Institute for Energy Economics and Financial Analysis

Briefing Note

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BHP is lagging its peers on Scope 3 and steel technology transition

- *BHP risks underestimating the speed with which the steel technology transition will eventuate. Technology shifts have a habit of happening faster than expected.*
- *The company continues to place high emphasis on carbon capture despite the growing likelihood that this technology will not play a major role in decarbonising coal-based steelmaking.*
- *There is a significant risk that BHP is overestimating the long-term resilience of metallurgical coal demand.*
- *In contrast to its peers, BHP is not targeting production of high-grade iron ore suitable for low-carbon steelmaking, a grade seeing growing demand.*

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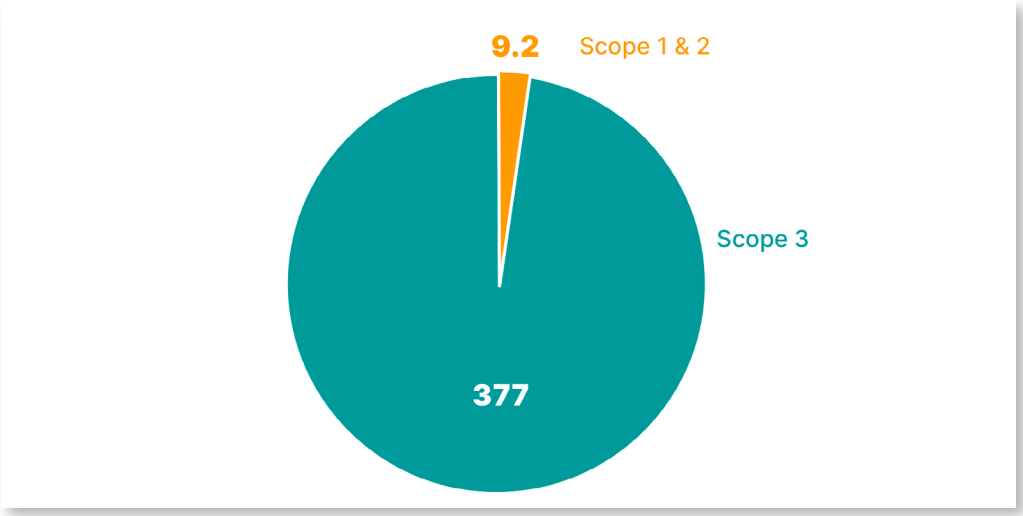
IEEFA has written previously detailing our view that BHP is lagging behind its peers in terms of commitment to steelmaking technology change that can realistically reduce Scope 3 emissions. BHP's new Climate Transition Action Plan (CTAP 2024) does nothing to change our opinion. While other major iron ore producers are investing in higher-grade ore suitable for low-carbon steelmaking, BHP is planning to continue to produce blast furnace-grade ore and metallurgical coal – i.e. business as usual.

BHP places a lot of emphasis on its operational (Scopes 1 and 2) emissions reduction efforts, but these are dwarfed by its Scope 3 emissions (Figure 1). The company's Scope 3 emissions are dominated by steelmaking raw materials – iron ore and metallurgical coal.

Figure 1: BHP's Scope 1, 2 and 3 emissions FY2024, MtCO2-e



Source: BHP Climate Transition Action Plan 2024. Note: MtCO2-e = Million Tonnes of carbon dioxide equivalent

In common with Rio Tinto, BHP does not have a measurable Scope 3 emissions reduction target. However, unlike BHP, Rio Tinto has long since exited coal mining and is now in the process of expanding its production of higher-grade iron ore. After Anglo American completes the sale of its Queensland metallurgical coal mines, BHP will be the only major miners listed in Table 1 to still be producing coal. BHP is also the only iron ore miner listed in Table 1 that is not producing high-grade iron ore suitable for lower-carbon, direct reduced iron (DRI)-based steelmaking. Vale, Rio Tinto, Fortescue and Anglo American are all planning increased production in response to growing demand for higher grades.

Table 1: Major steel raw materials miners' Scope 3 emissions targets

Comany	Steelmaking Raw Materials Produced		Measurable Scope 3 Emissions Reduction Target	Net Zero Emissions Goal
	Iron Ore	Metallurgical Coal		
RioTinto	✓		None	Net zero by 2050 **(Scope 1 & 2 Only)**
BHP	✓	✓	None	Net zero by 2050 **(Scope 1, 2 & 3)**
Fortescue	✓		Net zero by 2040	Net zero by 2040 **(Scope 1, 2 & 3)**
VALE	✓		15% Reduction by 2035*	Net zero by 2050 **(Scope 1 & 2 Only)**
AngloAmerican	✓	✓	50% Reduction by 2040**	Net zero by 2040 **(Scope 1 & 2 Only)**

**Against a 2018 baseline **Against a 2020 baseline*
Source: Company disclosures.

BHP has a "goal" to reach net zero Scope 3 emissions by 2050, but as the company makes clear in the glossary of its CTAP 2024, a goal is very different from a target. It defines a Goal as:

"An ambition to seek an outcome for which there is no current pathway(s), but for which efforts are being or will be pursued towards addressing that challenge, subject to certain assumptions or conditions. Such efforts may include the resolution of existing potential or emerging pathways."

Meanwhile, a Target is defined as:

"An intended outcome in relation to which we have identified one or more pathways for delivery of that outcome, subject to certain assumptions or conditions."

Underestimating the speed of technology transition

BHP's CTAP 2024 introduces a new 1.5°C scenario developed by the company. However, the company makes very clear in the CTAP that it does not think a pathway compatible with its 1.5°C scenario for steel is likely and that this informs its strategy:

"Our view is that decarbonisation of the steel sector is likely to occur more slowly than has been projected by many low GHG [greenhouse gas] emission scenarios, including our 1.5°C scenario... We also believe decarbonisation of the steel sector will occur more slowly than what has been projected by the International Energy Agency's Net Zero Emissions by 2050 scenario... Our view of a near zero emissions steel trajectory for the sector informs our strategy and actions…"

Technology transitions have a long history of happening faster than expected. IEEFA has observed clear indications that the steel technology transition away from blast furnaces is accelerating. Others have also noticed. In a 2023 column for the Financial Times, International Energy Agency (IEA) executive director Fatih Birol stated: "The transition to clean energy is also accelerating in other sectors, including those where emissions are most challenging to reduce, such as steel. The project pipeline for producing steel with hydrogen rather than coal is expanding rapidly. If currently announced projects come to fruition, we could already have more than half of what we need in 2030 for the IEA's net zero pathway."

Later the same year, BlueScope Steel CEO Mark Vassella noted that momentum in the steel industry to cut carbon emissions was now increasing faster than he had predicted just two years previously, stating: "The technology is moving faster than we might have expected."

BHP maintains on page 23 of its CTAP 2024 that "Currently there are no near zero emissions technologies for iron ore-based steelmaking that are ready for widespread commercial adoption." It also highlights on page 61 that one of the key assumptions behind its new 1.5°C scenario is that hydrogen-based DRI technology will not be available until "the mid-2030s". This may be news to Stegra – the new name for H2 Green Steel – which will begin production of truly green iron and steel using green hydrogen-based DRI at commercial scale from 2026. Stegra is already planning further green iron and steel plants in Brazil, Portugal and Canada.

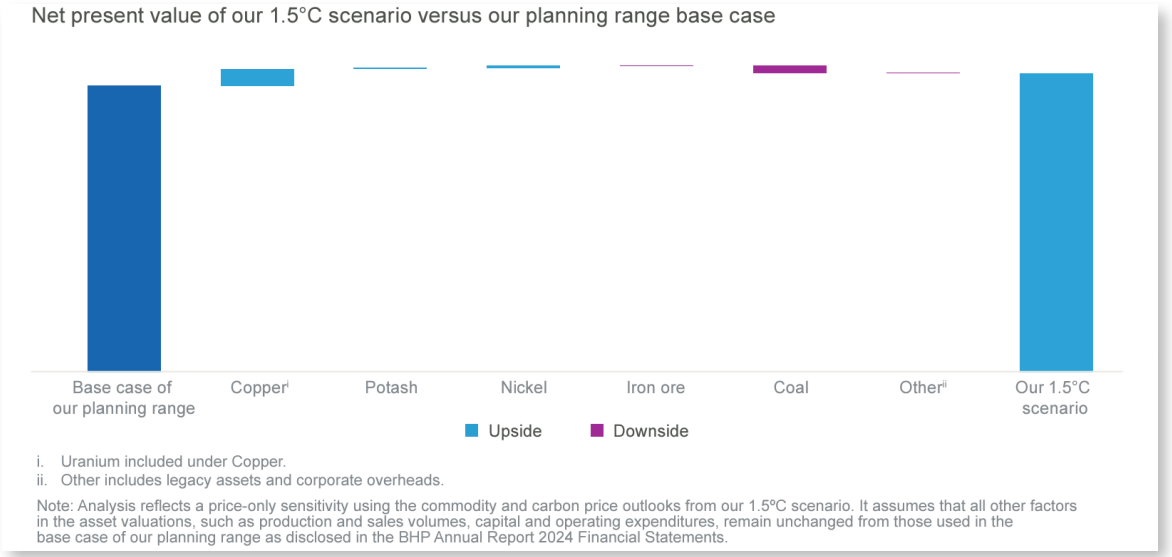
These are all locations where at least part of the power grid is highly decarbonised, significantly aiding early production of green hydrogen at lower cost. DRI is a mature technology and the key DRI equipment providers – Midrex and Energiron – have made clear that their technology is hydrogen-ready. There is potential for an initial wave of commercial-scale, green hydrogen-based DRI plants to now emerge in locations that have both high-grade iron ore and decarbonised power grids, including South Australia.

The steel technology shift away from coal is accelerating, and opportunities for the suppliers of steelmaking raw materials to reduce Scope 3 emissions have moved closer. Despite this, BHP still has no measurable overall Scope 3 emissions target.

BHP also makes clear in its CTAP 2024 that, even if the world does follow a pathway reflective of its new 1.5°C scenario, its mining portfolio for steelmaking raw materials would see limited impact (Figure 2). It states: "Our 1.5°C scenario results in a marginal decrease in the value of

our iron ore assets and some loss of value in steelmaking coal relative to the base case of our planning range."

Figure 2: BHP's diversified portfolio under its 1.5°C scenario



Source: BHP.

This is partly due to the role that BHP sees being played by technology combinations involving DRI with a melting step (aka an electric smelting furnace) that would allow the use of its blast furnace-grade ore in DRI-based steelmaking. BHP's February 2024 announcement that it was joining a Rio Tinto and BlueScope project developing this technology was a welcome move. BHP has belatedly joined Rio and Fortescue in developing ways to use the majority of Pilbara iron ore production in lower-carbon steelmaking.

More problematic is the disclosure in the CTAP 2024 that BHP will only allocate USD75 million to steel decarbonisation projects between FY2025 and FY2029 – a tiny amount given the volume of its steel-related Scope 3 emissions.

However, another key reason why BHP's iron ore and metallurgical coal portfolios are relatively unimpacted under its 1.5°C scenario is because it has assumed an unrealistically high implementation of carbon capture, utilisation and storage (CCUS) technology.

CCUS's limited prospects in decarbonising steelmaking

BHP is far more committed to CCUS than the other big iron ore miners. This is perhaps unsurprising because it is the only one of the Big 4 still mining metallurgical coal. It is in BHP's interests to promote the idea that steel decarbonisation (and hence Scope 3 reductions) will come from retro-fitting blast furnaces with CCUS, allowing it to continue to supply met coal and its blast furnace-grade iron ore – business as usual.

BHP is developing a carbon capture pilot project with Chinese steelmaker HBIS, and another in partnership with Mitsubishi Heavy Industries Engineering, Mitsubishi Development and ArcelorMittal at the latter's Ghent steelmaking plant in Belgium. In a November 2023 sponsored article in the Australian Financial Review, BHP highlighted another carbon capture pilot at ArcelorMittal's Ghent plant (ArcelorMittal's Steelanol project), which it termed "a scale demonstration plant that will capture carbon-rich process gases from the blast furnace and convert them into ethanol". What the sponsored article didn't note was that this project is capturing less than 2% of the plant's emissions. Despite this, BHP stated in the article that "CCUS is one of the key abatement technologies" that can support net zero emissions steelmaking.

A key assumption behind BHP's new 1.5°C scenario outlined in its CTAP 2024 is that CCUS technology for steelmaking will be available "beginning in the mid-2020s". However, it is now late 2024, and there are no commercial-scale CCUS facilities for coal-based steelmaking anywhere in the world, and virtually nothing in the pipeline.

The only commercial-scale CCUS project for steel in existence is for DRI-based steelmaking. The Al Reyadah project in the United Arab Emirates (UAE) only captures around 25% of the steel plant's Scope 1 and 2 emissions, continuing the long trend of underwhelming capture rates experienced across all sectors in which CCUS has been applied. The carbon captured at Al Reyadah is used for enhanced oil recovery.

BHP's enthusiasm for CCUS for blast furnaces is in contrast to some steelmakers, including BlueScope Steel, which sees a switch from blast furnaces to DRI as a much more promising decarbonisation approach. Of technologies like CCUS and biocarbon, "BlueScope's view is that due to technical limitations these technologies alone are not a viable pathway to achieve net zero emissions – rather they are expected to supplement a DRI pathway", according to its new Climate Action Report. BlueScope has a DRI options study underway as it considers the longer-term replacement of its blast furnaces.

It's not hard to see why BlueScope is doubtful of CCUS's ability to make a meaningful contribution to coal-based steel decarbonisation. CCUS technology has been implemented for five decades in other sectors and has accumulated a track record of significant underperformance.

CCUS looks even less likely to make a major impact on coal-based steelmaking than in other sectors. Integrated, blast furnace-based steel plants have multiple sources of carbon emissions, making it expensive to significantly decarbonise them. Experience of CCUS in other sectors has demonstrated that capture rates tend to be low. It looks improbable that it would be any better for blast furnace-based steelmaking. Carbon pricing looks unlikely to help – the EU has had a meaningful carbon price for years but has not seen any commercial-scale CCUS projects for steel implemented as a result. If it makes no headway in the EU, it's even less likely to make progress in Asia – the key steel demand growth region globally.

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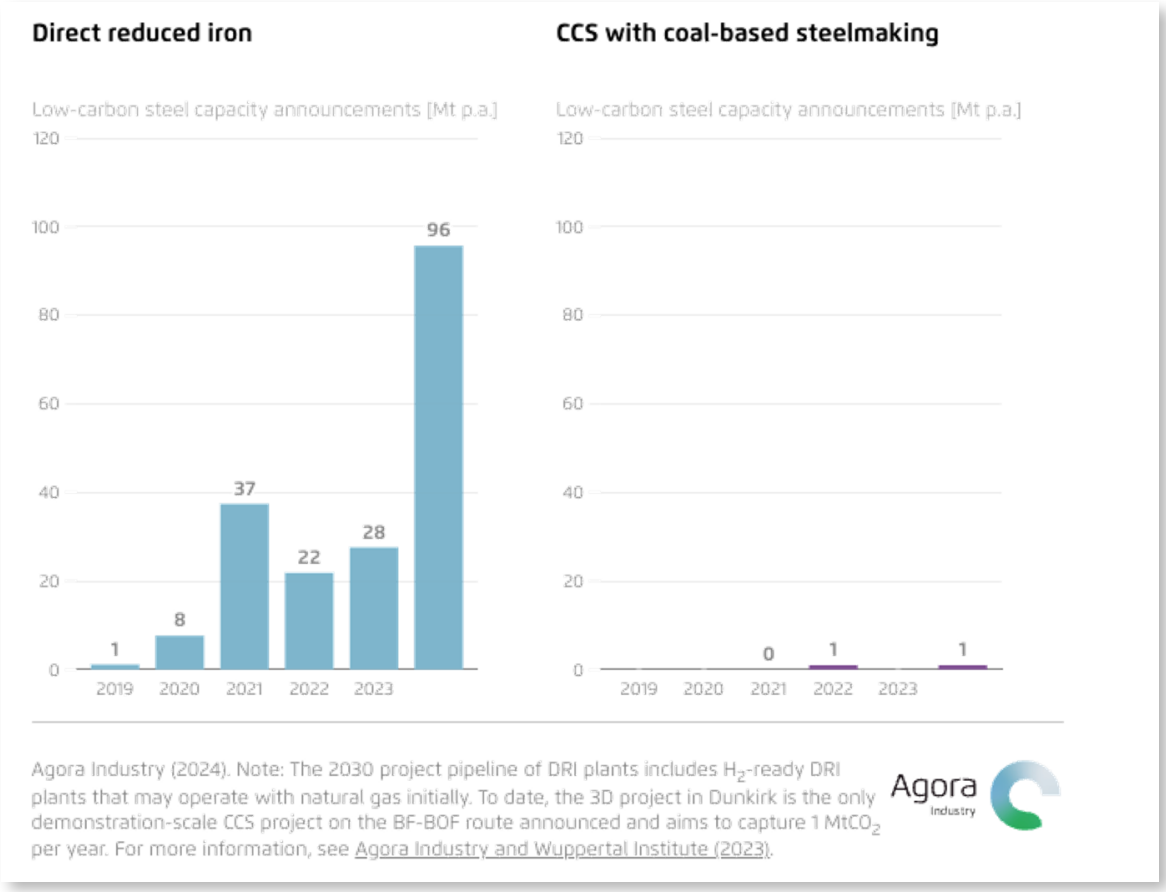
German think tank Agora Industry highlights that to date, virtually all plans for commercial-scale, low-emissions primary steel plants are DRI-based, not coal and carbon capture-based. The 2030 project pipeline includes 96 million tonnes per annum (Mtpa) of DRI capacity and just 1Mtpa of CCUS for blast furnace-based steelmaking (Figure 3). CCUS for coal-based steelmaking is already being left behind by alternative technology as has happened in other sectors like power generation.

Figure 3: 2030 pipeline of commercial-scale, low-carbon primary steel project announcements



Source: Agora Industry.

In addition, CCUS for blast furnace-based steelmaking would do nothing to address the issue of coal mine methane emissions. The scale of this issue is only now becoming apparent in Australia, and it is already clear that metallurgical coal mines are often major sources of methane emissions.

The lack of any impact on coal mine methane, along with low rates of capture experienced at CCUS projects in other sectors, means that CCUS will never enable the production of truly low-carbon or 'green' steel. There is little global consensus as to what actually constitutes 'green steel' at present, but tighter definitions can be expected in the near future. Steel made in coal-consuming blast furnaces with CCUS is unlikely to meet such definitions. With mature, alternative technology like DRI now expanding, steelmakers may increasingly find that their customers don't want any coal in their supply chains.

Overestimating long-term metallurgical coal demand

In its CTAP 2024, BHP makes clear that it doesn't see any threat to metallurgical coal demand on the horizon: "Steelmaking coal continues to be an attractive commodity for us over the next several decades."

The company's upbeat outlook for met coal, even under its 1.5°C scenario, is partly based on its view that CCUS will play a significant role in blast furnace-based steelmaking (a view that IEEFA believes is increasingly unlikely to become reality): "In our 1.5°C scenario, demand for steelmaking coal peaks in the late CY2020s followed by a modest decline over the following

decade. The blast furnace equipped with CCUS, which requires steelmaking coal, remains an important route for steel production out to CY2050."

In common with some other metallurgical coal miners in Australia, BHP consistently pushes the narrative that metallurgical coal is an essential raw material of the energy transition towards renewable energy, a line that often gets parroted by senior Australian ministers. This ignores the fact that steel can be made without coal using existing, mature technology.

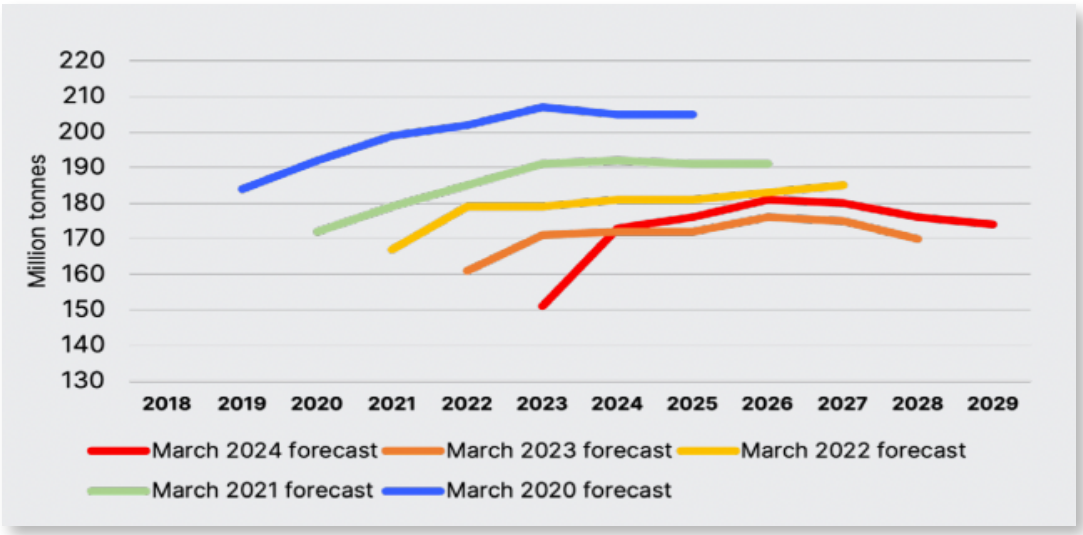
Further evidence of BHP's long-term commitment to metallurgical coal mining in Queensland is not mentioned in CTAP 2024. BHP's Peak Downs Mine Continuation Project "would ensure that the Peak Downs Mine will continue to produce up to 18 million tonnes per annum (Mtpa) of product (metallurgical) coal for up to approximately 93 years", taking the life of the mine out to 2116, 66 years beyond its goal to reach net zero emissions.

However, with CCUS highly unlikely to ever make coal-based steelmaking low-carbon, and the steel technology transition away from blast furnaces accelerating, there is a significant risk that long-term metallurgical coal demand will fall faster than expected.

Even in the medium term, the outlook for metallurgical coal is not necessarily positive. In its most recent medium-term outlook, the Australian Government's Department of Industry, Science and Resources (DISR) forecasts that Australian metallurgical coal exports will peak in 2026 before falling through the rest of the decade. It also forecasts that global metallurgical coal trade is already in decline.

Furthermore, DISR has a history of being over-optimistic with its forecasts of Australian metallurgical coal exports (Figure 4).

Figure 4: Australian government metallurgical coal export forecasts 2020-24



Source: DISR, Australian Government.

With Chinese steel demand now in structural decline, met coal exporters are looking to India – the key growth market for steel demand globally – to boost demand. India is targeting a doubling of its steelmaking capacity to 300Mtpa by 2030. However, with Indian steel production growth at less than 6% according to DISR's most recent forecast, the country is not on course to fully utilise such capacity. Tata Steel forecasts that Indian steel demand will reach only 200Mtpa by 2030. Analysis by S&P Global Commodity Insights found that just one quarter of the anticipated 100Mtpa of new steel capacity in India and Southeast Asia is likely to be built by 2030.

Even though India's steel capacity is highly unlikely to expand as much as targeted by its government, growing reliance on metallurgical coal imports is becoming a significant energy security issue for the country. The country has already begun to take steps to address this.

India has significantly expanded domestic thermal coal production to reduce reliance on imports, but it is also targeting increased metallurgical coal output for the same reason. The Indian Ministry of Coal's FY2024-25 Action Plan targets increased domestic metallurgical coal production to reach 140 million tonnes (Mt) by FY2029-30, up from 66Mt in FY2023-24.

In addition, India has been successfully diversifying its sources of met coal imports away from Australia. Increased imports from Russia pushed Australia's share of imports to a five-year low (56%) in the June quarter of the current Indian fiscal year. In August 2024, Jindal Steel & Power announced that it had reduced dependence on Australian met coal by 50% stating: "Given global uncertainties and supply chain disruptions, diversifying our coking coal sources was imperative. The Steel Ministry's directive was timely and essential. By reducing reliance on Australian coking coal imports and increasing intake from other regions, we've strengthened our supply chain and improved cost efficiency." Jindal also noted that it is "looking at further diversification in the coming months".

India is also looking to Mozambique and Mongolia for further diversification away from Australian met coal. Beyond this, the Indian steel sector is already developing green hydrogen projects. Using domestically produced green hydrogen to make steel rather than imported coal or gas would be a further energy security boost for India in the longer term.

India looks likely to disappoint Australian metallurgical coal exporters.

Disregarding growing demand for DR-grade iron ore

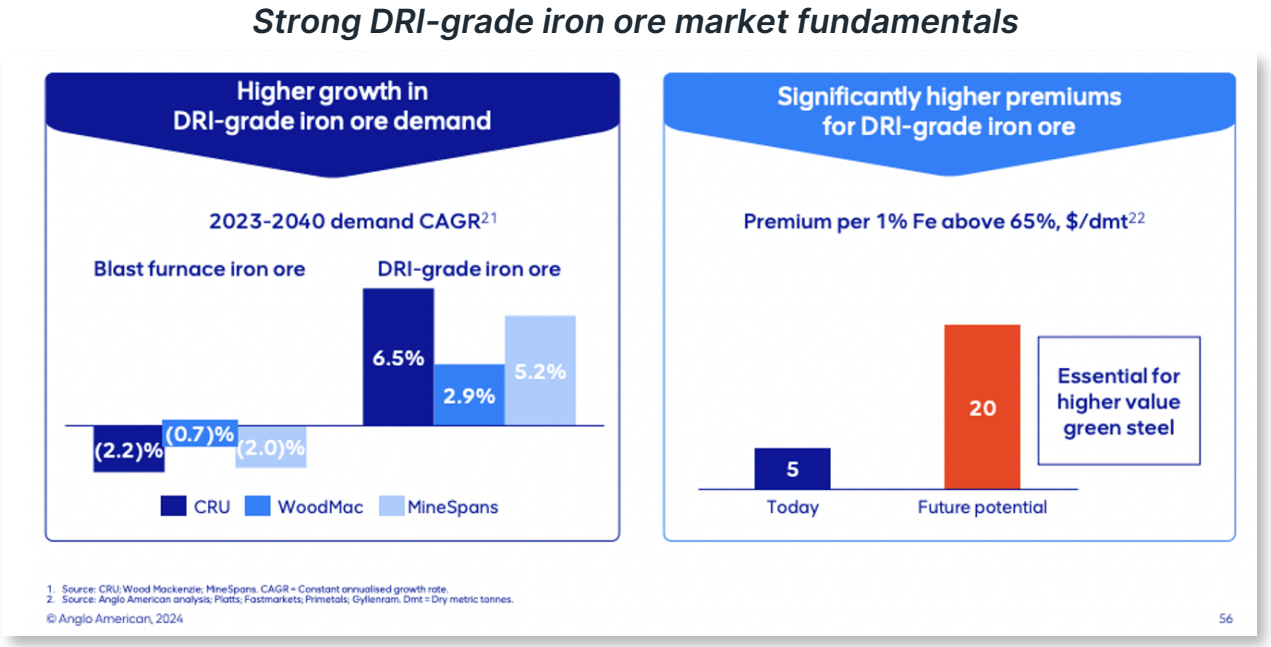
BHP maintains in CTAP 2024 that "We are positioning our portfolio of commodities and assets to create value for today and the future."

When it comes to steelmaking raw materials, this could only be correct if CCUS was well placed to decarbonise future blast furnace-based steelmaking. However, with this looking unlikely, and steelmakers planning a switch to DRI-based steelmaking, metallurgical coal and blast furnace-grade iron ore don't look like future-facing commodities. The latter will have a brighter outlook if and when DRI+melter technology combinations can work with low- to middle-grade Pilbara iron ores. However, Rio Tinto recently highlighted that such technology may not become widely available until the 2040s.

As it stands, DRI-based steelmaking requires high-grade iron ore. BHP is not developing any high-grade mines, in contrast to other major iron ore producers.

Vale is the world's biggest supplier of high-grade iron ore suitable for direct reduction-based (DR-grade) steelmaking. It forecasts that seaborne demand for DR-grade ore will more than triple by 2040. Meanwhile, in its recent interim results presentation Anglo American highlighted a summary of industry forecasts showing demand growth for DR-grade ore as demand for blast furnace-grade ore enters long-term decline (Figure 5).

Figure 5: Anglo American's summary of iron ore demand forecasts



Source: Anglo American.

Vale and Anglo American are both planning to take advantage of long-term DR-grade iron ore demand growth. Vale's incoming new CEO has already made clear that his first short-term goal will be the supply of high-grade iron ore to steelmakers. The company is also now seeking opportunities to produce green hydrogen with which its high-grade ore can be processed into 'green iron' for export. Vale has a measurable target to reduce Scope 3 emissions 15% by 2035.

Anglo American plans to increase DR-grade iron ore production at its own Brazilian mine. It will also now invest USD428 million to treble high-grade iron ore production at its Sishen mine in South Africa through upgraded processing. The shift towards more high-grade iron ore will help Anglo American achieve its measurable target to reduce Scope 3 emissions 50% by 2040.

Rio Tinto and Fortescue are also developing high-grade iron ore operations outside Australia. Rio Tinto is developing the Simandou iron ore deposits in Guinea, West Africa with project partners. Currently under construction, first shipments out of the Simandou projects are expected in 18 months, which will ramp up to 90Mtpa by 2028. Rio Tinto has stated that: "Simandou will deliver a significant new source of high-grade iron ore that will strengthen Rio Tinto's portfolio for the decarbonisation of the steel industry." The company already produces DR-grade iron ore at its Canadian operations and it signed a multi-year supply agreement with Stegra in August 2023.

While Fortescue ramps up DR-grade ore production at its Iron Bridge project in the Pilbara, it is also planning future production at its Belinga project in Gabon, Central Africa. Fortescue has stated that "every indication we have, shows the project has the potential to be significant scale and very high-grade." Fortescue is by far the most ambitious of BHP's peers when it comes to downstream emissions, targeting net zero Scope 3 emissions by 2040.

Rio Tinto is running out of excuses not to have a measurable Scope 3 target given it is targeting increased production of high-grade iron ore suitable for low-carbon steelmaking. But BHP looks to be continuing a largely business-as-usual plan for its iron ore and met coal production in the misguided belief that CCUS will prop up long-term demand for both.

BHP's strategic approach to steel technology change has diverged from other major iron ore exporters. It is looking like a technology and emissions laggard.

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