **Promoting and protecting European industrial capacities**.

The European Commission continues to emphasise that global overcapacities severely threaten the profitability and competitiveness of European industries. The EU reviewed the existing steel safeguard to address the latest market developments and determined it necessary to introduce effective protective measures beyond 30 June 2026 when current safeguard measures will legally expire. The Commission rightly highlighted in March 2025 that global negative trade-related effects are likely to be exacerbated, as an increasing number of third countries are adopting measures aimed at limiting imports into their markets, resulting in the EU market becoming the main receiving ground of global excess capacities. In October 2025, the Commission drafted proposed new measures that were then agreed upon in April 2026 (detailed below).

4. **Promoting circularity for metals**.

Enhancing circularity is a critical step forward for the EU to continue the phased and progressive decarbonisation of its metals industries. Recycling of scrap and secondary steel production can save up to 80% of the energy required for primary steel production. Circularity in the EU also further reduces dependencies of European industries on imported primary raw materials.

[197] European Commission, A European Steel and Metals Action Plan, 19 March 2025

However, ferrous scrap exports have more than doubled in recent years, reaching a high of over 19Mtpa in 2021 (20% of annual scrap generation) as a result of lack of EU industrial demand and higher prices for scrap paid by steel and aluminium producers in external countries.

5. **Defending quality industrial jobs**.

The Commission has made it clear it will support long-term sustainability and growth of its metals industry workforce, promoting safety standards, real wage growth, and transparent, predictable working conditions.

6. **De-risking decarbonisation projects through lead markets and public support**.

The European Commission will focus on:

- **Lead markets** with public procurement, subsidies and regulatory incentives to shape markets and build reliable demand that can be serviced by low-emissions producers.
- **De-risking high investment cost** projects through strategic public capital deployment. From October 2022 to February 2025, the Commission approved €9bn of State aid for 10 steel decarbonisation projects, and supported further through the EU Innovation Fund.
- **Simplifying regulatory approvals** processes.

European Reduction in Tariff-free Steel Import Quotas

In April 2026, the European Commission reached an agreement to introduce more stringent trade barriers to shield domestic steelmakers from global overcapacity. The agreement will set a new tariff-free quota of 18.3Mtpa on steel imports. Steel imported above the quota will now face a 50% tariff for 30 categories of steel imported into the EU.[198] The new measure slashes the tariff-free quota by 47% and doubles the tariff applied on out-of-quota imports against the current domestic steel safeguard measures erected in 2024.

The measure will also see the Commission introduce a 'melt and pour' requirement to improve traceability and transparency for imported steel products. The requirement aims to address circumvention of steel tariffs through the reporting of country of origin in which the steel was originally melted and poured – that is when the steel was first produced in liquid form in a furnace and cast into first shape.[199]

The European Commission expects global steel overcapacity to grow to 721Mtpa by 2027, more than 5x that of the EU's annual consumption. The European Commission have emphasised that the erection and strengthening of the trade bloc's trade restrictions are a necessary response to other large import markets' trade restrictions that have made the EU the primary recipient of global excess steel. Since 2007, the EU has lost 65Mtpa of steel manufacturing capacity and 100,000 steel sector jobs, with its remaining steel industry running at a capacity utilisation of just 67% in 2024.[200]

European Hydrogen Bank

Established in 2022, the European Hydrogen Bank aims to unlock private investments in hydrogen value chains in the EU and in global markets by connecting renewable hydrogen supply with the emerging demand by European off-takers and thus to establish an initial market for renewable hydrogen. The Hydrogen Bank introduced new financing mechanisms to support hydrogen production domestically and internationally.[201]

The Hydrogen Bank has created fixed premium auctions to support EU production, designed to:

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[198] European Commission, Commission Welcomes Political Agreement on New EU Steel Measure, 13 April 2026
[199] European Council, Council and European Parliament Strike Deal to Protect EU's Steel Industry from Global Overcapacity, 13 April 2026 (updated 24 April 2026)
[200] European Council, Council and European Parliament Strike Deal to Protect EU's Steel Industry from Global Overcapacity, 13 April 2026 (updated 24 April 2026)
[201] EUR-Lex, European Hydrogen Bank, 16 March 2023

- Connect EU domestic suppliers with demand.
- Bridge and reduce the cost gap in the EU between renewable and fossil hydrogen
- Allow for price discovery and market formation in the EU through the running of competitive auctions with simple and transparent set-up reveal private costs.
- De-risk projects by lowering capital cost intensities for private capital.

The first auction ran from November 2023 to February 2024 with 132 bids, awarding €720m to 7 renewable hydrogen projects. Combined, these projects would produce 1.52Mt of hydrogen in their first 10 years of operation. In October 2024, 6 of the 7 proposals signed their respective grant agreements, but to-date, only 2 have entered construction and 2 are still pre-FID but progressing, whilst another 2 have withdrawn, showing that even with significant government funding support, developing GH2 projects in the EU is extremely financially challenging, particularly in areas of high electricity costs.

The second auction closed in February 2025, receiving 61 bids. The European Hydrogen Bank awarded €992m to 15 renewable hydrogen projects.

The European Commission announced the third auction in December 2025 and closed in February 2026 with a total budget of €1.3bn.[202]

United Kingdom

March 2026 saw the UK launch its national Steel Strategy, designed to revitalise the national steel sector through protective measures for domestic industry and public support mechanisms to accelerate decarbonisation, boost profitability and maintain strategic national capabilities.[203]

From 1 July 2026, the UK Government will reduce tariff-free steel import quotas by 60% compared to current arrangements, with out-of-quota imports subject to a 50% tariff, mirroring that of the EU.[204]

The UK Government have emphasised, similarly to the European Commission, that global steel overcapacity, compounded by high operating costs and structural challenges to decarbonisation and transformation of the steel sector, have resulted in crude steel production in the UK declining more than 50% in the last decade to 4Mtpa in 2024.[205] The UK's Steel Strategy aims to boost domestic production's share of national demand from 30% in 2024 to 40-50%.

To support the UK Steel Strategy, the UK's National Wealth Fund in January 2026 announced a new strategic plan to invest £5.8bn (US$7.8bn) by 2030-31 into 10 priority sectors across strategic industries and national infrastructure. The priority areas include steel, ports and supply chains, carbon capture and storage, hydrogen, battery manufacturing, power grids, energy storage, nuclear, transport infrastructure, and place-based regeneration.[206] The UK NWF will focus on debt and guarantee financing and equity investments to support the transformation of primary iron and steel production, as well as support upstream collection, sorting and recycling of scrap steel to support secondary steel making.

Germany

SuSteelAG Intergovernmental Green Iron RD&D, Australia and Germany

Green Metals for Sustainable Steel from Australia and Germany (SuSteelAG), a partnership between Australia's Federal Department of Climate Change, Energy, Environment and Water (DCCEEW) and Germany's Federal Ministry of Education and Research (BMBF), is a joint initiative to explore the potential for creating sustainable green iron and steel value chains between the respective countries.

[202] European Commission, Innovation Fund 2025 Hydrogen Auction, 04 December 2025
[203] UK Government, The UK Steel Strategy, 20 March 2026
[204] UK Government, UK Steel Industry Backed by Major New Trade Measure and Strategy, 19 March 2026
[205] UK Government, UK's Steel Trade Measure from 1 July 2026, 02 April 2026
[206] NWF, National Wealth Fund to Drive More than £100bn into the UK Economy, 28 January 2026

Germany's Bundesanstalt für Materialforschung und -prüfung (BAM) (Federal Institute for Materials Research and Testing) is leading the international consortium SuSteelAG alongside researchers across German and Australian universities and institutes, Fortescue, Salzgitter and technology developers.[207]

As part of the SuSteelAG partnership, the consortium developed Project Oshivela in Namibia – constructing a 15,000tpa hydrogen-based rotary kiln DRI process supported by an 20MW solar PV installation. German SuSteelAG technology partner TS Elino GmbH designed and constructed the hydrogen-based rotary kiln for the reduction of iron ore. BAM has reportedly successfully studied rotary kiln technologies at lab-sale to reduce iron ore using 100% hydrogen as a reductant.[208]

In April 2026, low-grade (56% iron content) Pilbara iron ore fines from Fortescue were successfully reduced in the renewable hydrogen-based DRI pilot in Namibia.[209] Fortescue will continue the processing of iron ores into metallic iron at the Namibia pilot, supplying 80 tonnes of iron ore, before Fortescue commissions its DRI-ESF pilot at Christmas Creek.

H2Global Tender, Australia and Germany

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).[210]

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. This is a variation to the Clean Commodities Trading Initiative (CCTI) proposed by Oliver Yates and Professor Elizabeth Thurbon.[211]

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[207] BAM, Germany and Australia Launch International Project for Sustainable Steel Production Using Hydrogen, 29 April 2025
[208] FuelCellsWorks, A Milestone for Green Steel: SuSteelAG Consortium Achieves Hydrogen-based Ore Reduction on an Industrial Scale, 13 April 2026
[209] FuelCellsWorks, A Milestone for Green Steel: SuSteelAG Consortium Achieves Hydrogen-based Ore Reduction on an Industrial Scale, 13 April 2026
[210] DCCEEW, Australia-Germany H2Global Joint Tender, 03 September 2025
[211] AP4D, the case for the Clean Commodities Trading Initiative, 15 June 2025

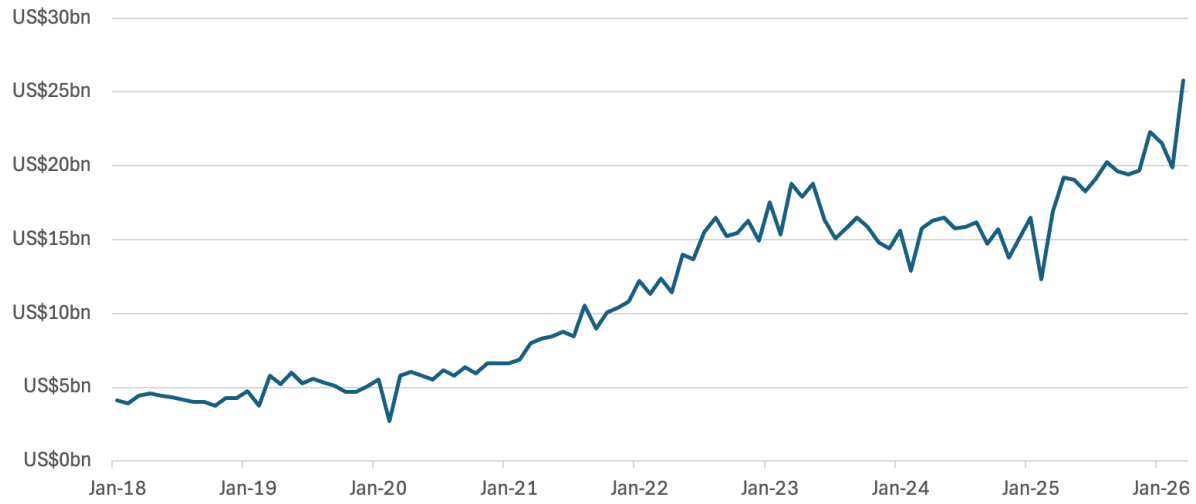
3.2. North Asian Policy

China

As the world's largest manufacturer of clean energy technologies to enable the energy transformation and decarbonisation of industrial energy and heat, China's export profile of such technologies provides valuable insight into the global adoption of low-emissions energy sources.

In March 2026, China's exports of clean energy technologies (cleantech) surged 30% to US$25.8bn from February 2026 alone to an all-time high – driven by the stepchange in global pace and political urgency for energy security to reduce economic exposure to the volatility and inflation of global fossil fuel markets as negative supply shocks rippled through seaborne supply chains from the US' war on Iran. Driving this growth was solar exports which skyrocketed 121% to US$4.8bn month-on-month, with battery exports surging 42% to US$10.2bn in March 2026. This marked the first time a cleantech product's monthly export value exceeded US$10bn - see Figure 3.1.[212]

Figure 3.1: Monthly China Exports of Clean Energy Technologies



Note: Includes batteries, EVs, solar, wind, grid infrastructure, heating and cooling systems
Source: Ember (2026)

The global adoption of China's cleantech continues to grow at an incredible rate. YTD March 2026 cleantech exports have risen 47% from 2025 to US$67.2bn, with batteries and EVs surging 51% and 77% respectively. In the rolling 12-months to March 2026, China has exported US$244bn in clean energy technologies, up 31% from 2025.

Vice Chairman of the NDRC Mr. Wang Changlin held a press conference in April 2026, providing significant detail and context on the newly released 15th Five Year Plan (FYP). This sees China double down on its commitment to decarbonisation and the technology development of zero emissions industries of the future but also accelerating high-level technological self-reliance. Despite "the severe challenges facing the international economic and trade order, the 15th FYP calls for actively expanding independent opening-up, promoting innovative trade development, guiding the rational and orderly cross-border layout of industrial and supply chains, and building a new system for a higher-level open economy." China targets: "the supply of non-fossil energy will significantly increase compared to 2025, and by 2035, it will double."[213]

[212] Ember, China Cleantech Export Data, updated March 2026
[213] China.com, The State Council Information Office held a press conference on promoting high-quality economic and social development in the 15th Five-Year Plan, 17 April 2026

April 2026 also saw reports China's leadership have stressed provinces will be graded on efforts to ensure China's carbon dioxide emissions peak before 2030, and on objectives to lift clean energy consumption and to limit the use of coal and oil.[214] All of this shows momentum continues to build for industrial decarbonisation across China, although there is an absence of hard new evidence on progress within the steel sector.

In July 2025, China's top economic planner, the National Development and Reform Commission (NDRC), unveiled draft guidelines to tighten oversight of government-backed investment funds to rein in spending on new manufacturing capacity that has intensified cutthroat competition and added to economy-wide deflationary pressure.[215] This intervention marks as significant recognition of the role excessive government funding into strategic industrial projects and sectors, leading to overcapacity across cleantech and industrial sectors, has exacerbated involution in domestic and export markets.

In August 2025, five leading ministries of the Chinese economy issued a new Work Plan for Stabilising Growth in the Steel Industry for 2025-26.[216] The Work Plan emphasised the structural challenges facing the steel sector, facing an overcapacity in supply coupled with insufficient effective demand, where the imbalance between supply and demand represents the primary contradiction affecting the quality and efficiency of industry development. The joint directive focussed 6 pillars of coordinated efforts to harmonise supply and demand, including:

1. Strictly **prohibiting new capacity additions** and implementing output reductions to control total production volume. The Work Plan announced revisions to the capacity replacement programme to reduce capacity, as well as providing differentiated support to reduced replacement ratios with projects aligned with developing low-carbon ironmaking and steelmaking processes, including hydrogen metallurgy and EAFs.
2. Expanding effective investments to **promote transformation of capacity to advanced electric furnaces**, specialised smelting, and phasing out BFs.
3. **Advancing the green and low-carbon transformation** of the steel sector through supporting research and development of low-carbon iron reduction technologies and integration of renewable electricity and hydrogen in industrial processes.
4. **Deepening upstream-downstream cooperation** between the steel industry and steel-consuming sectors, such as shipbuilding, to sign long-term stable cooperation and supply agreements to maintain supply chain stability and reduce capacity traded on spot markets.
5. Strengthening **management of steel product exports** to maintain competitive order. Critically, the ministries highlighted the importance in adhering to international trade rules, conducting international steel trade in accordance with laws and regulations.
6. Strengthening organisational safeguards. Led by major steel-producing provinces, industry shall actively curb vicious competition, organise enterprises to correctly understand and accurately grasp industry trends, and strictly implement national policies on capacity and output regulation.

In December 2025, China's Ministry of Commerce announced further measures to curb excessive exports of Chinese steel in response to growing protectionist measures in key export markets. From 01 January 2026, 300 steel items will require export licences on the basis of export contracts. While export controls through this licensing mechanism will do little to alleviate short-term pressures, it lays the foundation for more stringent regulation in the future.[217]

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[214] Bloomberg, Fail on Climate Action and Miss Out on Promotion, China Warns Officials, 24 April 2026
[215] SCMP, China Unveils New Oversight Guidelines Seen as a Strategic 'Anti-involution Effort', 30 July 2025
[216] Ministry of Industry and Information Technology, Notice from Five Departments on Issuing the "Work Plan for Stabilising Growth in the Steel Industry (2025-2026)", 06 August 2025 (published 22 September 2025
[217] Reuters, China to Regulate Steel Exports with a Licence System, 13 December 2025

Japan

METI Demand-side Green Steel Incentives

In January 2025, Japan's Ministry of Economy, Trade and Industry (METI) announced the expansion of subsidies for Clean Energy Vehicles (CEVs) to vehicles produced using low-emission steel. The decision by METI marked a small step forward in Japan's outlook for decarbonising its iron and steel industry, introducing a demand-pull support mechanism for EVs using low-emission steel, with consumers eligible to receive up to JPY 50,000 (A$518) per vehicle – see Figure 3.2.[218]

Figure 3.2: Japan Green Steel Demand-side Subsidies for EVs

Vehicle	Subsidy	With Green Steel Subsidy
EV	JPY 150,000 - 850,000 (AUD 1,554 – 8,804)	JPY 200,000 – 900,000 (AUD 2,072 – 9,322)
Light EV	JPY 150,000 - 550,000 (AUD 1,554 – 5,697)	JPY 200,000 - 600,000 (AUD 2,072 – 6,215)
PHEV	JPY 150,000 - 550,000 (AUD 1,554 – 5,697)	JPY 200,000 - 600,000 (AUD 2,072 – 6,215)
FCEV	Up to JPY 2,555,000 (Up to AUD 26,413)	Up to JPY 2,605,000 (Up to AUD 26,931)

Source: METI [219], Climate Energy Finance Calculations

The automotive sector could be leveraged as a first market mover for decarbonised metals and minerals, with the ability to distribute green premiums across vehicles and a large customer base, leveraging the consumer facing nature of the auto sector. However, when every global EV maker is battling for hard-fought yards against the world-leading EV brands of China, automakers are looking for every measure possible to protect the margins on their vehicles.

Transition Asia in July 2024 determined the green premium on Japanese EVs for 100% green steel would amount to ~US$200-210 (A$315-330) per vehicle.[220] The policy measure by METI would more than cover the green premium added to the cost of EVs in Japan. Given an average of 0.9 tonnes of steel is used per passenger vehicle, the demand-pull mechanism is an implicit price signal for industry in Japan of the value in which METI places on low-emission products, pricing it at A$575/t of steel.

If METI implemented an internationally-accepted emissions intensity threshold, such as the IEA's 400 kg CO_2-e/t-cs for low-emission steel, this effectively introduces an implicit carbon price of A$300/t (US$192/t), determined as the value per tonne of CO_2 emissions from the difference in low-emission steel (0.4t/t) and the traditional BF-BOF (2.33t/t) steelmaking route of the majority of Japan's steel industry.

[218] METI, FY2024 Supplementary Budget "Clean Energy Vehicle Introduction Promotion Subsidy", 27 January 2025
[219] METI, https://www.meti.go.jp/policy/mono_info_service/mono/automobile/cev/r6CEV.pdf,
[220] Transition Asia, The Green Steel Premium for Cars and Buildings is Negligible, 25 July 2024

However, Japan's steel industry, championed by the Japan Iron and Steel Federation (JISF), has established a 'mass balance' approach to reducing the emissions embedded in Japan's iron and steel production.[221]

JISF Mass Balance Carbon Accounting Framework

The mass balance approaches refer to the allocation of CO_2-e emissions reduction certificates generated from separate projects with additionality that has been proportionately applied to the emissions content of iron and steel products. Japan's major steel producers, Nippon Steel, JFE Steel and Kobe Steel, all employ the mass balance approach to produce 'green steel', circumventing the need to invest into decarbonisation technologies and production pathways that reduce embedded emissions.

JISF guidelines for mass balance follow the framework of:

1. Calculate embedded emissions intensity of steel products, complying with ISO 201915 or JIS Q 20915. Emissions are verified by a third party.
2. Identify carbon emission reduction projects and calculate emission reduction volumes, complying with ISO 14064. Projects must be within the organisation and meet financial additionality requirements, i.e. an additional cost burden.
3. Issue reduction certificates for steel products, using mass balance model in ISO 22095 (Chain of custody), transferring reduction certificates to customers.

SteelWatch has urged Japan's Ministry of Environment not to include mass balance accounting in its guidelines to the Act on Promoting Green Procurement, citing the IEA's low-emission steel definitions clearly state that offsetting emissions from outside the supply chain or aggregation of emissions reductions credits/certificates across multiple units of production and/or supply chains is not permitted for near-zero emissions recognition.[222]

The JISF guidelines allow for an entity-level mass balance approach, pooling emissions reduction projects within a corporate boundary to virtually allocate emissions reduction certificates to promote the sale of 'green steel'.

In the broader context for Japan's planned carbon pricing measures, it is important for METI to publicly release the carbon accounting methodologies, green product definitions and emission thresholds it will use to determine products and producers that will benefit from the models approved under the new subsidy scheme, to build international credibility and standing. Absent a credible price on carbon that introduces a polluter-pays principle on the embedded emissions of products, it is vital for the future integrity and efficacy of public capital used to catalyse investment into industrial decarbonisation that market incentives are provided to products that meet internationally-accepted thresholds and criteria.

For METI to introduce a market signal to produce green materials and a price signal for the value of embedded decarbonisation for international markets, METI must adopt internationally-accepted carbon accounting frameworks that will result in capital flows to low-emission pathways.

Japan's Green Transformation (GX)

The Japanese steel industry is mainly relying on lowering production to meet its 2030 emissions reduction goal for a 30% reduction in CO2 emissions by 2030 (from 2013 levels), as well the closure of approaching end of life BFs and replacement with new EAF.

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[221] JISF, Role of Green Steel Upon the Application of the Mass Balance Approach in the Pathways Toward Carbon Neutrality, November 2023

[222] SteelWatch, SteelWatch Comment on Proposed Revisions to Japan's Act on Promoting Green Procurement, 12 December 2024

January 2023 saw the government launch its GX initiative as Japan's flagship strategy for reaching carbon neutrality by 2050.[223] The 2023 GX Promotion Act authorised ¥20tn GX Economic Transition Bonds over 10 years to FY2033. Issuance to date has reached ¥4.2tn, but so far little of these funds are flowing to decarbonisation projects, suggesting a government led greenwash that erodes the initiatives' credibility.[224]

The Japanese government is providing grant funding for one-third of the capex for new EAFs by Nippon Steel and JFE (refer section 1.3), plus 7 years of production tax credits of ¥20,000t (A$200/t) and then three years of ¥5,000/t to cover cost differentials of EAF vs BF due to high electricity prices in Japan.[225] Japan is also providing ¥439bn in Green Innovation Fund R&D subsidies, with the majority earmarked for BF technologies, and some for hydrogen utilisation.[226]

CEF sees a key role in Green Energy Statecraft [227] for the development of a green iron and steel supply chain across Asia. Bilateral and multilateral agreements are critically important to get FOAK deployments to FID, into construction and then operation, to learn by doing and advance down the cost curve towards commercial viability. Public capital support is particularly needed in the absence of a price on carbon in international trade in Asia, noting the growing role this will play as the EU CBAM takes greater substance. It would be great to see active participation in green steel market development by Japan's leading public financial institutions, namely Japan Bank for International Cooperation (JBIC), Japan Organization for Metals and Energy Security (JOGMEC) and Nippon Export and Investment Insurance (NEXI). This should include deployment of the Japan Climate Transition Bond funding into FOAK green steel supply chain projects.[228]

Korea

K-Steel Act

In November 2025, South Korea passed the landmark bipartisan "Special Act on Strengthening Steel Industry Competitiveness and Carbon Neutrality Transition" (Steel Industry Special Act) – referred to by industry as the K-Steel Act.[229] The Act, set to come into effect in May 2026, provides a legislative framework to accelerate the decarbonisation of Korea's steel industry, as it faces structural challenges from global oversupply, erection of tariffs and trade restrictions from key export markets – such as intensifying US protectionism and isolationism that introduced 50% tariffs on Korean steel imports – and escalating global and domestic carbon reduction obligations.

The K-Steel Act is designed to transition the industry into a low-carbon, high-value sector, with a principal focus of the legislation designed to bolster Korean steel's competitiveness and resilience in emerging green steel value chains. The Act's current iteration will remain in force until the end of 2028 with an option to extend for three years. A Prime Ministerial special committee has been selected to oversee its implementation, indicating the highest level of political buy-in for the initiative.[230]

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[223] Government of Japan, Climate Transition Bonds Show Japan's Commitment to Carbon Neutrality, 27 September 2024
[224] Green Central Banking, Japan's GX transition bond was never about decarbonisation, 30 March 2026
[225] ACCR, Japan Corporate Engagement: Optimising Transition Finance in the Japanese Steel Value Chain, April 2026
[226] Green Innovation Fund projects, Hydrogen Utilization in Iron and Steelmaking Processes, Accessed 25 April 2026
[227] Green Energy Statecraft Project
[228] METI, Towards a Transition to Decarbonisation - Transition Finance
[229] MySteel, Korean Lawmakers Pass K-Steel Act, 01 December 2025
[230] Steel Radar, The K-Steel Act Has been Passed in Korea, 29 November 2025

Korean Minister for Trade, Industry and Resources, Kim Jung-kwan, said "The Steel Industry Special Act will support the transition to low-carbon processes and the shift to future high-value products, which require significant costs and time".[231]

The K-Steel Act creates low-carbon steel standards and certification systems, establishes support for low-carbon technology development, and designates low-carbon steel special zones where regulatory barriers are streamlined to encourage innovation and investment.[232] To support the industry's green transition, the bill includes a wide range of financial incentives, including subsidies, low-interest loans, tax breaks under the special tax Treatment Control Law and Local Tax Special Exemptions and Relief Act, and production cost support for companies investing in hydrogen-based and other low-emission technologies.[233] A KRW 400bn (US$278m) guarantee program backed by the Korea Trade Insurance Corporation (K-SURE), will support steel exports.[234]

Green Transformation (GX)

In January 2026, the South Korean government launched the public-private taskforce responsible for developing the country's Green Transformation (GX) Strategy,[235] to be announced in 1HCY2026. The Strategy is intended to provide the roadmap for cross-sector, economy-wide transformation in alignment with the country's 2035 NDCs, targeting a 53-61% reduction in emissions against 2018 levels by 2035 and its pledge to reach carbon neutrality by 2050.

A key goal flagged for the strategy includes expanding renewable energy to 100GW by 2030 and increasing the share of renewables in the energy mix to 20% – a target that is deeply unambitious by international standards.[236] The country's energy mix is currently dominated by fossil fuels at around 60% of supply, with nuclear at around 30%, and while renewable energy has doubled over the past five years, it makes up one of the smallest shares among industrialised nations.

The plan also prioritises piloting hydrogen based steel production, rapidly accelerating the adoption of electric vehicles, electrifying thermal energy and converting livestock manure into energy. It is supported by a range of measures including technology development, financial and tax incentives, regulatory reforms to ease barriers to participation and just transition policy.[237]

Deputy Prime Minister and Minister of Economy and Finance Koo Yun Cheol stated, "For our manufacturing-centred economy, proactive green transformation is a core agenda tied to the nation's fate. We will provide full support with strong resolve so that the K-GX strategy becomes a driving force for future national competitiveness and a major economic leap forward."

At the opening ceremony of Green Great Transition International Week in April 2026, Minister of Climate, Energy and Environment, Kim Sung-hwan, said "Energy has become a key factor that determines not only the response to the climate crisis but also the future of our economy and industry. Countries are now faced with the new challenge of ensuring a stable energy supply while simultaneously reducing carbon emissions. The Republic of Korea has decided to pursue energy transition as a national growth strategy based on political determination and execution capabilities. By 2030, we aim to achieve a renewable energy generation share of over 20%, leap forward as a

[231] Chosun, K-Steel Act Passes National Assembly, Boosting Low-Carbon Transition, 27 November 2025
[232] Chosun, K-Steel Act Passes National Assembly, Boosting Low-Carbon Transition, 27 November 2025
[233] Asia News Network, South Korea Eyes K-Steel Act to Rescue Industry from Tariffs, China Glut, 6 August 2025
[234] GMK Center, South Korea Passed the K-Steel Act to Support Steel Producers, 28 November 2025
[235] Korean Ministry of Climate, Energy and Environment, Launch of the Public-Private Joint K-GX Task Force, Korea's Green Transformation Gets Fully Underway, 28 January 2026
[236] Eco-Business, South Korea to Unveil Green Transition Roadmap Amid Lagging Renewables, 22 April 2026
[237] South Korea Ministry of Climate, Energy and Environment, Launch of the Public-Private Joint KG-X Taskforce, Korea's Green Transformation Gets Fully Underway, 28 January 2026

powerhouse in green manufacturing, and achieve balanced regional development through the energy transition".[238]

Energy Security to Support Deployment of Renewables and Electrification

Currently, South Korea imports more than 90% of its primary energy demand, with 70% of its crude oil demand passing through the Strait of Hormuz. President Lee Jae Myung and cabinet have signalled their intent to use the Iran crisis and subsequent global oil shock as a catalyst for a faster clean energy transition. In April 2026, South Korea's Minister of Climate, Energy and Environment Kim Sung-hwan said there is a "growing national consensus that we must undergo a fundamental energy transition…" and the Iran war is "serving as a significant turning point" for South Korea to shift to domestic energy resources in renewable energy and displace the economy's exposure and dependence on imported oil.[239]

Most of South Korea's renewable targets predated the crisis, including a target of 100GW renewable energy capacity that would generate 20% of Korea's electricity demand by 2030 – a target that would see renewable energy capacity treble from current installed capacity of 37GW – and phase out coal in the electricity market by 2040. However, the pace and political urgency of this transformation have shifted sharply. A supplementary budget allocated KRW 500bn to the energy transition in April 2026, funding grid infrastructure upgrades and increasing overall annual support for renewable energy projects to a record KRW 1.1tn (US$670m).[240]

April 2026 saw South Korea's Financial Services Commission (FSC) announce it will mobilise KRW 80 trillion (US$54bn) in support of its domestic industries impacted by the US war on Iran, US tariff policies and supply chain disruptions. Of this amount, KRW 25.6 trillion will be provided through state-owned financial institutions. CEF notes this could be mobilised as an explicit finance mechanism to reward steel supply chain decarbonisation efforts in partnership with stable strategic allies, as POSCO has been evaluating with its Port Headland Iron 2Mtpa DRI proposal in the Pilbara, West Australia (refer Section 1.5).

[238] Asia Business Daily, Korea's Innovation Capabilities to Drive Economic Growth Through Clean Energy Transition, 21 April 2026
[239] CNBC, Iran war sparks 'fundamental energy transition' in Seoul toward renewables, 16 April 2026
[240] The Guardian, How South Korea plans to use the Iran crisis to spur a renewables revolution, 16 April 2026

3.3. South & East Asian Policy

Vietnam

Vietnam's steel industry has emerged as a key pillar of the country's industrialisation and economic growth, supporting major infrastructure, urban development and construction initiatives. The Vietnam Steel Association (VSA) has established a GHG emissions reduction target by 2030, aiming to reduce emissions by 43.5% from business-as-usual levels and limiting total industrial sector emissions to 86 $MtCO_2$-e.[241]

In February 2026, Vietnam approved the national Steel Industry Development Strategy, designed to develop the steel sector in line with national and international standards to meet 80-85% of domestic demand by 2030 and 85-90% of domestic demand by 2035 from sovereign capacity. To realise this ambition, the Strategy has set a roadmap to see annual steel production increase to 25-26Mtpa by 2030, 33-36Mtpa by 2035, and 75-80Mtpa by 2050.[242] The new strategy focuses on modernising technology, diversifying high-quality products, and promoting green transformation to participate more deeply in the global value chain.[243]

The Strategy aims to support the industry shifting towards high value-added steel products, including high-quality alloy steel, stainless steel, and high-strength steel for automobiles, shipbuilding, railways, renewable energy, and offshore structures. The steel sector will focus on investing in large-scale, advanced technology projects located in areas with deep-water ports, strong logistics infrastructure, and access to renewable energy sources. Strengthening value chain linkages—from raw materials and metallurgy to rolling and final consumption—is seen as essential to optimizing costs, reducing emissions, and improving competitiveness.[244]

To protect domestic producers from low-cost Chinese imports, Vietnam imposed anti-dumping levies of up to 28% on hot-rolled coil products from China in July 2025, set to remain in place for 5 years. 72% of Vietnam's hot-rolled coil imports originate from China.[245]

India

India's steel sector has both an exceptionally high emissions intensity of production, and a strong demand growth outlook as the Indian economy modernises. Even as India commissions its first EAF, India is undertaking huge investment in new BF capacity across the country. The development of a steel sector decarbonisation strategy will be critical to aligning India's steel industry with global emissions reductions targets, noting India's steel exports surged 36% in FY2026 to 6.6Mtpa, mostly to Europe.

In September 2024, the Indian Ministry of Steel published a roadmap and action plan for the decarbonisation of India's steel sector. The roadmap was updated in March 2025, providing a plan to decarbonise the steel industry and achieve net-zero emissions by 2070.[246]

In December 2025, India's finance ministry imposed a 3-year import tariff of 11-12% on steel products to curb cheap shipments from China.[247]

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[241] Transition Asia, Decarbonising Vietnam's Steel Industry: Challenges and Opportunities for a Low Carbon Industrial Future, July 2025
[242] Vietnam Government, Steel Industry Development Strategy Approved, 9 February 2026
[243] Department of Grassroot Information and Foreign Information, Vietnam, Steel industry strategy to 2050: Targeting 70 million tons of crude steel production and prioritizing green steel, 10 February 2026
[244] Vietnam Metal Recycling Forum, Green Steel – The Key for Vietnam's Steel Industry to Overcome Global Carbon Barriers, 11 February 2026
[245] Reuters, Vietnam Imposes Anti-dumping Tariff on Hot-rolled Steel from China, 07 July 2025
[246] Indian Ministry of Steel, Greening the Steel Sector in India: Roadmap and Action Plan, March 2025
[247] Reuters, India Imposes Three-year Tariff on Some Steel Products to Curb Cheap Imports, 31 December 2025

March 2026 saw researchers from Australia's CSIRO and the Indian Institute of Science successfully demonstrate a viable approach to reducing emissions from BFs by partially replacing coal with agricultural waste. Using locally sourced rice husk pellets, researchers validated sustained production of biomass-derived synthetic gas for iron ore reduction at a large-scale commercial Jindal Steel complex in India.[248]

Indonesia

In August 2025, the World Resources Institute, Indonesia's Ministry of Industry and the Institute for Essential Services Reform formulated an Industrial Decarbonisation Roadmap, aimed at aligning industry with net-zero emissions by 2050, a decade earlier than the national target of 2060.[249]

The Decarbonisation Roadmap covers nine energy-intensive subsectors: cement, iron and steel, fertilizers, chemicals, pulp and paper, textiles, glass and ceramics, automotive, and food and beverages. The nine covered sectors, under business-as-usual emissions intensities, would amount to 66.5MtCO_2-e by 2035 and 289.7MtCO_2-e by 2050. Across these subsectors 46% of emissions in the manufacturing industry come from direct energy generation, 16% from purchased electricity, and 38% from chemical processes in production and product applications.

[248] CSIRO, Austria-India Partnership Takes Step Closer to Green Steel Through World-first Use of Ag Waste in Steelmaking, 10 March 2026

[249] Ministry of Industry, Indonesian Government Prepares Roadmap for Clean Net Zero Industry by 2050, 22 August 2025

3.4. Australian Policy

Future Made in Australia

Future Made in Australia (FMIA),[250] announced in the 2024-25 Federal Budget,[251] is the Albanese government's flagship $22.7bn industrial strategy, designed to pivot Australia from a "dig-and-ship" economy to a value-adding renewable energy trade and investment superpower. This policy positions the federal government as a strategic investment partner to de-risk and catalyse private capital inflows into priority sectors for green reindustrialisation, complementing conventional market led approaches.

A pillar of the FMIA package is to position Australia as a key player in supporting the decarbonisation of global iron and steel value chains, leveraging Australia's historical dominance in iron ore production and further concentration in seaborne iron ore trade, as well as its abundance in solar and wind potential and industrial support for the production of green hydrogen.

Incentivising domestic processing using firmed renewables, the framework seeks to ensure that the economic benefits generated by Australia's reserves of key energy transition and industrial decarbonisation materials are captured onshore, supporting high wage regional jobs, future proofing Australia's participation in global iron and steel markets, generating a significant revenue and GDP boost on the current model of shipping raw ore, and critically – with steelmaking accounting for around 7-9% of global emissions – contributing to domestic and global emissions reduction targets.

The capital-intensive nature of green metals requires significant upfront investment to overcome the "green premium" – the higher cost of low-emission production using renewable energy compared to traditional fossil fuel-powered processing and manufacture, the basis of the case for strategic public capital commitments at scale.

Under FMIA's National Interest Framework, green metals are part of the Net Zero Transformation Stream, comprising industries that will make a significant contribution to the net zero transition and are expected to have an enduring comparative advantage, and where public investment is needed for a sector to contribute to emissions reduction at efficient cost.[252]

This legislative architecture is designed so that taxpayer support is targeted judiciously and rigorously toward industries where our resources endowment and green domestic and export industrial opportunities are best aligned to the national interest, embedding Australia in decarbonising global supply chains, and where private capital can be attracted at scale.

Underpinning Australia's emerging green metals industrial capabilities is the critical imperative to accelerate development and deployment of enabling firmed renewables and low- or zero-emissions technologies and infrastructure. Policies and programs directed at green iron and steel industry development are complemented by initiatives to support large industrial facilities to decarbonise their refining, processing and manufacturing operations.

Highlighted below are key funding and support measures capitalised under FMIA that directly support the emergence of a green iron and steel industry in Australia, as well as indirect financing and budget mechanisms that can support the competitiveness of a green metals industry.

[250] PMC and Treasury, Investing in a Future Made in Australia, 14 May 2024
[251] Federal Budget, Budget 2024-25: A Future Made in Australia, 14 May 2024
[252] Treasury, Future Made in Australia National Interest Framework – Supporting Paper, 14 May 2024

National Reconstruction Fund ($10bn) and Net Zero Fund ($5bn)

In November 2023, the $15bn National Reconstruction Fund (NRF) was capitalised with the purpose to facilitate flows of finance into priority areas of the Australian economy to diversify and transform Australian industry, drive sustainable economic growth and boost productivity. The NRF is Australia's sovereign investment vehicle aimed at scaling manufacturing and industrial capability.

The NRF mandate provides financing instruments including guarantees, debt and equity facilities with the ability to accept higher levels of risk in emerging technologies and industries that support Australia's strategic national interest and/or have long-term payback periods. The NRF mandate targets a return of 2-3% above the 5-year Australian Government Bond rate over the medium- to long-term, deployed into 7 priority investment areas:

1. **Value-add in resources** – including investments into activities that process, refine and use minerals in Australia including refining materials for use in battery manufacturing and technologies as well as manufacturing products and technologies to advance mineral processing, refinement and fabrication.
2. **Value-add in agriculture, forestry and fisheries** – including investments that manufacture products for use in or in connection with primary industries or process primary industry outputs into higher value goods.
3. **Transport** – including investments into the manufacture of vehicles and parts for aircraft, road vehicles, rail vehicles and ships.
4. **Medical science** – including investments into the manufacture of medical devices, medicines, personal protective equipment and vaccines.
5. **Renewables and low-emission technologies** – including investments into the manufacture of products that contribute towards renewable energy generation, transmission, distribution, or storage, energy efficiency, waste reduction and resource recovery, recycling and reducing GHG emissions.
6. **Defence capability** – including investments to support the manufacture of products that are wholly or primarily for use in or in connection with defence.
7. **Enabling capabilities** – including investments to support the manufacture of advanced technologies in additives, advanced composite materials, semiconductors, advanced integrated circuits, as well as AI, quantum, autonomous and autonomous technologies.

Through FY2025, the NRF had received 857 co-investment and partnership proposals, ultimately approving 10 investments totalling $584m were funded. By 2029, the NRF aims to deploy up to $3bn in renewables and low-emission technologies and $1bn into value-adding in resources.[253]

In September 2025, the National Reconstruction Fund reallocated $5bn of its mandate into a new suballocation, the Net Zero Fund – a dedicated pool within the NRF designed to sit alongside and build on FMIA in driving the national decarbonisation agenda.[254] The Net Zero Fund will offer highly concessional finance (targeting a lower rate of return, namely the five-year government bond rate minus 1%, in contrast to the NRF's plus 2-3%), focusing on supporting large-scale industrial facilities to decarbonise the most energy intensive aspects of their operations, improve energy efficiency, and transition to net zero, and identifying the subsectors that represent the greatest opportunity and need for decarbonisation, and those most impacted by the economy's transition.[255]

The Net Zero Fund is set to be implemented by mid-2026, with the Federal Government citing the Fund as a key initiative in its program of multibillion dollar investments into green metals, alongside the FMIA Innovation Fund and the Green Iron Investment Fund, detailed below.[256]

[253] NRF, 2024-25 Annual Report, 06 November 2025
[254] DISR, New $5bn Net Zero Fund will Accelerate Australia's Industrial Decarbonisation, 18 September 2025
[255] DISR, New Zero Fund Finalises Design, 04 February 2026
[256] DISR, Green Metals, 2026

FMIA Innovation Fund – Green Metals Priority Fund ($750m)

Launched in December 2025, the $750m Green Metals Priority Fund is a dedicated capital pool under the FMIA Innovation Fund to accelerate pre-commercial innovation, demonstration and deployment of low-emissions technology across the green metals sectors of iron, steel, alumina and aluminium, supporting pathways to proving, scaling and deploying FOAK solutions development.[257] The Fund aims to accelerate or enable FID on commercial-scale green metals production.

Administered by the Australian Renewable Energy Agency (ARENA), the Green Metals Priority Fund operations across two streams:

- **The Innovation Stream** supports early stage activities including prototyping, pilots, pre-commercial demonstrations, small-scale deployment and studies including feasibility and Front-End Engineering and Design (FEED).
- **The Deployment Stream** supports technology scaling where outcomes have been demonstrated at small scale but require validation at commercial scale.

Projects must contribute to one or more defined program outcomes, including evaluating and demonstrating innovation in iron and steelmaking processes, technologies, and equipment for green iron and steelmaking in Australia. A further purpose of the Fund is to fund targets projects that "research, demonstrate and scale the use of Australian iron ores in green iron and steelmaking" as a key outcome, pointing to the structural challenge of limited capabilities of existing low-emission iron and steel technologies to utilise Australia's predominantly low-grade, high-impurity hematite and goethite ores in green iron and steel value chains. The fund is open and ongoing, allowing a continuous pipeline of innovation, with the first projects under the scheme yet to be announced.

Green Iron Investment Fund ($1bn)

The $1bn Green Iron Investment Fund (GIIF), managed through the Department of Industry, Science and Resources (DISR), is administered via two deployment streams.[258] The National Development Stream, with a budget allocation of at least $500m, is designed to provide substantial grants to early movers capable of proving commercial-scale viability by 2031, to help Australia secure early positioning in the burgeoning global low-carbon iron and steel market.[259]

The GIIF grants cover up to 25% of eligible project expenditure, acting as a critical bridge over the "valley of death" between pilot-stage innovation and commercialisation. To qualify for support under the GIIF, existing facilities and greenfield projects must focus on capital works such as the construction and commissioning of green iron production facilities that utilise processing pathways with a Technology Readiness Level (TRL) of 7 or higher, meaning a system/process prototype has been demonstrated in an operational environment with a clear path to commercial operation.[260]

To ensure the program facilitates the unlocking of substantial private capital into Australia's green iron opportunity, the remaining 75% of project capex must be funded by the applicant. This can include other government funding, however, total government grant contributions across all levels (commonwealth, state and local) cannot exceed 65% of total eligible project expenditure.

Applications closed in February 2026 with a competitive assessment process now underway.

The second stream allocates up to $500m Whyalla Steelworks, highlighting the government's commitment to regional green reindustrialisation and the potential of Whyalla to be revitalised as a key hub in the steel decarbonisation value chain (with allocation of the funding contingent on a new owner being identified through the administration and sale process).

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[257] ARENA, FMIA Innovation Fund Priority, Green Metals, December 2025
[258] PMC, Media Release: Albanese Government Building Australia's Green Future, 20 February 2025.
[259] Australian Government, Grants to Support the Growth of Australia's Green Iron Industry, February 2026
[260] ARENA, FMIA Innovation Fund Program Guidelines, December 2025

Hydrogen Production Tax Incentive

The $6.7bn Hydrogen Production Tax Incentive (HPTI) provides an uncapped $2 per kilogram tax incentive for renewable hydrogen produced between 2027-28 and 2039-40.[261] The incentive is structured to provide temporary support for up to ten years per project, enhancing project feasibility and offering long-term revenue certainty that grants do not provide, enabling producers to sign long-term offtake agreements with buyers.[262]

The incentive is designed to effectively bridge the price gap between grey hydrogen (produced through the reformation of methane gas) and green hydrogen (produced from renewably-powered electrolysis), potentially helping to make green iron produced using hydrogen based-DRI economically competitive in Australia.

To be eligible, hydrogen must be produced with an emissions intensity of less than 0.6 $kgCO_2$-e/kg-H2, have a minimum capacity of 10MW, and reach FID before July 2030. Importantly, the offset is refundable, meaning eligible companies can receive a cash payment even where they have no existing tax liability, making it accessible to early-stage producers.

The HPTI will be jointly administered by the ATO and the Clean Energy Regulator (CER).

Hydrogen Headstart

The $4bn Hydrogen Headstart Program, administered by ARENA under the FMIA framework, provides revenue support for large-scale renewable hydrogen projects by bridging the commercial gap between the cost of producing renewable hydrogen and its current market price for first mover projects.[263] The program does not support smaller or mid-sized projects with eligibility requiring deployment of at least 30MW of electrolyser capacity at a single site. Green metals including green iron are explicitly identified as a priority use case for the program, alongside ammonia, methanol, and long-distance transport.

Payments made under the Hydrogen Headstart program are reduced by ARENA to reflect any hydrogen production tax offset that a company has received. The program has a total commitment of $4bn across two rounds. Round 1 had concluded, and in 2025 awarded Headstart to:

- Copenhagen Infrastructure Partners' (CIP) 1.5GW Murchison Green Hydrogen Project in Kalbarri, WA. ARENA awarded $814m to CIP.[264]
- Orica's 50MW Hunter Valley Hydrogen Hub in Newcastle, NSW. ARENA awarded $432m to Orica.[265] Origin Energy also withdrew as project partner in 2024.

Round 2, with a further $2bn available, opened for expressions of interest in October 2025, with the stated aims of accelerating development of Australia's hydrogen industry; catalysing clean energy industries and helping Australia connect to new global hydrogen supply chains.

The first two recipients, Murchison and the Hunter Valley Hub, are green ammonia projects. We note that the Hydrogen Headstart program is end-use agnostic, with no requirement that renewable hydrogen development supported under the program be deployed in the production of green iron. The Hunter Valley Hub will initially displace only 7.5% of the gas used by Orica in ammonia production, with plans for further expansion. Murchison is designed to produce renewable hydrogen and green ammonia for export to Asian markets.

CEF acknowledges the proximity of the Murchison proposal to Port Hedland, the world's largest bulk export hub, and the potential to use low-emissions ammonia to decarbonise shipping lanes of

[261] DISR, Media Release: Production Tax Credits Pass the Senate, 10 February 2025
[262] DCCEEW, Tax Incentive to Drive Investment in Renewable Hydrogen, 25 November 2024
[263] DCCEEW, Hydrogen Headstart Program, 22 January 2026
[264] ARENA, Murchison Green Hydrogen Project Given a Headstart, 20 March 2025
[265] ARENA, ARENA backs Hunter Valley Renewable Hydrogen Project with $432m, 04 July 2025

Australian exports. However, the decision to delay the adoption of the International Maritime Organisation's (IMO) Net Zero Framework's baseline-and-credit GHG emissions pricing mechanism as a result of the US' regression and dismantling of climate action domestically and internationally has effectively nullified the economic viability of hundreds of ammonia and methanol projects globally. If adopted, the Net Zero Framework would have seen the introduction of a marginal price on emissions of US$380/t$CO_2$-e – by far the highest price on carbon internationally.

The deployment of the majority of Round 1 funding to an export-oriented ammonia proposal for shipping decarbonisation without offtake contracts secured does little to help facilitate and catalyse demand for hydrogen derivatives in the industries with the most viable pathways to commercialisation.

CEF believes the program eligibility criteria, as currently defined, do not reflect the lowest opportunity cost for the deployment of this strategic public capital. Future rounds of Hydrogen Headstart should be allocated to Australia's premier multi-hundred-billion-dollar future-facing industry opportunity in the net zero economy of green iron. If Australia wants to lead the world in establishing a green iron trade it needs to start prioritising projects that will produce green hydrogen for ironmaking or risk losing out to other countries.[266]

Rewiring the Nation ($20bn)

The $20bn Rewiring the Nation (RtN) program is spearheaded by the Clean Energy Finance Corporation (CEFC) to develop a secure, reliable and low-cost electricity system across Australia. In August 2023, the Australian Government and WA Government announced a letter of intent for up to $3bn in concessional financing through the RtN to leverage private investment into transmission and distribution networks and enabling infrastructure to underpin decarbonisation across the state and crowd-in industry investment into the region.[267] The provision of concessional financing arrangements through the RtN includes non-market characteristics such as alternate risk positions, lower finance costs, deferred payment arrangements and longer loan tenors.

Analysis commissioned by the CEFC identified a common user infrastructure (CUI) approach in the Pilbara will require 29% less new transmission kilometres, saving an estimated $4bn in new transmission capex over 25 years than if industry adopted a go-it-alone approach.[268] Furthermore, the analysis identified that a CUI approach would:

- Require 21% less land than a go-it-alone approach.
- Require 16% less renewable energy generation and storage capacity, representing savings as much as $26bn to 2050.
- Reduce diesel fuel consumption by 2.8-3.6 billion litres pa, saving $4.2-5.3bn in operational expenditure annually. The displacement of methane-gas based electricity generation would also save a further $2.2bn pa. Combined, this displacement would avoid 24Mtpa CO_2-e in the Pilbara.

Over the 25 years to 2050, the cost of transmission in the $14.7bn go-it-alone model was forecast to be $4bn, or 40%, higher than the CUI approach of $10.5bn. The capital cost of generation to 2050 of $131.6bn in the go-it-alone case would be 25% higher than that of the $105.4bn CUI approach.

A multi-party common user approach will attract lower cost of funding infrastructure capital than would bespoke go-it-alone solutions. This capital is available from global investors looking for opportunities in renewable energy and decarbonisation with appropriate returns.[269]

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[266] IEEFA, Australia Needs to Get Smarter with Green Hydrogen, 30 July 2025
[267] WA Government, $3bn Rewiring the Nation Deal to Power WA Jobs and Growth, 29 August 2023 (updated 28 May 2024
[268] Marsen Jacob Associates, Common User Transmission and Decarbonising Pilbara Energy Demand, September 2025
[269] CEFC, Investment Insight: Electrifying the Pilbara, September 2025

A key example of industry partnerships accessing lower-cost infrastructure capital for the deployment of enabling energy infrastructure in the Pilbara was the December 2025 transaction between BHP and Blackrock-backed **Global Infrastructure Partners** (GIP).[270] GIP and BHP established a trust entity, with GIP investing US$2bn for a 49% stake in the trust. BHP will pay the entity a tariff linked to BHP's share of WAIO's inland power over a 25-year period.

Western Australia: State Development Act

Developed from the WA Government's newly legislated State Development Act, the creation of State Development Areas (SDAs) aims to fast track industrial precincts and developments to diversify the WA economy.

The NeoSmelt joint venture has been named a priority project, which will benefit from further support by the State Development Act's Western Trade Coast. The Western Trade Coast is a key industrial precinct, generating $20bn in annual contributions to the State's economy and supporting 43,000 jobs, covering the Strategic Industrial Areas of Kwinana, Kemerton and Henderson – set to become the largest naval maintenance and shipbuilding precinct in the southern hemisphere.

The new State Development Act establishes clear objectives for industrial precincts and activates powers with the Coordinator General to become the central point of oversight, enabling better coordination of planning, infrastructure and approvals across government.

This is supported by a $90m allocation in the 2026-27 State Budget to enable key industrial hubs, inclusive of $45.2m for land assembly at Latitude 32, $11.3m into Kemerton SIA for land assembly and water supply studies, and $27.1m into Boodarie SIA in the Pilbara for water supply studies and design works on infrastructure corridors.[271]

South Australia: Whyalla Rescue Package

When the Steelworks was forced into administration in February of 2025, 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, $32m 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.[272]

Following this, in February 2026, the SA Government announced a binding term sheet with Santos for the long-term supply of methane gas to supply the Whyalla Steelworks potential future DRI facility following the completion of the current administrative process. The term sheet consists of a 10-year supply for 20 petajoules (PJs) per annum from 2030 (200PJ total), delivered from the Cooper

[270] BHP, BHP Enters into a US$2bn Infrastructure Agreement with GIP on WAIO Power, 09 December 2025
[271] WA Government, Cook Government to Fast-track Key Industrial Precinct and Projects, 16 April 2026
[272] SA Government, State Budget 2025-26: Supporting Whyalla, 04 June 2025

Basin ex-Moomba gas plant.[273] First gas will flow from 1 March 2030, coinciding with the expiry of Santos' Horizon contract with the GLNG venture in Gladstone.

The supply agreement established SA's State Strategic Gas Reserve, representing a third of total gas production in the Cooper Basin and just below a third of SA's 63PJ annual gas consumption. Gas supply will be delivered on a fixed-price prepayment structure with indexation. The transaction is subject to agreement of a full gas supply agreement by 30 June 2026.

In March 2026, the Malinauskas Labor Government established the SA Gas and Water Trust to de-corporatise SA Water and provide methane gas to projects in mining, data centres, manufacturing, energy and agriculture. As part of the Gas and Water Trust, the Malinauskas Government will direct taxpayer funds to the expansion of the Whyalla lateral methane gas pipeline's connection to the Moomba-Adelaide Pipeline (MAPS).[274]

CEF has strongly advocated against embedding gas as "transition" fuel in Whyalla, urging a re-evaluation of the cost and risks, and noting that gas is not the solution, in the interim and in the long-term, particularly where 50 year life gas pipeline infrastructure needs to be built to enable the methane gas use. Domestic gas prices in Australia make it uneconomic, while a "gas-led" transition is incompatible with Australia's decarbonisation and climate ambitions.[275]

[273] Santos, Santos Agrees Key Terms with South Australian Government for 200PJ of Gas Over 10 Years from 2030, 20 February 2026
[274] SA Government, SA Gas and Water Trust, 04 March 2026
[275] CEF, A Strategy for Whyalla, Enabling the Transformation and Decarbonisation of the Steelworks, 17 November 2025

Section 4. Carbon Pricing Developments in Key Green Iron Production and Supply Markets

Since 1990, when Finland, Sweden and Norway introduced the world's first national carbon taxes to 2024, carbon pricing mechanisms have generated a cumulative US$763.9bn in revenues, and US$102.2bn in 2024 alone. Through 2024, carbon taxes and ETSs have effectively contributed equally to cumulative carbon revenues. In 2024, the EU, German, Californian, UK and US subnational (RGGI) ETSs contributed 94% of the US$69.1bn in revenues generated from ETSs, with the Canadian Federal Fuel Charge, French, Swedish and British Columbian (Canada subnational) carbon taxes generating the majority of the US$33.1bn in carbon tax revenues globally - see Figure 4.1.[276]

Figure 4.1: Historical Global Carbon Pricing Revenues

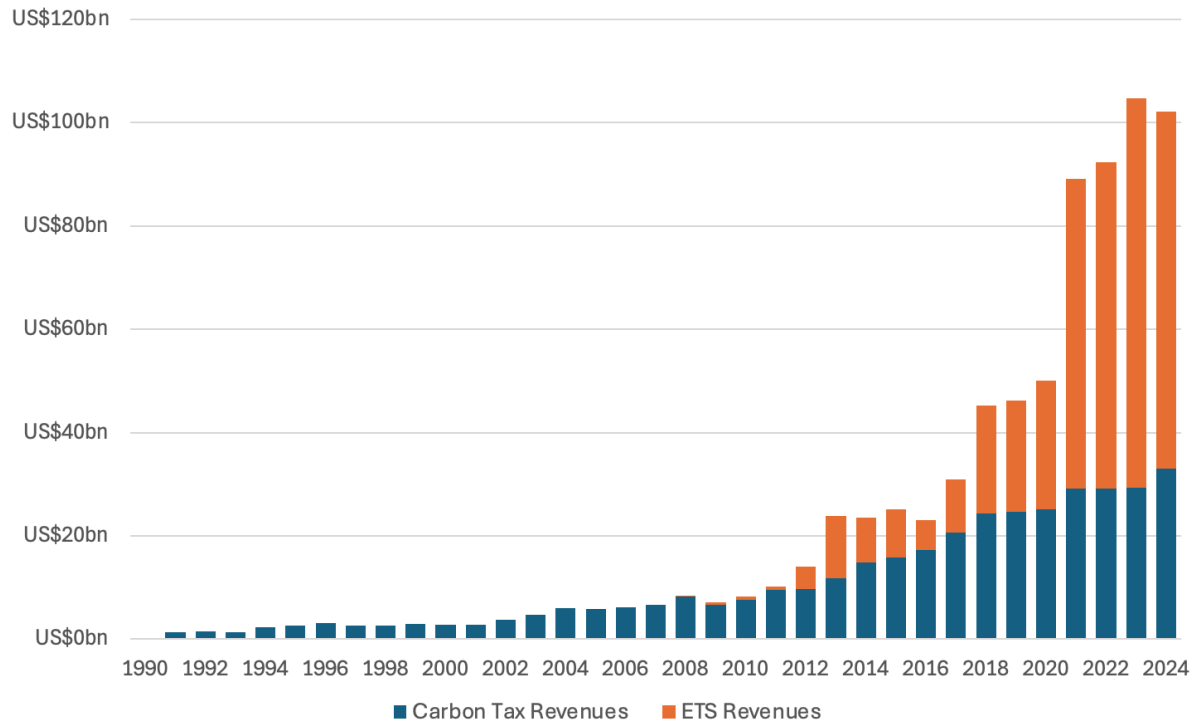

Chart: Climate Energy Finance
Source: World Bank [277]

41 carbon pricing mechanisms are now in force as of 2026 across the world, with a further 16 under development or consideration, primarily in middle-income economies. Existing systems continue to improve in strength and depth: tightening caps, refining allocation methods, extending coverage to further sectors. 14 billion tCO_2-e emissions annually are now covered by some form of ETS, equivalent to 26% of global GHG emissions, with 80% of those captured emissions in the Asia Pacific.[278] We have seen significant expansions of carbon pricing mechanisms across the Asia Pacific in 2025 and into 2026, with emerging and developing economies across the Global South outlay the critical enabling policy architecture for carbon prices that can catalyse the needed investment into iron and steel decarbonisation at the epicentre of global production.

[276] World Bank, State and Trends of Carbon Pricing 2025, 10 June 2025
[277] World Bank, State and Trends of Carbon Pricing 2025, 10 June 2025
[278] ICAP, Emissions Trading Worldwide: ICAP Status Report 2026, 14 April 2026

4.1. EU ETS and CBAM

Since the start of 2024, the EU ETS has seen sustained positive growth in the European allowance price, surpassing €80/tonne into 2026. The largest development in global carbon pricing in 2026 will be the implementation of the critical carbon border adjustment mechanism (CBAM) of the EU ETS. After a three year transition period, from 1 January 2026 the EU CBAM has taken effect, covering iron and steel, aluminium, cement, fertilisers, all hydrogen imports and imported electricity.

The most established ETSs introduced globally – the EU, UK, and German ETSs – all have a primary market in which auctions are held between the regulator and market participants to purchase emissions allowances, credits that provide the emitter the ability to emit a tonne of GHG emissions. However, these ETSs, as well as the China national ETS and Korean K-ETS, provide production-adjusted free allowances to industrial emitters and sectors that are trade-exposed or at high risk of carbon leakage from imports. As a result, industrial emitters, such as iron and steel producers, remain shielded from effective carbon prices, nullifying the policy mechanism to drive decarbonisation.

The EU CBAM addresses the risks of carbon leakage for domestic producers within trade-exposed, emissions-intensive industries. The EU CBAM provides the mechanism to verify embedded carbon emissions of specific goods imported into the EU, imposing an equivalent carbon price to bridge the gap between any carbon prices paid prior, and the carbon price that is paid by a domestic producer of the same product. Such a mechanism allows for the phase-out of the temporary measures of free allocation of allowances to trade-exposed industrial emitters in the EU, with the proportion of freely distributed allowances falling in line with the share of emissions covered for imported goods. In 2026, the rate of free allocation for domestic producers will fall by 2.5%, meaning an effective 97.5% proportion of free allocation. The rate will progressively ratchet up until no producer receives freely distributed credits by 2034.

Iron and steel imports into the EU account for the majority of EU CBAM-covered commodities, accounting for 69% and 66% of volume and value of covered imports respectively - see Figure 4.2.

Figure 4.2: Distribution of CBAM-Covered Imports to EU by Quantity and Value

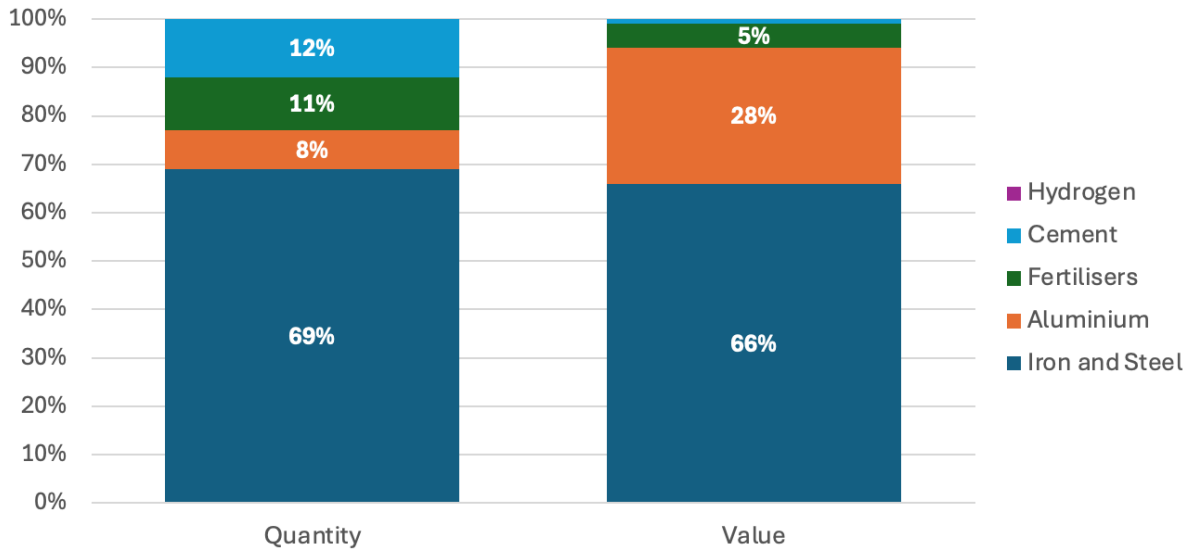

Chart: Climate Energy Finance
Source: BloombergNEF (2026)

As a result, the EU CBAM provides the policy mechanism to not only accelerate decarbonisation of domestic producers of emissions-intensive commodities, but also provides the policy certainty to incentivise exporters of such products to decarbonise their export-oriented emissions-intensive industries.

China is by far the largest exporter of CBAM-covered commodities into the EU and UK, exporting US$16.8bn worth of iron and steel, aluminium, fertilisers, cement, and hydrogen. However, CBAM-covered exports account for just 0.5% of China's trade. Other key Asian iron and steel producers have similar trade exposure profiles to China, with CBAM-covered exports from South Korea, Vietnam, Taiwan, and India accounting for 0.7%, 0.8%, 0.9% and 1.6% of trade respectively - see Figure 4.3.

Figure 4.3: CBAM-Covered Exports to EU and UK and Trade Exposure, 2024

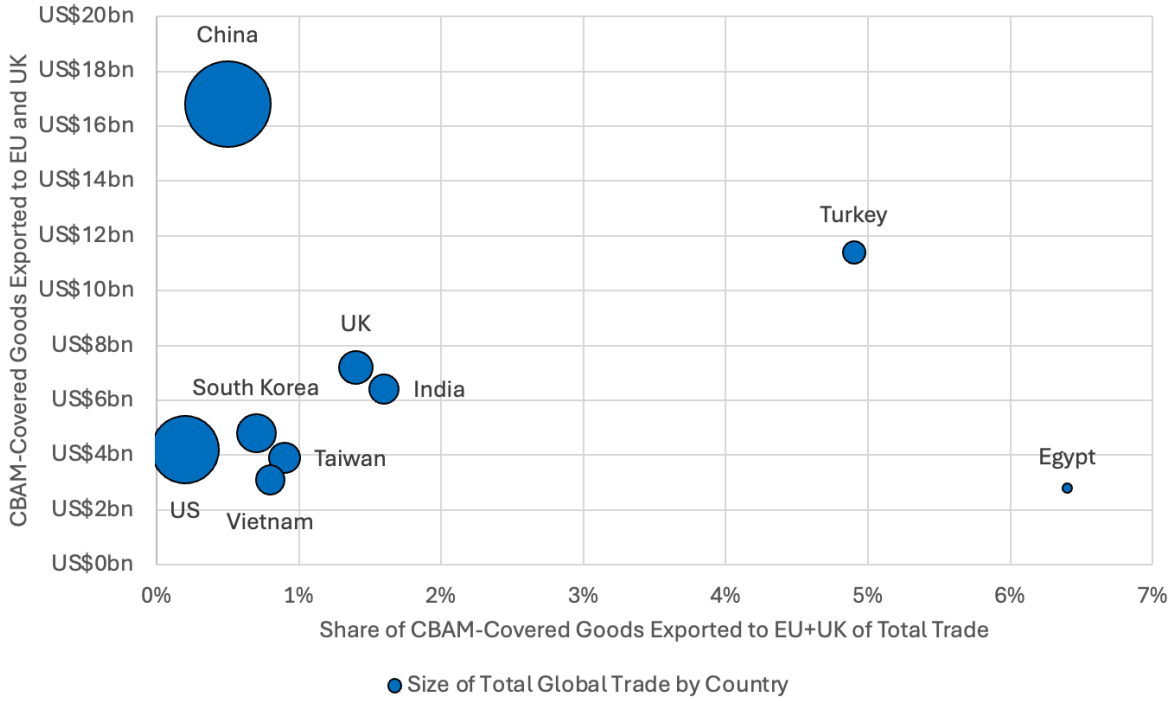

Chart: Climate Energy Finance
Source: BloombergNEF (2026)

But this has already seen shifts in emissions monitoring, reporting, verification, and investments into structural transformations of iron and steel production in key export facilities. In July 2025, China's HBIS Group signed its first commercial contract to export 10,000 tonnes of hydrogen-reduced steel to Italy. The produced steel has a claimed 50% lower carbon footprint compared to a traditional BF-BOF carbon intensity, produced on Danieli's Energiron DRI platform. The shipment will be accompanied by an internationally recognised and audited Environmental Product Declaration (EPD). Critically, the monitoring, reporting and verification of embodied emissions of the shipment and production facility mean the exports to Italy would meet CBAM compliance criteria, significantly lowering the border carbon adjustment penalty relative to the default emissions value placed upon Chinese iron and steel exports.[279]

[279] FuelCellsWorks, China's HBIS to Export 10,000 Tonnes of Hydrogen-Reduced Green Steel to Italy, 25 July 2025

4.2. China ETS

China's national ETS began operating in 2021 as a regulated cap-and-trade mechanism. Like most policies in China, the nation implemented the mechanism with 'Chinese characteristics', primarily that the ETS is configured as a bottom-up, facility-level, intensity-based emissions cap, with the cap dependent on production, or more specifically, electricity generated from thermal power plants – effectively operating as a facility-level baseline mechanism. This is in contrast with EU ETS, the most established cap-and-trade mechanism, which introduces an enforceable cap on total emissions, reducing linearly over time.

In August 2024, China's State Council signalled this could change in its publication of 'Accelerating the Construction of Notice on the Work Plan for the Carbon Emission Dual Control System', proposing the implementation of a new mechanism for the comprehensive transformation from dual control of energy consumption to dual control of carbon emissions, in which both the total volume of emissions and emissions intensity per unit of GDP baselines will be used to accelerate the green transformation.[280] Professor Boqiang Lin of the China Institute for Studies in Energy Policy highlighted China's energy and climate developments in 2025 will focus on advancing its dual-carbon goals through several key initiatives.[281]

On 20 October 2025, secondary market prices hit a record low of CNY 38.5/t (US$5.65/t). Since then, secondary market prices have rallied consistently, closing out 2025 at CNY 75.8 (US$11.12/t), rising 97% in just 2 months. Secondary market prices averaged CNY 71.97/t (US$10.56), the second highest average behind CNY 92.46/t (US$13.56/t) in 2024 – Figure 4.4.

Figure 4.4: China National ETS Secondary Market Prices (CNY/t)

Chart: Climate Energy Finance
Source: International Carbon Action Partnership (2026)

March 2025 saw China's Ministry of Ecology and Environment (MEE) release a work plan to expand its carbon trading market to include the steel, cement and aluminum smelting industries by end 2026. The expansion adds 1,500 enterprises to the carbon trading market covering an additional 3 billion tonnes of carbon dioxide equivalent annually, taking coverage to 60% of the national total.[282]

[280] General Office of the State Council, Notice on Issuing the Work Plan for Accelerating the Establishment of a Dual Control System for Carbon Emissions, 02 August 2024
[281] Carbon Brief, 2025 Government Policies; China's First Energy Law; What to Watch, 09 January 2025
[282] Xinhua, China expands carbon trading market to steel, cement, aluminum smelting sectors, 27 March 2025

4.3. Korea K-ETS

Launched in 2015, the Korea ETS (K-ETS) was Asia's first national compliance ETS, and the second national ETS adopted globally, behind the EU. The K-ETS covered ~78% of Korea's annual GHG emissions, covering 813 entities across power, industrial, buildings, waste, transport, domestic aviation and maritime in 2025.

Through 2025, the K-ETS secondary market prices for emissions allowances were just KRW 9,393 (US$6.40), the lowest annual price in the ETS' history, and down 69% from their annual average high in 2020 of KRW 30,164 (US$20.56) - see Figure 4.5. The 2025 average K-ETS price was 1% lower than averages in 2024 – previously the lowest average in the K-ETS history.

Figure 4.5: K-ETS Secondary Market Prices (KRW/t)

Chart: Climate Energy Finance
Source: International Carbon Action Partnership (2026)

In November 2025, the South Korean Government announced its 2035 NDC target to reduce GHG emissions by 53-61% compared to 2018 levels of 742MtCO_2-e. To support the nation's new 2035 NDC targets, South Korea approved the National Emission Allowance Allocation Plan for the 4th phase of the K-ETS in November 2025, covering allocations from 2026 to 2030.

In its 4th phase over 2026-2030, the K-ETS has set a total emissions cap of 2,537MtCO_2-e, divided into 2 sectors: power generation and non-power.[283] The total cap over the fourth phase represents a 15.7% reduction from the aggregate cap of the third phase of the K-ETS from 2021-2025. For the power sector, the K-ETS will see the paid allocation to free allowance ratio gradually increase to 50% by 2030 (2026: 15%, 2027: 20%, 2028: 30%, 2029: 40%). For the non-power sectors, in particular emissions-intensive industries with high export profiles – accounting for 95% of the industrial sector – will maintain 100% free allocation through this phase. The remaining 5% of the industrial sector that will not receive trade-exposed adjustments will see a sectoral paid allocation ratio rise from the current 10% to 15% by the end of the fourth phase.

[283] Korean Ministry of Climate, Energy and Environment, 2035 NDC and Fourth Emissions Trading Allocation Plan Finalised at Cabinet Meeting, 11 November 2025

Industries that will maintain 100% free allowances under the K-ETS though 2030 include iron and steel, nonferrous metals, petrochemicals, cement, oil refining, semiconductors, secondary batteries, paper manufacturing, glass, rubber and plastics, pharmaceuticals, and grain processing.

The free allocation of allowances is a major headwind to decarbonisation, and continues to massively undermine the effectiveness of the K-ETS at driving emissions reductions, showing an ongoing lack of political will to provide any effective market price signal. The K-ETS's free allocation to the industrial sectors, coupled with the lenient cap from excessive emission allowances distributed, has led to significant revenues generated from the sale of free permits on the secondary market. This practice has translated to a significant rightward shift to the supply curve in the secondary market, undermining the policy intent and pushing traded allowance prices to new record lows in 2025.

The EU is the third largest export destination for South Korea and accounts for around 10% of total exports. About 12% of South Korea's exports of CBAM products go to the EU, with exposure mainly concentrated in iron and steel.[284] CEF expects the formalisation of the EU CBAM from 2026 to act as a catalyst for a lifting of climate ambition in South Korea's steel industry to avoid being priced out of a key export market.

4.4. Japan GX-ETS

In April 2010, The Tokyo Metropolitan Government launched the Tokyo Cap-and-Trade Program, Japan's first compliance ETS. Following the Tokyo ETS, Japan introduced a national voluntary baseline-and-credit ETS, the GX-ETS, in April 2023. The GX-ETS has been operating in its pilot phase since October 2023, with the initial phase of the GX-ETS operating until March 2026.

On 01 April 2026, Japan's GX-ETS officially entered into its second phase – transforming the GX-ETS into a national mandatory ETS following a three-year voluntary period from FY23-25. The first phase of mandatory participation will run from FY26 to FY32. The voluntary period covered more than 700 emitters responsible for over 50% of Japan's national GHG emissions.

The new mandatory ETS operates as a baseline-and-credit mechanism, with its absolute cap determined from a production-adjusted bottom up method – analogous to that of Australia's Safeguard Mechanism (discussed below). The mandatory GX-ETS captures facilities that produce annual emissions of at least 100,000tpa CO_2-e, which will cover an estimated 300-400 entities.

In December 2025, METI published a proposed price ceiling and price floor for the second phase of the GX-ETS. The proposed benchmarks would see a JPY 1,700/t (USD 10.76/t) floor and JPY 4,300/t (USD 27.21/t) ceiling in 2026, rising to a JPY 1,913/t (USD 12.10/t) floor and JPY 4,840/t (USD 30.62/t) ceiling by 2030 - see Figure 4.6.[285]

Figure 4.6: Proposed GX-ETS Phase 2 Allowance Price Floor and Ceiling

GX-ETS Phase 2	2026	2027	2028	2029	2030
Ceiling Price (JPY/t)	4,300	4,429	4,562	4,699	4,840
Floor Price (JPY/t)	1,700	1,751	1,804	1,858	1,913

Source: METI (2025)

[284] Carbon Market Watch, Carbon Pricing Trends in Asia, 17 December 2025
[285] METI, Proposed Upper and Lower Price Limits in the Emissions Trading Scheme, 19 December 2025

4.5. Australia Safeguard Mechanism

The Safeguard Mechanism (SGM) is the Australian Government's policy for reducing emissions at Australia's largest industrial facilities. The SGM was first introduced on 1 July 2016, requiring Australia's highest emitting facilities to keep their emissions below a baseline limit. The SGM applies to all industrial facilities emitting more than 100,000 tpa CO_2-e, covering facilities within mining, oil and gas production, manufacturing, transport and waste. The SGM applies the emissions baseline to the electricity sector via a 'sectoral' baseline mechanism, with all generators connected to each of Australia's main electricity grids collectively meeting the legislated reduction.

The SGM underwent a significant reform in 2023, with the amendments enforced from 1 July 2023. The reforms restructured the SGM as a baseline-and-credit ETS, with the legislated limits (baselines) declining predictably and gradually to assist Australia in achieving its NDC commitments of 43% emissions reduction target by 2030, relative to 2050, and net zero by 2050. To implement the gradual emissions reduction, baseline emissions ceilings will reduce annually in-line with the nation's commitment to achieving the interim emissions reduction, declining at 4.9% per annum from 2023 to 2030.

To meet compliance obligations if a facility's emissions in a compliance period exceeds that of their baseline, captured entities must surrender federally-regulated credits to reduce gross emissions to their baseline. Facilities can surrender Australian Carbon Credit Units (ACCUs) – tradable financial products generated through eligible carbon abatement projects ranging from reforestation to energy efficiency schemes – and/or Safeguard Mechanism Credits (SMCs) – generated when Safeguard facilities gross emissions are below that of their baseline. Similarly to ACCUs, SMCs are tradable credits, designed to incentivise facilities to reduce their emissions beyond their baselines. SMCs can be banked by Safeguard facilities to meet future baseline obligations, or sold on the Unit and Certification Registry to facilities that require SMCs to meet their current baseline obligations.

ACCUs and SMCs averaged ~A$35/t (USD 25/t) through 2025, closing out the year at ~$36.6/t (USD 26/t) - see Figure 4.7.[286] Prices have sustained in the first quarter of 2026, closing out March 2026 at ~$36 for both ACCUs and SMCs.

Figure 4.7: Australian SGM Compliance Credit Prices

Source: Clean Energy Regulator (2026)

[286] CER, Quarterly Carbon Market Report December 2025, 10 March 2026

Analogous to the designs of the EU ETS and K-ETS, Australia's SGM has concessions for covered facilities whose main product is trade exposed and faces an elevated risk of carbon leakage. Under SGM rules, trade-exposed baseline-adjusted (TEBA) facilities have reduced baseline reduction targets for 3 years based on an assessment of the cost impact of the SGM on a facility relative to the facility's revenue in a financial year. For TEBA facilities, the baseline reduction is 1% pa.

The 2024-25 compliance period of the SGM sees industrial emitters that have received TEBA concessions have total baseline reductions of just 2%, well below that of the benchmark 9.8% reduction.

Australia's iron and steel producers, as well as Australia's alumina, aluminium, and fertiliser producers have received full TEBA concessions in the first two years of compliance following the 2023 reforms - see Figure 4.8.

Figure 4.8: Facilities with Full SGM TEBA Concessions for EU-CBAM Sectors, 2024-25

Facility	Company	Product	Baseline ($ktCO_2$-e)	Gross ($ktCO_2$-e)
Port Kembla Steelworks	BlueScope	Iron and Steel	6,351	6,062
Whyalla Steelworks	GFG Alliance	Iron and Steel	839	1,288
QLD Alumina	Rio Tinto	Alumina	2,814	3,170
Yarwun	Rio Tinto	Alumina	1,911	2,045
Kwinana Alumina	Alcoa	Alumina	100	140
Bell Bay Smelter	Rio Tinto	Aluminium	350	341
Boyne Smelter	Rio Tinto	Aluminium	921	944
YPF	Yara	Fertiliser	1,680	1,638
Phosphate Hill	DynoNobel	Fertiliser	466	472

Source: Clean Energy Regulator (2025)

Carbon Leakage Review

In March 2023, the Australian Government announced it would undertake a review of carbon leakage as part of the introduction of the reformed SGM, conducted by Australian carbon pricing expert Professor Frank Jotzo.

The Jotzo Review identified that multilateral and plurilateral initiatives to address carbon leakage are ideal, in particular an internationally agreed approach for a CBAM. "Whilst some international initiatives focused on carbon leakage are prospective, consensus or broad-based agreement on any international solution will take time to develop and will not replace the need for domestic policy action in the short- and medium-term."

The Review identified value in deepening collaboration with like-minded trade and climate partners, and the role Australia can play in the global landscape to support the development and implementation of commonly accepted and interoperable approaches.

In February 2026, DCCEEW published the final Carbon Leakage Review following multiple rounds of consultation, a year after the Review was finalised.[287] The number one recommendation of the Carbon Leakage Review was for an Australian border carbon adjustment to be introduced for a select group of commodities that have a particular risk of carbon leakage, including cement and clinker, lime, hydrogen, ammonia, iron and steel, and glass.

Should the Federal Government adopt the recommendations of the Carbon Leakage Review, Professor Jotzo outlined that an Australian CBAM should:

- Mirror domestic emissions policy settings for imports to provide a level playing field. As a result, the liability should be assessed on Scope 1 emissions above benchmarks set in line with Safeguard Mechanism baselines and effective carbon prices embodied in imported products.
- **Remove TEBA concessions for commodities and facilities once a CBAM is fully implemented.**
- Introduce measurement, reporting and verification requirements for a CBAM that minimise administrative burdens on importers and exporters.

The Review also urged the Federal Government to actively engage in multilateral and plurilateral initiatives that support the implementation of CBAMs, such as the development of interoperable standards and approaches to default emissions intensities or measurement, reporting and verification of embodied emissions. The Review also recommended that potential revenues generated from the introduction of border carbon adjustments could, in part, be directed towards capacity building in trade partner developing countries of emissions monitoring, reporting and verification.

Safeguard Mechanism Review 2026-27

In 2026-27, the Federal DCCEEW will undertake a review of the Safeguard Mechanism. The 2026-27 review will be based on the first two years of Safeguard's operation since the 2023 reforms: 2023-24 and 2024-25.[288] The review is designed to assess the scheme's design and appropriately calibrate various dynamics of the scheme's operations to ensure it is effectively contributing towards Australia's emissions reductions targets. The Federal Government have signalled the scope of the review will include:

- Safeguard emissions baseline decline values.
- Consideration for the potential integration of international credits into compliance obligations.
- The suitability of the Safeguard Mechanism's arrangements for emissions-intensive, trade-exposed facilities.
- The role and importance of manufacturing in providing sovereign manufacturing capability, with a key focus on capabilities that support national decarbonisation investment.
- The impact of integrating a carbon border adjustment mechanism.
- The commercial readiness and viability of technology to reduce emissions from manufacturing.
- The carbon efficiency of these facilities when compared to that of competing import facilities.
- The progress of international commitments and policies to reduce emissions.
- The sufficiency of the cost containment measure.
- The treatment of flexibility mechanisms beyond 2030, including the use of banking and borrowing of baselines and multi-year monitoring periods.

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[287] DCCEEW, Australia's Carbon Leakage Review, 13 February 2026

[288] Federal Register of Legislation, National Greenhouse and Energy Report (Safeguard Mechanism) Amendment (Reforms) Rules 2023 - Explanatory Statement, Attachment B, 05 May 2023

- The use of SMCs and offsets beyond 2030, noting these credits provide a significant incentive for investment in onsite abatement.
- The coverage arrangements and the potential to expand the scope and depth of the Safeguard Mechanism, taking into account competitiveness issues, abatement potential, and regulatory compliance.

The Climate Change Authority (CCA) will also advise the government on the extent to which onsite abatement is being driven by the 2023 reforms, and determine whether additional policy incentives are required. DCCEEW have signalled this may include adjustments such as discounting the abatement value of ACCUs when used under Safeguard mechanism compliance above a certain percentage of a baseline, or other mechanisms that limit the surrender of ACCUs.

The review of Safeguard Mechanism in 2026-27 is a critical opportunity for improvement in the scheme's design and efficacy. Prior to the 2023 reforms of Safeguard that significantly improved the scheme through re-adjustments of baselines and the introduction of annually reducing baselines, DCCEEW undertook rounds of reviews and consultations with stakeholders in 2022-23.

4.6. South & East Asia Carbon Pricing

Vietnam ETS

Vietnam's national carbon market began with a pilot phase from 2025 to 2028 and full operations will commence auctioning permits from 2029. The pilot covers 34 thermal power plants, 25 iron and steel facilities and 51 cement plants, collectively responsible for half the national emissions, but with free permits. This is a core strategy under Vietnam's Net Zero by 2050 pledge, and is a key response to the fact that the EU represents ~12% of Vietnam exports, with steel and aluminium as key export exposures.[289]

January 2026 saw the government issue Decree No. 29/2026/ND-CP, which officially established the regulatory architecture for the domestic carbon trading exchange, , with the Hanoi Stock Exchange expected to launch formal trading in late 2026.[290]

Singapore Carbon Tax

January 2026 saw Singapore's carbon tax increase to S$45/$tCO_2$-e, up from S$25/tCO_2-e in 2025. This rate is expected to remain through 2027 before rising towards S$50–80 by 2030. Whilst this is stepping up the market price signal on carbon pollution, the majority of emissions are still given transitional allowances and rebates. Rather than simply collecting the tax, Singapore "recycles" the revenue through the High-Emissions Intensity Grant to support corporates' energy efficiency investments.[291]

India's Carbon Credit Trading Scheme (CCTS)

March 2026 saw the official launch of the Indian Carbon Market Portal, with official trading in carbon credit certificates due to commence late 2026, jointly led by the Power and the Ministry of Environment, Forest and Climate Change (MoEFCC). Initially, there are expected to be ~500 Obligated Entities across the petroleum refining, petrochemicals, textiles, aluminium, cement, chlor-alkali, pulp & paper, iron, steel, and fertiliser sectors representing >700Mtpa of carbon emissions (the power sector is excluded), in alignment with the EU CBAM. This CCTS is to be intensity-based with a cap-and-trade structure, initially with 100% free permit allocation. The Indian government plans to establish a market stabilisation fund to prevent price volatility and ensure prices do not fall below a certain floor.[292]

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[289] Carbon Market Watch, Carbon pricing trends in Asia, 17 December 2025
[290] Vietnam Briefing, Decree 29/2026: Vietnam Operationalizes its First Carbon Trading Market, 03 March 2026
[291] S&P Global, Singapore carbon credit buying to grow as 2026 tax hike looms: participants, 06 March 2026
[292] Akshay Makar, India's Carbon Market: The $7 Billion Opportunity Launching in 2026, 28 February 2026

Section 5. Opportunities and Looking Forward

The decarbonisation and electrification of the global iron and steel industry is undergoing a structural recalibration, shifting from a period of speculative optimism on the now deflated hype regarding the rapid deployment of hydrogen into a measured, phased, and evolutionary decarbonisation trajectory.

Whilst this report showcases points of decarbonisation advancing across the iron and steel value chain, in aggregate the global sector is advancing unevenly, haltingly, sporadically and at a pace that remains deeply misaligned with the speed and breadth demanded by the climate science. For every step forward on an individual project or market-level, the broader investment pipeline showcases an equal case study of project delay, cancellation, and restructure in the face of unresolved structural headwinds, with the US policy backsliding undermining global capital momentum.

The economic realities of rising infrastructure costs, slower-than-anticipated deflation of electrolyser cost curves (at least, as is evident outside of China), incoherent and unstable enabling policy architecture, sustained volatile and high fossil fuel prices globally and rising geopolitical tensions have necessitated a more considered approach to investment. The high capital intensity and energy requirements of 100% green hydrogen-based reduction showcase the importance of flexibility and operational modularity for DRI projects and highlighted the value of advancing iron and steel value chain decarbonisation through RD&D to drive learning by doing in both hydrogen and non-hydrogen pathways for iron and scaling capacity of electrified secondary steelmaking.

The interlocked imperatives of accelerating public policy support, accelerating the maturation and commercialisation of hydrogen and non-hydrogen pathways across the iron and steel value-add landscape, and accelerating carbon pricing efficacy and international reach (thanks to the EU CBAM) must be developed in conjunction through inter-regional cooperation and alignment (in the absence of a global consensus as the US self-isolates and undermines global action).

To unlock green iron investment at speed and scale, we must see:

1. **A shift in carbon pricing as a policy mechanism from a marginal signal to structural driver.**

The economic viability of a structural transformation for the decarbonisation of iron and steel remains contingent upon the implementation of robust and transparent carbon pricing in international trade. The introduction of the EU CBAM in January 2026 represents a transformative shift in global carbon pricing architecture by implementing a mechanism to phase out concessionary allocations of emissions allowances to industrial emitters. For carbon pricing to truly catalyse investment, it must move beyond the current practice of providing free allowances to industrial emitters, a policy that continues to shield polluters and nullify the incentive for deep technological transformation. China is in the process of expanding its world leading national ETS (by volume) to cover a range of heavy industry sectors over 2026/27. Australia's Safeguard Mechanism is starting to show its worth, but needs broadening and deepening in the review later in 2026.

2. **Alignment of domestic and foreign policies to drive investment absent an enabling price on carbon.**

As this report showcases, the largest steel producing and consuming markets have implemented a myriad of public policy support measures to accelerate investment into the decarbonisation of iron and steel. Policies have been designed to support demand-pull mechanisms and supply-side production incentives and subsidies. However, the absence of international collaboration and engagement across critical industries has resulted in this kaleidoscopic array of support without a clear, long-term policy pathway across domestic and export markets, or sufficient financial sector leadership to encourage a wider corporate buy-in. Multilateral and plurilateral mechanisms across market-based support mechanisms will play a critical role in market formation by bridging the price gap between producers and offtakers, distributing cost premiums across multiple markets.

We look to greater EU-China collaboration to elevate two of the most important economic powers globally to lift momentum and capacity building, leveraging the November 2025 agreement by two major industry associations in China and Europe each signing onto landmark agreements with the Australian nonprofit ResponsibleSteel to set internationally coherent standards for what qualifies as green steel. Together, the three organizations represent around 60% of global steel production.[293]

3. Maturing and commercialising the technology stack.

The collision between green hydrogen ambition and economic reality is now a defining feature of the green iron landscape. Electrolyser cost deflation has not materialised at the speed anticipated outside of China, and steelmakers globally continue to experience margin compression that prohibits structural changes that, currently, will see further erosion of the financial sustainability of energy-intensive value-add. Public investment in R&D must be sustained and sharpened. CEF reiterates that the aforementioned pillars of public policy will also provide significant support for crowding-in private capital into the commercialisation of low-emission iron and steel technology pathways – providing a long-term market demand signal for the deployment of such technology.

The global acceleration of green iron and steel investment, including enhanced scrap steel recycling, will depend on the ability of policymakers to synchronise technological, fiscal, and diplomatic levers across markets and borders to shift decarbonisation from a perceived cost into a central pillar of sovereign industrial strategy, a key lesson in 2026 given the US war against Iran.

For Australia, the structural conditions that made the Pilbara the epicentre of iron ore globally will not persist into low-emissions iron value-adding without a significant step change in political will, coordination and speed of execution, along with sustained investment in technology innovation. Australia's potential green iron hubs are facing increasingly favourable competing offers from Saudi Arabia, Oman, Libya, and the emerging hydrogen valleys of the MENA region. Australia needs to capitalise on the supply chain security risks of the Middle East to highlight our strategic value and policy leadership so as to attract bilateral and multilateral support for FOAK deployments in DRI and subsequently green iron here.

While progress remains incremental, CEF urges policymakers to recognise that this remains a global race. Australia's window of comparative advantage – including our iron ore endowment, renewable energy potential, phenomenal capital base, potential for world-scale deployments and established trade relationships with key steelmaking markets across Asia – is real but is increasingly time limited.

[293] ResponsibleSteel, Landmark agreements link majority of world's steel production under global and regional standards for low-emission steel, 14 November 2025