Magnetite Mines Submission to the Australian Government

Green Metals. A Future Made in Australia: Unlocking Australia's Green Iron, Steel, Alumina and Aluminium Opportunity, Consultation Paper

May – July 2024

PH: +61 8 8427 0516 E: info@magnetitemines.com

A: Suite 3, Level 3, 30 Currie Street, Adelaide, SA 5000

12 July 2024

Department of Industry, Science & Resources
GPO Box 2013
Canberra, ACT 2601

Dear Sir or Madam

Magnetite Mines welcomes the opportunity to make a submission to the **Unlocking Australia's Green Iron, Steel, Alumina and Aluminium Opportunity, Consultation Paper** (the "Consultation Paper") released in May 2024.

Magnetite Mines is an ASX-listed iron ore company focused on the development of magnetite iron ore resources in the highly prospective Braemar iron region of South Australia.

The Company has a 100% owned Mineral Resource of 6 billion tonnes of magnetite iron ore and is developing the Razorback Iron Ore Project, located 240km from Adelaide, to meet accelerating market demand for premium iron ore products created by iron & steel sector decarbonisation.

The Razorback Iron Ore Project will produce high-value Direct Reduction (DR) grade concentrates, suitable for green iron production, and is set to become a very long-life project with expansion optionality in a tier 1 jurisdiction that will produce a superior iron ore product sought by steelmakers globally.

In this submission Magnetite Mines provides detailed information to help support the development of an Australian green metals industry and the Australian Government's work to support the industry's efforts to decarbonise metals production both in Australia and globally.

Our submission is focused on green iron, although we have also provided responses to selected questions that have been highlighted in the consultation paper based on areas of either specific commercial interest to the Company, or where we have deep expertise and knowledge.

We thank you for consideration of our submission and request the opportunity to follow up with a face-to-face meeting at your convenience to ensure clarity of understanding and alignment with the government's needs.

Yours faithfully,

Gemma Brosnan
General Manager - External Affairs
gemma.brosnan@magnetitemines.com

OVERVIEW OF RECOMMENDATIONS

Magnetite Mines' primary recommendation for the Consultation Paper is that Australia must act soon because time is running out.

The global steel industry has a carbon problem due to it being responsible for contributing 8% of the world's carbon emissions. The global steel industry has committed to decarbonise, creating new demand for the feed stock required to make low emission steel: green iron.

Australia has comparative advantages, relative to its key trading partners, to produce green iron, presenting an enormous manufacturing and export market opportunity. If Australia is to seize this opportunity for the nation it must rapidly develop and implement a **National Green Iron Strategy** to secure the economic gains possible by being a first-mover in this industry and capture meaningful market share.

If it fails to do this, the imminent risk is that other nations will secure the infrastructure, investment and resulting economic, environmental and community benefits that will flow, creating a tangible barrier to other nations.

While Australia does not today have a Green Iron Industry, it has two comparative advantages: abundant magnetite deposits and substantial renewable energy resources for producing green hydrogen, both commodities being essential to produce green iron. South Australia is one State that is particularly well positioned.

To deliver a successful, competitive Green Iron Industry by 2035, this submission outlines a three-step pathway for success centred on the rapid development and then implementation of a National Green Iron Strategy.

Step 1: Establish the foundations for success through the immediate development of a National Green Iron Strategy and funding for a Green Iron Centre of Excellence to demonstrate the effective production of export-quality green iron from Australian magnetite concentrates.

Step 2: Commence production in the form of an expandable-scale green iron facility with the support of National and State Government policies and infrastructure support.

Step 3: Grow to scale with a target of producing 5Mtpa green iron by 2030 and 10Mtpa by 2035 encouraged by embedding National Green Iron Strategy policies.

THE RATIONALE FOR CREATING A GREEN IRON INDUSTRY FOR AUSTRALIA

Steel has a carbon problem

The steel industry contributes 8% of the world's carbon emissions and transitioning the sector to produce low-emission 'green' steel has become a priority imperative in the global quest to reduce the impacts of climate change. Most of the problem lies in converting iron ores (oxides) into elemental iron using coal and gas, with more than 80% of the industry's carbon emissions currently created in this single process step.

Australia's opportunity – compelling, but time bound

In a speech to the National Press Club on 14 February 2024, Professor Rod Sims AO & Professor Ross Garnaut AC from The Superpower Institute clearly articulated the compelling economic opportunity facing Australia presented by global decarbonisation efforts. The Superpower Institute's argument is that Australia should use its comparative advantages of abundant renewable energy to produce export products that effectively embed that renewable energy into commodities that are in demand by our trading partners.

Professor Garnaut rightfully placed **green iron** at the top of the list.[1] This is a recognition of the fact that green iron production has the highest carbon emission mitigation potential of the various suggested hydrogen applications (the blue bars in Figure 1)[2].

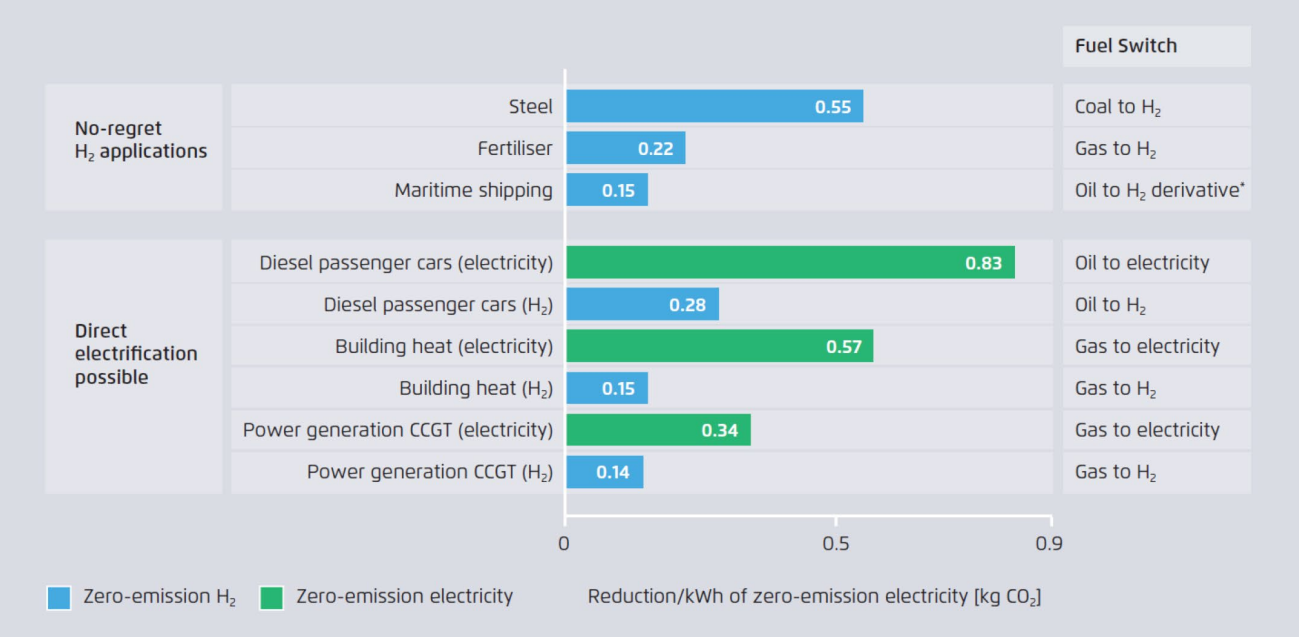


Figure 1 - No-regret H2 use: steel has the highest CO_2 mitigation potential compared to various other H2 applications[2]

[1] Addressing climate change can be the lynch pin of Australia's economic prosperity, The Superpower Institute, February 2024

[2] 15 Insights on the Global Steel Transformation, Agora Industry, June 2023

The prioritisation of green iron is also a reflection of the steel industry's carbon problem creating a large new market demand for this commodity.

Using hydrogen produced from renewable energy to produce an exportable form of reduced iron ore, "Direct Reduced Iron" (DRI) or "Hot Briquetted Iron" (HBI), creates a new Australian export commodity that is forecast to be in increasingly high demand by our key trading partners, including Japan, Korea and Taiwan, but also by China, India and other steel producing Asian countries. Each of these countries and their steelmakers have made decarbonisation commitments and are actively seeking green iron supply chains to help meet those commitments.[3]

An essential element of the green steelmaking supply chain, and one where Australia has a comparative advantage, is the availability of extremely high-quality iron ore which is created by concentrating magnetite from magnetite iron ores at the mine site.

Only ore concentrates which have high iron content, but more importantly, very low levels of impurities such as silica and alumina, termed 'DR-grade', can be converted into near-pure iron products suitable for green steelmaking in Electric Arc Furnaces (EAFs), the only commercially available technology to produce green steel.

The current supply of high-grade and DR-grade iron ore as a proportion of the overall iron ore market is very small (Figure 2). However, steelmaking's decarbonisation transition is forecast to significantly grow the demand for DR-grade iron ore over the coming 25 years.

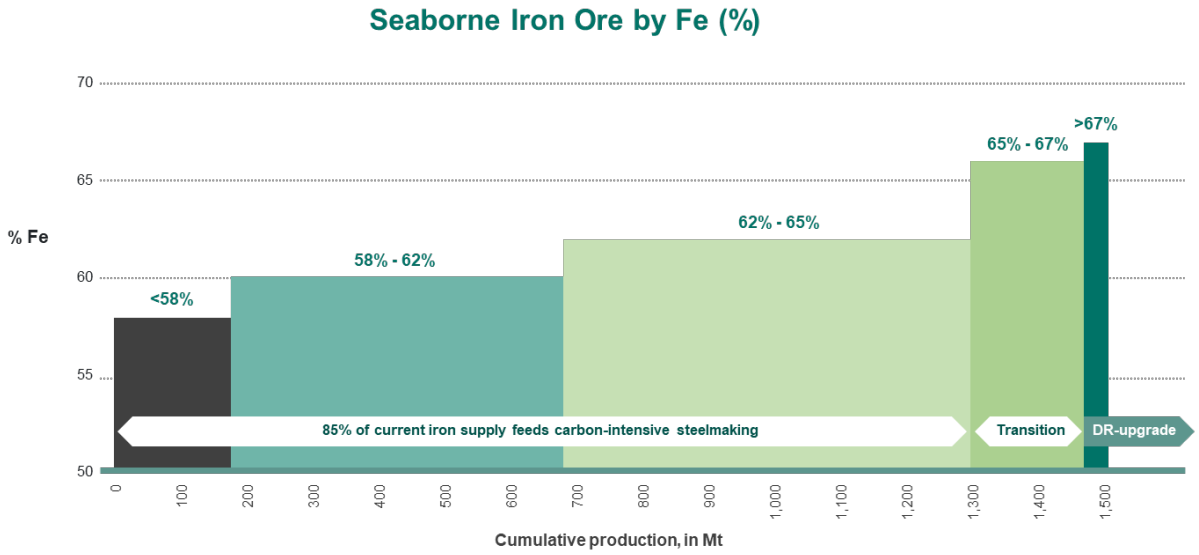


Figure 2 - Current Composition of Seaborne Iron Ore Market (CRU Group)

By 2030, demand for DR-grade pellets is expected to reach between 80-100 million tonnes per year. McKinsey, Wood Mackenzie and the International Iron and Metallics Association have all predicted that, based on current trends and the long lead times for iron ore projects, supply will fail to reach the projected level of demand, creating a significant deficit.

[3] Australia Face Growing Green Iron Competition from Overseas, IEEFA, September 2023

Wood Mackenzie has also estimated a five-fold increase in high-grade iron ore demand by 2050 and a potential supply shortfall of approximately 350 million tonnes per annum (Figure 3).[4]

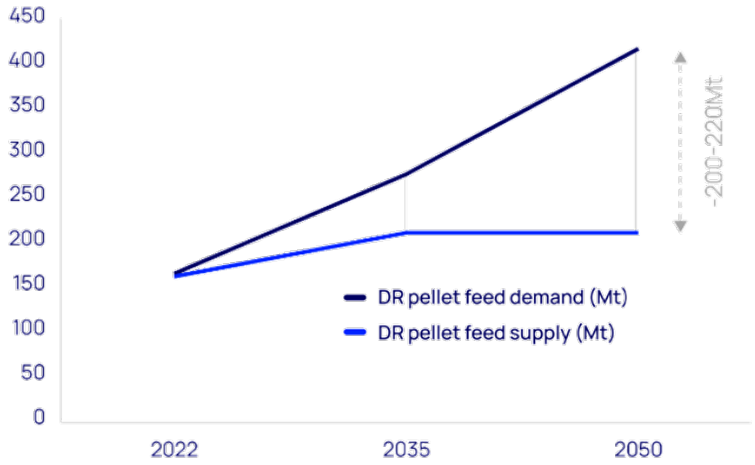


Figure 3 - High-grade iron ore demand-supply gap forecast to significantly increase (Wood Mackenzie)[5]

Bloomberg estimates the increase in DR-pellet feed demand to be ten-fold if the industry is to meet its Paris and COP decarbonisation commitments (Figure 4).

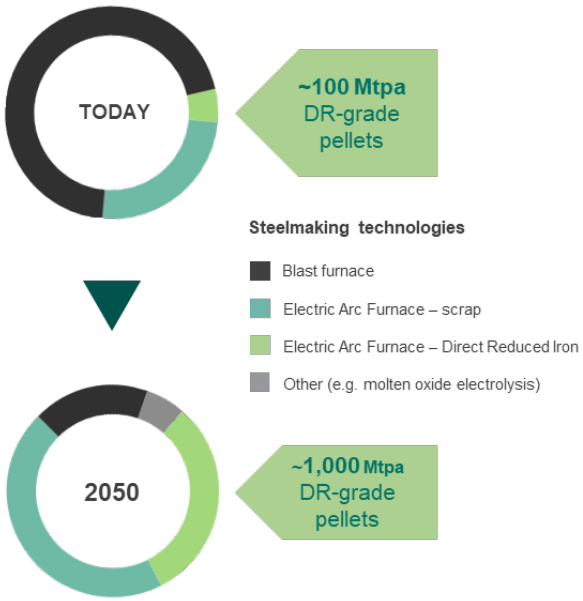


Figure 4 - Forecasted Demand for DR-Grade Pellet Feed in 2050 (Bloomberg)

[4] "Metalmorphosis": How decarbonisation is transforming the iron and steel industry, Wood Mackenzie, October 2023

[5] "Metalmorphosis": How decarbonisation is transforming the iron and steel industry, Wood Mackenzie, October 2023

The green iron pathway to low-emission green steel is leading to a geographic separation between iron and steelmaking – a seismic shift in the vast global steelmaking supply chain. DRI produced with low or no CO_2 emissions ('green iron') will be produced in regions endowed with some or all of the necessary resources: near-pure iron ore, natural gas (used in transition) and future green hydrogen supply. DRI will be exported to steel-using countries for green steel production in market-facing Electric Arc Furnaces (EAFs) that run on renewable electricity.

While this transition represents a major financial and technical challenge for steel producers, it represents a significant opportunity for regions endowed with magnetite deposits that can produce premium-grade concentrates, along with abundant renewable energy to produce green hydrogen. This is the opportunity for Australia and embodies the Superpower Institute's vision for Australia's future prosperity beyond fossil fuel exports.

The South Australian Advantage

South Australia is one of a handful of regions globally that possesses the characteristics to take advantage of the green iron opportunity and the State is uniquely positioned to become a first mover for a new green iron production and export industry in Australia and globally.

Why?

- With greater than 70% renewable energy on grid, it is on track for 100% renewable energy on grid by 2027,
    - It has abundant, world-leading wind and solar resources required for green hydrogen production at scale.
    - South Australia's expansive Braemar Iron Formation, located 160km from Port Pirie and extending into New South Wales, has been proven to be able to produce DR-grade magnetite concentrates, necessary to produce green iron. The Braemar has enough magnetite resources to support large scale DR-grade iron ore production for many decades.
    - Magnetite Mines has commenced approvals to produce 5Mtpa of premium-grade magnetite concentrates from its Razorback Iron Ore Project, with production targeted to commence in 2029.
    - There are available workforces located in port/industrial towns around the Upper Spencer Gulf near where magnetite deposits are located.
    - The South Australian State Government has signalled its vision to establish a green iron industry in the state by 2030 to take advantage of these comparative advantages.

Australia's Green Iron Industry does not exist today

At the time of this submission, Australia as a nation does not have a Green Iron Industry and is lacking significant infrastructure or policy signals to incentivise one.

- No Green Iron Strategy exists at a national level resulting in an absence of policy signals, incentives or a vision for what Australia is seeking to achieve.
- Australia produces no:
    - Direct Reduced Iron or Hot Briquetted Iron (i.e. green iron);
    - Direct Reduction Pellets (DR Pellets) needed to make green iron;
    - DR-grade magnetite iron ore concentrates needed to make DR Pellets;
    - Green hydrogen required to produce green iron from DR Pellets.
- Australia does not have a dedicated facility to test and demonstrate the production of green iron from Australian magnetite iron ores.
- Magnetite or high-purity iron ore is not on the Australia's recently revised Critical Minerals or Strategic Materials list, unlike in other jurisdictions such as Canada deprioritising government support for the industry.
- Australia is in competition for green iron investment with other countries – several countries in the Middle East are accelerating their plans to create a green iron industry there, taking advantage of low-cost abundant natural gas (transition gas before switching to green hydrogen) and abundant renewable energy potential.

Taking advantage of the green iron opportunity

Essential to Australia's ability to take advantage of the green iron opportunity is the need for the nation to:

1. **Produce DR-grade magnetite** – Establish magnetite mines that can produce long-term, DR-grade iron ore concentrates at scale;
2. **Prove we can make green iron** – Demonstrating to potential customers (regional steelmakers) and investors that a green iron industry in Australia is feasible and more attractive than other locations or regions; and
3. **Produce green hydrogen at scale** – Producing enough competitively priced green hydrogen to produce green iron at commercial scale with expandability.

Australian Green Iron: Vision 2035

Australia must first define the type of Green Iron Industry it is seeking to establish. This will inform policy and allow industry to respond. Magnetite Mines believes that by 2035 the following could be achieved in establishing a successful, competitive Green Iron Industry.

In 2035:

- Australia has taken advantage of its unique comparative advantage of both abundant renewable energy and magnetite resources to create a world-leading green iron production and export industry; successfully embedding its renewable energy into easily transportable export products desired by our key trading partners.
- Australia is producing 10Mtpa of green iron and is investing to expand further with a target of 30Mtpa green iron production by 2050.
- Australia's green iron is in high demand by Australia's key regional trading partners, creating strong new long term export revenues to replace declining fossil fuel and low-grade iron ore export revenues.
- Regional steelmakers have invested heavily in Australia to build a green iron supply chain in support of transitioning their domestic steel industries to green steel.
- By supporting regional steelmaker decarbonisation, Australia is contributing well above its weight in terms of global greenhouse gas emission reduction.
- The new green iron industry has created 1,500-3,000 FTE direct jobs and 15,000 – 25,000 indirect jobs in regional Australia and is contributing AUD$2 billion p.a. to Australia's GDP.

A Pathway For Success

To achieve the Australian Green Iron: Vision 2035, a pathway with key actions is outlined below.

Step 1: Establish the foundations for success

In 2024/25:

- Immediately establish a National Green Iron Strategy that identifies the policies, technology and infrastructure critical to the rapid establishment of an Australian Green Iron Industry.
- Fund and build, via CSIRO, a Green Iron Centre of Excellence (laboratory / research centre / demonstration facility) in South Australia's Upper Spencer Gulf that demonstrates the production of export-quality green iron from locally produced green hydrogen and Braemar magnetite concentrates.

Step 2: Start Production

- Commence implementation of the National Green Iron Strategy by introducing integrated National and State Government policies that incentivise international and private sector investment to develop an expandable, commercial scale green iron facility ("hub"), initially producing 1.0 - 1.5Mtpa of green iron in, or near, Port Pirie.

Step 3: Grow to Scale

- Embed the National Green Iron Strategy by encouraging development of DR-grade magnetite mines, expansion of renewable energy supply, green hydrogen production, and green iron production in the Upper Spencer Gulf with a target of producing 5Mtpa of green iron by 2030 and 10Mtpa by 2035.

A National Green Iron Strategy

The success of establishing a competitive Green Iron Industry in Australia will be supported by national recognition of a stated outcome and alignment of the principles for policy support to achieve that outcome.

We suggest the following 9 key elements for inclusion in a National Green Iron Strategy:

1. A statement of Australia's vision for a domestic Green Iron Industry.
2. The inclusion of magnetite or high-purity iron ore on the Australian Critical Minerals or Strategic Materials list, signaling the government's intention to support new production.
3. The identification of priority projects or "green iron hubs" to be developed that will result in the acceleration of production and export of Hot Briquetted Iron (HBI).
4. The identification and financial support from Federal and State Governments for key common user infrastructure required to be developed to support the industry including transport (port and rail), renewable power and water.
5. The introduction of financial incentives in the form of subsidies or tax policy designed to decrease risk for industry investment in projects.
6. The development of a pathway to the operation of Hydrogen-based DRI facilities in Australia, recognising the role of natural gas as a transition fuel capable of delivering short-term emissions reductions.
7. Advocacy for a timeline that introduces a mandate for the use of green steel regardless of the technology implemented, starting with government procurement policy.
8. Streamlining of regulatory approvals, enabling projects to move from design to production faster.
9. International awareness of the role Australia seeks to play in a global green iron industry, and the potential for partnering with key regional trading partners.

DIRECT REPONSES TO CONSULTATION PAPER QUESTIONS

Question 1: What insights do you have on green metals markets?

The steel industry's carbon problem is creating an emerging and large new market for green iron as evidenced by:

- Developed countries with mature carbon trading systems, e.g., the EU, are defining green steel and paying premiums for low emission steel.
- Sweden's H2Green Steel is a new green steel supplier that is establishing commercial production of green iron (DRI made with hydrogen: HBI/DRI-H2), and green steel by 2026. The company is rumoured to have captured large green premiums on HBI-H2 and steel for sales to EU customers.
- Indices for green steel spot prices are now reported in the EU.
- Direct engagement and relationship development with major steelmakers and trading groups over the past 18 months leading to a recently announced Heads of Agreement with JFE Shoji, part of Japan's JFE Group which includes Japan's second largest steelmaker, JFE Steel[6]. Magnetite Mines has also recognised the emergence of the Middle East as a key potential customer base for DRPF in the near-term with green iron projects planned in UAE, Oman, Bahrain and Saudi Arabia, many in collaboration with Japanese and other Asian steelmakers. These countries recognise the opportunity that green iron and steel production present as they transition away from oil dependency and are acting accordingly.
- The current supply of high-grade and DR-grade iron ore as a proportion of the overall iron ore market is very small. However, steelmaking's decarbonisation transition is forecast to significantly grow the demand for DR-grade iron ore over the coming 25 years.
- By 2030, demand for DR-grade pellets is expected to reach between 80-100 million tonnes per year. McKinsey, Wood Mackenzie and the International Iron and Metallics Association have all predicted that, based on current trends and the long lead times for iron ore projects, supply will fail to reach the projected level of demand, creating a significant deficit.
- Wood Mackenzie has also estimated a five-fold increase in in high-grade iron ore demand by 2050 and a potential supply shortfall of approximately 350 million tonnes per annum (Figure 3).[7]
- Bloomberg estimates the increase in DR-pellet feed demand to be ten-fold if the industry is to meet its Paris and COP decarbonisation commitments.

[6] ASX Announcement - Heads of Agreement JFE Shoji Australia - 8 July 2024

[7] "Metalmorphosis": How decarbonisation is transforming the iron and steel industry, Wood Mackenzie, October 2023

For example:

a. Expected current and future demand for green metals domestically and in key export destinations.

- The EU has already established a mature market for green iron (HBI) and green steel.

b. Australia's potential production volumes of green metals.

- Australia has a strong potential to develop green iron production and ramp up production over time in line with the expansion of renewable energy grids and hydrogen production from RE power.
- Supporting this outcome, Australia has resources of magnetite iron ore, which can be processed to produce 'DR-grade' concentrates – a necessary input commodity to produce green iron using green hydrogen.
- Magnetite Mines expects the export market for green iron, dominated by North Asian steel makers and trading groups, to grow in line with Australia's increasing ability to produce.
- Magnetite Mines suggests a green iron production target in Upper Spencer Gulf of 5Mtpa by 2030 and 10Mtpa by 2035, encouraged by embedding National Green Iron Strategy policies.

c. Which countries/markets are green metals currently being sourced from and used in?

- Green iron is currently being traded into and between EU countries.
- Japan and South Korea's steelmakers are actively seeking supply chain for future green iron to feed planned new Electric Arc Furnaces (EAFs).
- MENA region is already a hub for DRI with nearly 46% of total global production based on the region's plentiful gas supply[8]. It now has an opportunity to convert its steel industry from gas to green hydrogen utilising the region's abundant solar resources.
- Japanese companies such as Kobe Steel and Mitsui have signed MoUs to explore the feasibility of DRI production and HBI export from Oman beginning in 2027. In the UAE, Emirates Steel has partnered with Japanese steelmaker JFE Steel and trading house Itochu in a plan to produce DRI in Abu Dhabi for shipping to Asia from 2025.

[8] Agora Global Steel Transformation Tracker

Figure 5: Agora Global Steel Transformation Tracker

e. Australia's capacity to source green metals from global supply chains

- Australia can produce enough green iron to support the conversion of 100% of the Australian current steel industry's conversion to green steel, as well as an escalating export demand from key trading partners, in particular, North Asian steel makers.

f. Which countries or markets will provide the greatest international competition, or demand for Australian produced green metals?

- Regions with the lowest cost renewable energy and highest level of government incentives to attract producers and investors
- Currently, these regions are Middle East / North Africa (Saudi Arabia, Oman, UAE, Egypt, Bahrain, Morocco, Mauritania), Canada (Quebec), and Brazil.
- Vale – the world's leading producer of DR-grade iron ore – projects that by 2030, global DRI/HBI production will increase 55% to 200 Mtpa, and demand for seaborne DR-grade iron ore will more than double to 110 Mtpa. The suitability of Brazil's high-grade iron ore for the type of low-carbon DRI-based iron and steelmaking that will become increasingly prevalent is already being demonstrated.[9]
- In addition to planning 'Mega Hubs' in the Middle East where Vale's high-grade iron ore fines will be agglomerated and used to produce iron for domestic use and export, the

[9] Green Iron and Hydrogen offer MENA a chance to shine, IEEFA, November 2023

company is also considering similar developments in both Brazil and North America (Figure 6).

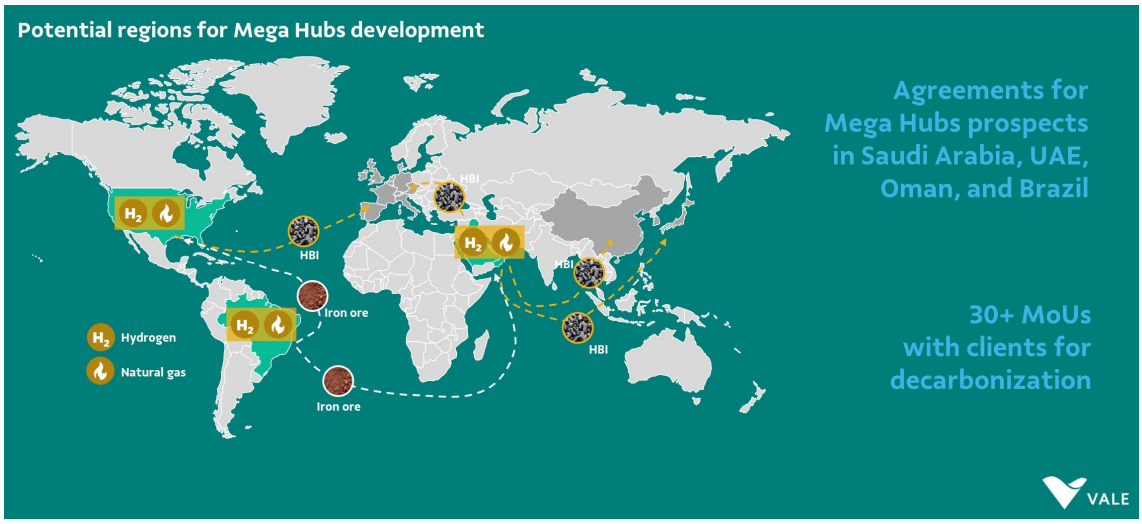


Figure 6 – Vale's view on potential green iron "Mega-Hub" development[10]

- The Institute for Energy Economics and Financial Analysis (IEEFA) has found that Australia is in competition with Brazil, Middle East and Africa for green steel investment and that Australia will need to move quickly or miss the opportunity (Figure 8).[3]

Figure 7 – Pros and cons of regions competing for Green Iron and Steel investment (IEEFA)

[10] Vale Investor Presentation – 2023 Global Metals, Mining & Steel Conference | Bank of America

- In one scenario modelled recently by Global Energy Monitor, Australia is shown to be in competition with eight other countries (not including the MENA region) for green iron production starting in 2028 and ramping up significantly through to 2045 (Figure 8).[11]

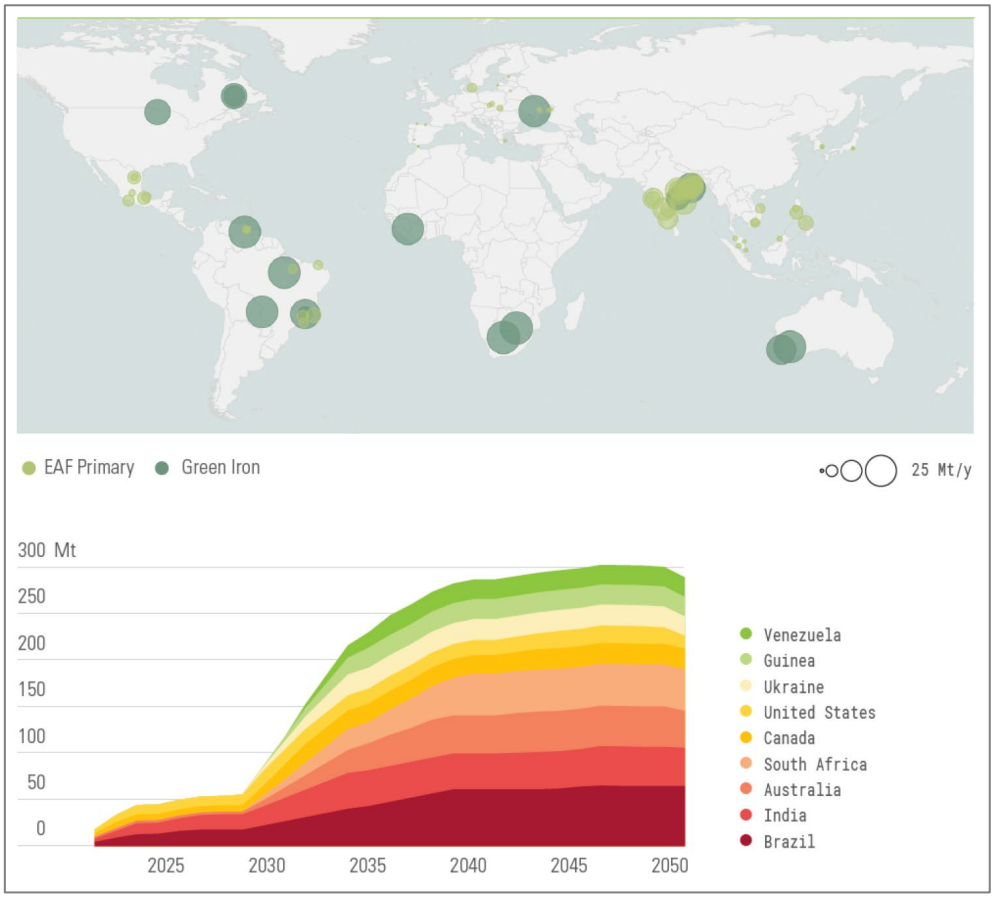


Figure 8 – Global Energy Monitor global green iron distribution scenario[11]

[11] Facility level global net-zero pathways under varying trade and geopolitical scenarios – Global Energy Monitor, June 2024

Question 6: What is the scale of investment needed to convert existing facilities or establish new ones (including enabling infrastructure)?

- In 2022, Wood Mackenzie forecast that the global steel industry would spend US$1.4 trillion on decarbonisation by 2050. Of the US$1.4 trillion investment[12]:
    - US$800-900 billion will be essential to greening existing steelmaking infrastructure, setting up new DRI and electric arc furnaces and developing a hydrogen ecosystem for steel.
    - Miners will need to play an active role in cutting operational emissions and investing in new high-grade mines and DR pellet capacities, all of which translate into a US$250-300 billion investment.
    - These measures will still fall short of emissions targets, necessitating an incremental US$ 200-250 billion investment in carbon offset measures, such as CCUS.
    - Given the scale of investment and pace required to reduce emissions from steelmaking, government support is essential to attract investors and improve capital return.

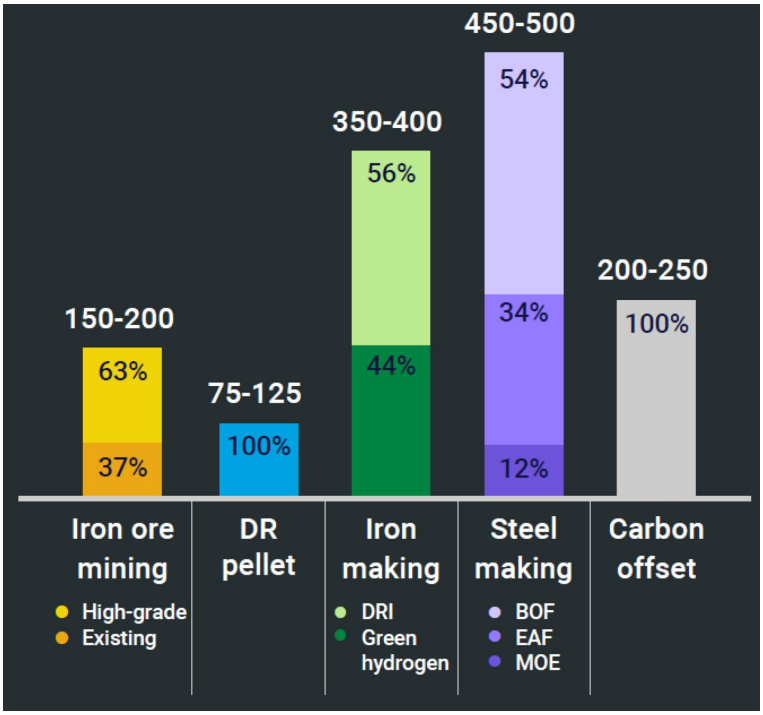


Figure 9 – Iron 6 Steel investments required to reach net zero by 2050 (US$billion)

[12] Pedal to the metal: Iron and Steel's 1.4 trillion USD shot at decarbonisation, Wood Mackenzie, September 2022

Question 7: Is your organisation currently undertaking or planning to undertake any major green metal investments or facility refurbishments?

- Investments: Magnetite Mines Ltd plans to develop its 100% owned Razorback Iron Ore Project in South Australia that will produce 5Mtpa of magnetite concentrates of sufficient quality to produce Direct Reduced Iron (DRI) or "green iron".
- The concentrate product will provide options for a combination of value-adding and export opportunities:
    - The concentrates may be exported as is to third-party countries seeking supply chain for green iron making elsewhere;
    - The concentrates may be pelletised in Australia for international export;
    - The pellets may be converted into green iron (by others) using hydrogen in a DRI/HBI plant for international export or domestic steelmaking.

When are these expected to begin, and what are the anticipated completion dates?

- The FID for the Razorback Iron Ore Project in South Australia is expected within 2 years, subject to funding and approvals. This will be followed by a 2-year construction period with the earliest production of concentrates scheduled for 2029.

When are the capital costs associated with the refurbishments expected to be recouped?

- The development capital cost for Stage 1 of the Razorback Iron Ore Project is expected to be in the range A$1.7 – A$2.0 billion, with a payback period of 4 – 5 years (on an 8% discounted cash flow basis) from first production.

Question 8: What are the benefits to the local region or community when developing a green metals project?

- Green metals projects, and specifically green iron projects, can provide a tangible benefit to regional communities and stakeholders through direct and indirect stimulus. South Australian magnetite deposits are particularly well-positioned to drive economic development outcomes given their location in greenfield mineral provinces.
- Importantly, the production of magnetite concentrates to feed emerging green iron and green steel markets provides a new, long-life and sustainable economic opportunity for communities in the face of a global-scale economic transition. The extensive mine life associated with bulk magnetite projects, such as the Razorback Iron Ore Project, can provide benefits for multigenerational recipients through:
    - Direct and indirect employment, including with targeted groups (youth, Indigenous, unemployed).
    - Access to improved training and development opportunities.
    - Local supply chain development.
    - Flow-on local economic activity.
    - Provision of taxation receipts and state-based royalties.
    - Direct community contributions by project proponents.
    - Shared use of new or improved infrastructure, such as civic.
    - Population growth and improved access to services.
- While many of these benefits can arise from other economic development opportunities, magnetite/green iron developments will generally disproportionately concentrate these benefits in regional areas. Economic analysis completed by BDO EconSearch identified the material benefits that can be derived from the Razorback Iron Ore Project on local, regional and state levels, including:
    - An increase in Gross State Product of over $1bn during operations, of which almost $200m is realised in regional SA.
    - Direct and flow-on employment of 2,849 persons and a population increase of 1,580 across SA, with 37% and 59% being realised in regional SA respectively.
    - Economic benefits being realised from magnetite mining in traditionally non-aligned service sectors, specifically through consumptive spending through increased salary receipts.
- The potential local benefits arising from the Razorback Iron Ore Project may be profound. While the Project sits within the Unincorporated SA local government area, principal service communities are situated to the east of the project area, particularly Peterborough.
- According to the Index of Relative Socio-economic Disadvantage (IRSD) (ABS 2021a), Peterborough is the 34th most disadvantaged community in Australia (7th percentile) and third most disadvantaged in SA (5th percentile).

- Peterborough is listed as the lowest in SA and 12th lowest nationally in ABS' Index of Employment and Education (IEO) (2021a).
- A conservative estimate of 8% of the operations-stage workforce being sourced from the Peterborough LGA equates to 36 full-time roles. Based on the median Australia mining worker salary of $2,403/week (Jobs and Skills Australia, 2024), this additional employment results in an additional $4.5m of salaries paid locally – a 19% increase on total employee income paid locally in 2020/21 (ABS 2021b).
- Selected SA and Peterborough outcomes, construction and operations[13]:

Figure 10 – Flow on economic activity in Peterborough (BDO)

[13] ABS 2021a, https://www.abs.gov.au/statistics/people/people-and-communities/socio-economic-indexes-areas-seifa-australia/latest-releaseABS
ABS 2021b, https://www.abs.gov.au/statistics/labour/earnings-and-working-conditions/personal-income-australia/latest-release#data-downloads
Jobs and Skills Australia 2024, https://www.jobsandskills.gov.au/data/labour-market-insights/industries/mining

Flow -on economic activity by sector in Peterborough:

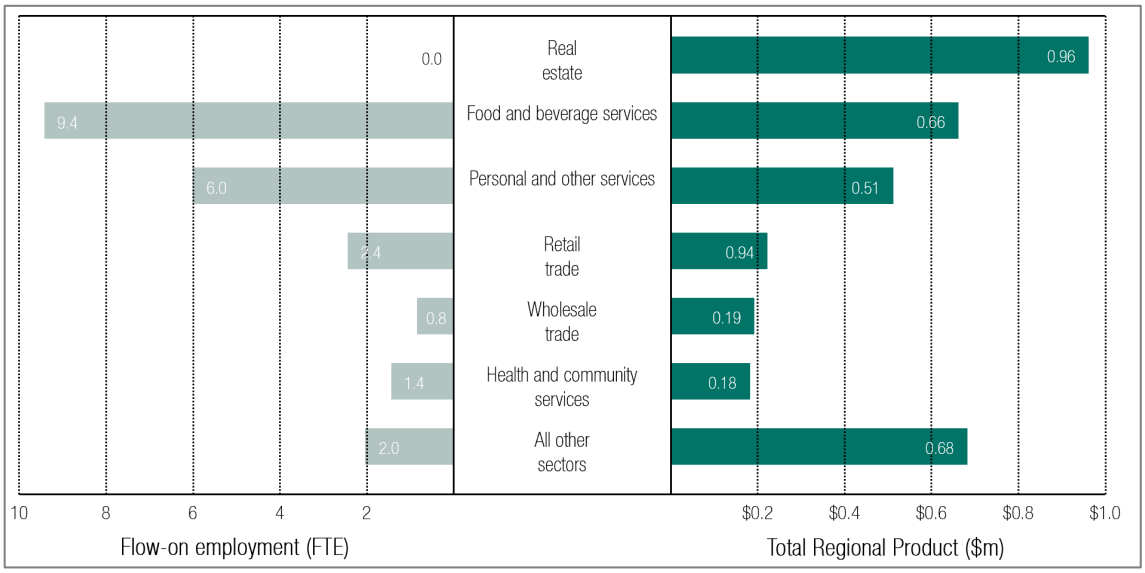


Figure 11 – Flow on economic activity in Peterborough (BDO)

Question 9: How are you considering these benefits in evaluating projects? Are there ways to increase opportunities for the local community or broader industry?

Magnetite Mines has a strong focus on how it can enable local/regional communities to engage in and benefit from the Razorback Iron Ore Project:

- Working with local communities form an early stage – MoUs with District Council of Peterborough and Port Pirie Regional Council to bring local matters/priorities into focus and provide a forum for collaboration and information flow.
- Further engagement with other groups, such as local chapters of Regional Development Australia.
- Making the project accessible to employees – a true FIFO model will limit accessibility for prospective local/regional employees; a regional transit hub model is being explored with Peterborough Council and RDA to open the opportunity to more regional personnel.
- Reversing population decline and retaining young members of the community is another ambition for local communities – Magnetite Mines has embarked on a strong collaborative effort with all levels of government to support this ambition.
- Utilising local resources and supply chains, and providing opportunities to same, creates additional tangible and intangible value for proponents (sustainability in resourcing, improved transport carbon footprints, further growing local communities, etc.).
- Reflecting the priorities of the communities that Magnetite Mines has engaged with, increasing the benefits for these communities will require support to make them accessible, connected and affordable, with comparable levels of service, amenity and recreation as metropolitan centres.

Question 10: How can the government support industry to enable communities and workers to share in the benefits of transitioning to green metals?

The Australian Government can support industry to enable communities and workers to share in the benefits of transitioning to green metals in practical ways by:

- **Workforce Planning**: Facilitating, with state governments, workforce planning for regions. This involves working with local governments and key stakeholders in the region to plan for skills needs, identify employment pathways and manage economic growth. This in turn will help grow existing industries and attract new industries to the area.

Figure 12 - Workforce planning and development is a key driver of economic and social development.[14]

- **Support for apprenticeships and traineeships:** Financial support for large green metals businesses, as well as small to medium businesses that will be part of the supply chain, to train and employ apprentices and trainees. This recognises the extra hours involved in training an apprentice and supports an investment by the business in the apprentice.

- **Housing and supporting infrastructure:** Working with all levels of Government and industry to incentivise new house builds and supporting infrastructure. A lack of housing for the workforce is a major risk to projects looking to start up and invest in regions.

- **Living away from home allowances:** Many of the new employment opportunities are going to be in a different location to where the employee currently lives. Relocation of whole families will take time and cost. Assistance to individuals who do relocate to work in new green metals industries would overcome a barrier to people benefiting from the new opportunity and help deal with a work force skills challenge.

[14] *Workforce planning for regions, A guide for regions, economic development bodies and government, Jobs Queensland April 2023.*

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

- **Priority 1 Barrier: lack of enabling infrastructure** to enable the development of new magnetite mines in South Australia's Braemar Iron Formation. A supply of high-quality magnetite concentrates is a necessary feed stock to produce green iron in Australia.

There are three key infrastructure needs:

1. **Fresh water supply**: 10Gl/a of water supply is required to enable the production of 5Mt/a of magnetite concentrates. This water is required at the process plant which is located at the mine site. In the case of Magnetite Mines' Razorback Iron Ore Project, the mine site is located 160km East of Port Pirie, 240km NNE of Adelaide and 50km south of Yunta.
2. **Electricity supply**: Magnetite Mines' Razorback Iron Ore Project will require approximately 150MW of electricity to power the process plant. To enable this, the Company has worked directly with ElectraNet (SA grid manager) to design a 275KV high-voltage transmission line from the Bundey Substation, which is a part of the Project EnergyConnect SA-NSW interconnector.
3. **Port upgrade**: The existing Port of Port Pirie requires upgrading to enable the intermodal receipt and export of bulk magnetite concentrates (rail, storage, conveyor systems, transshipment berth).

- **Priority 2 Barrier:** low-cost renewable energy at scale.

To attract international investment in downstream value-adding (i.e. the production of DR pellets from magnetite concentrates, and the further processing of DR pellets into DRI for export as HBI), the cost of energy (both natural gas and renewable electricity for producing green hydrogen) will be the key deciding factor. Australia is competing with other nations for this investment and therefore must create a competitive energy environment.

- **Priority 3 Barrier:** absence of magnetite or high purity iron ore from Australia's Critical Mineral or Strategic Materials List.

Canada recently added high-purity iron ore to its Critical Minerals list, signaling government support for the mineral, recognising its essentiality to a new green iron industry, and thereby providing further attractiveness to international investment.

Australia needs to follow suit.

- **Priority 4 Barrier:** Awareness and encouragement of green iron and the opportunity for Australia.

The green iron opportunity is extremely compelling for Australia, although it is somewhat complex to describe and is very new globally. This creates a barrier in the form of a lack of awareness by the stakeholders that will be needed to support the development of the opportunity, including communities, government departments, and the investment community.

Education and promotion of the opportunity will be required across all stakeholders to ensure buy-in from all necessary stakeholders at an early stage if we are to compete in the necessary timely manner.

- **Priority 5 Barrier:** Regulatory approvals.

Increasingly arduous environmental and regulatory approvals provide a barrier to the timely introduction of a new green iron industry, and is often the critical path on development schedules, delaying the commencement of operations.

Enabling a green iron industry will require a large range of new infrastructure and industrial facilities including, water supply, electricity transmission, port upgrades, water desalination, hydrogen electrolysers, magnetite mines and concentrators, pellet plants and DRI/HBI plants. All of these require regulatory approvals and each can be a broken link in the chain to achieving green iron production.

Regulations should be streamlined and well-resourced by government to ensure that the lag is not detrimental to Australia's ability to compete in a timely manner.

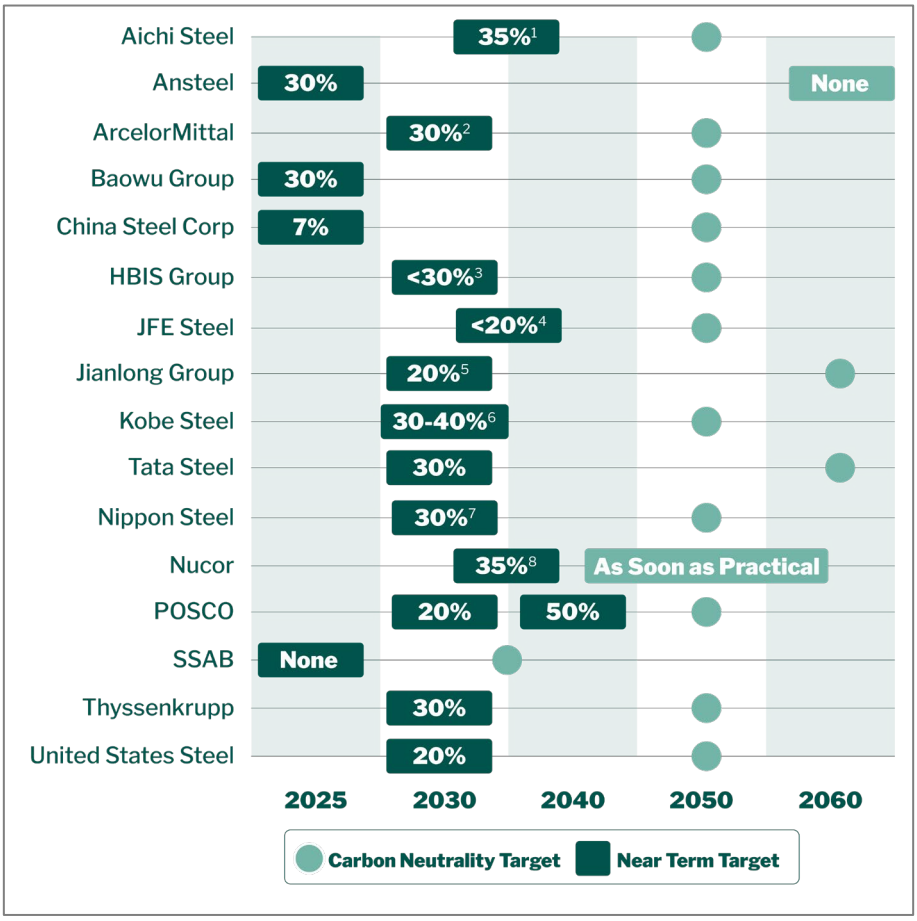
Question 13: To what extent are barriers comprised of upfront capital costs or ongoing operational costs?

- Large scale magnetite mining and processing operations are both capital and operating cost intensive. In particular, the need to provide critical enabling infrastructure (see response to previous Question) has been a key blockage to the development of magnetite mines in the Braemar Iron Formation to date.
- The development capital cost for Stage 1 of Magnetite Mines' Razorback Iron Ore Project is expected to be in the range A$1.7 – A$2.0 billion, with total cash costs of production c. US$90/t concentrate CFR China.
- The development capital cost is particularly burdensome, with logical mitigation centred around sharing capital risk amongst two or more JV partners, and a project debt facility that spreads debt risk across a range of debt sources.
- Government support in the form of direct funding of enabling infrastructure (see previous Q) or low-cost/guaranteed debt can create a much lower risk environment for private investors and JV partners.

Question 15: What are the technologies associated with meeting green thresholds?

The Transition to Green Steel

- The steel industry currently generates approximately 8% of global carbon emissions, primarily from blast furnace steelmaking which uses coking coal as a reductant and energy source.
- Most major steel producers have made commitments to reduce their carbon emissions and achieve carbon-neutrality by 2050 (Figure 13).



1. by 2030 compared to 2013 levels | 2. by 2030 over 2018 | 3. by FY2030 compared to 2022 | 4. by FY2030 compared to FY2013
5. lower by 2033 | 6. by 2030 from 2013 levels | 7. by 2030 compared to 2013 levels | 8. by 2030 using 2015 baseline

Figure 13 - Major Steel Producer Carbon Reduction Targets (Company reports)

- Potential pathways to reduce carbon emissions in blast furnace steelmaking includes partial substitution of coking coal with green hydrogen, and via carbon capture and storage. Despite many years of research, however, these technologies are not yet proven at scale, enable only partial emissions reductions, and are commercially inferior to alternatives.
- Using high-grade iron ore as blast furnace feedstock can also yield emissions savings as ores with fewer deleterious elements produce less slag and require less coke for processing than lower-grade ores. Magnetite Mines' Razorback Iron Ore Project's

targeted concentrate specification, produced in laboratory conditions, is estimated to reduce blast furnace carbon emissions by 0.3 million tonnes (post-agglomeration) relative to standard-specification 62% Fe iron ore.

- It is forecast that most steel industry carbon emission savings will be achieved through the transition from blast furnace to electric arc furnace (EAF) steelmaking, using renewable energy provided electricity to convert scrap steel and direct reduced iron (DRI) into liquid steel.
- The key to realising the full emissions-reduction potential of green steelmaking lies in the reductant gas used to convert high-grade iron ore into DRI:
    - Natural-gas based DRI processes typically emit between 0.6 and 1.2 tonnes of CO2 per tonne of steel.
    - Replacing natural gas with 100% green hydrogen can reduce emissions to near zero.
- Almost all major steelmakers have made recent investments in low-carbon EAF projects, e.g., in May 2023, Nippon Steel joined ArcelorMittal and SSAB in committing to converting a large portion of its steelmaking capacity to electric arc furnaces as part of its efforts to be net zero by 2050.
- Wood Mackenzie has estimated that in order to meet the Paris Agreement's 1.5 degree scenario, at least 70% of steel will need to be produced through hydrogen-based EAF processes by 2050.

Question 16: Are these technologies being developed or commercialised?

a. If yes, when do you expect these to be ready for commercial scale deployment?

- Yes, the technologies required for the green steel value chain are available and demonstrated for both transition (natural gas) and decarbonised (hydrogen) downstream processing.
- DRI produced using natural gas or coal fines is well proven in the iron and steelmaking industry and accounts for approximately 5% of current global steel production.
- More recently, both pelletising and DRI OEM's have commercially tested hydrogen-using versions of their equipment and made them available for purchase. Feedback from OEM's suggest that take up has been slow due to the cost and availability of hydrogen relative to natural gas.
- EAFs are used in the production of approximately 20% of global steel production, mostly by using the technology to melt recycled steel scrap. EAFs cannot separate impurity elements (slag) from steel, like in BF-BOF facilities, and therefore require very high purity iron feeds (scrap or near pure DRI).
- The remaining 70% of global steel is produced in integrated steel facilities that combine Blast Furnaces with Basic Oxygen Furnaces (BF-BOF), using coke formed from metallurgical coal as the reductant.
- The reduction step in steelmaking accordingly accounts for ~80% of steelmaking carbon emissions.
- Major steelmaking nations, including Australia's key regional trading partners, have made decarbonisation commitments that are resulting in a shift from BF-BOF facilities as they reach end of life or reline decisions, to EAFs, and are seeking sources of DRI and scrap to meet future low emission steelmaking targets. This has created the demand for hydrogen-based DRI (HDRI) as a critical new supply chain commodity.
- The lowest cost HDRI, or green iron, will be produced in regions that have abundant magnetite resources capable of producing DR-grade concentrates, and low-cost abundant green hydrogen production. This is where Australia has a clear comparative advantage to our key regional trading partners.

Question 18: What are the best examples of a 'green premium' being established for low emissions products? What actions could improve demand for these products?

- Green steel premiums in the EU are currently estimated at €100-300/t with customers in the white goods and automobile manufacturing industries.
- From Fastmarkets[15]
    - Demand for low-emission steels has been steadily increasing, particularly from the automotive industry.
    - Previously, demand was largely exploratory, with consumers testing new suppliers and materials without necessarily being willing to pay a premium.
    - That has changed, however, and premiums for physical steel with CO2 emissions of no more than one tonne per tonne of steel (for Scopes 1, 2 & 3) were reported in the range €200-300 per tonne.
- From Research And Markets[16]
    - The outlook for green steel demand has positively surprised over recent years with a larger range of end users than projected. It is clear that demand for green steel has spread into many more end sectors than was anticipated.
    - The demand for green steel is driven by two main factors: Scope 3 emission reduction targets and end-user demand for these products, which turned out to be wider than originally forecast.
    - Green hydrogen and direct reduction of iron (DRI) plants powered by renewable energy are set to transform the industry.
- From Wood Mackenzie[17]
    - **CBAM, a catalyst for global carbon pricing and trade flows** – EU imports 23% of its steel equating to 34% (80-90 Mt) of its carbon emissions from finished and semi-finished steel. From 2026, an increasing share of these emissions must be paid for under the CBAM with complete implementation by 2034. This will lead to the delivered steel price in the EU increase by US$300/t by 2034. When benchmarked to EU steel mills, this will equate to an average cost burden of US$100-150/t.

[15] Green premium for flat steel stable in first European assessment, Fastmarkets, June 2023
[16] European Green Steel Market, Research And Markets, November 2023
[17] Green steel: challenging the status quo, Wood Mackenzie, May 2024

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

- Investment requires certainty. Clear direction in government policy de-risks a project from both the perspective of the Australian company's investment decisions and the decisions of foreign offtake/investment partners. Uncertainty delays investment decisions and risks Australia locked out for decades on opportunities that will instead flow offshore to countries that provide clear direction and certainty (such as the Middle East).
- Australian and State Government investment in enabling multi-user infrastructure is a tangible way to demonstrate commitment and support for establishing a new green iron industry in Australia, to both the company developing the green iron projects and international investors/offtake partners.

a. What impact will the government's industry investment measures, such as the National Reconstruction Fund and Future Made in Australia Innovation Fund, have on your transition?

- It is important to consider the different levels of industrial players in the green iron space in Australia. Program funding guidelines need to provide assurances for spending taxpayers' dollars and, at the same time, be flexible and agile to enable new, often smaller, companies to access the support.
- If the threshold for eligibility and securing funding is too high, the Government risks not fully capitalising on the green iron opportunity for Australia. Many innovative opportunities have been identified and initially developed by small companies who don't qualify for government assistance schemes.
- Global investors and offtake partners are considering the support offered by other governments around the world in deciding where to invest their money. These agreements are being locked into multi-decade terms and Australia risks missing out if we are not globally competitive.
- Governments in competitor countries are offering a variety of significant support schemes, hence it is recommended that the Australian Government should seek to achieve a level the playing field, rather than creating an advantage domestically.

b. What impact will the government's recently announced renewable hydrogen measures have on your transition?

- The establishment of a green iron industry in Australia represents one of the biggest and most lucrative economic opportunities for the country emerging from global decarbonisation. To be competitive and therefore successful, a new green iron industry will require two key elements;

    a) the availability of competitively priced green hydrogen at scale (for use in Direct Reduced Iron production); and

    b) premium-grade magnetite concentrates produced at scale.

Both elements are being sought by downstream customers (steelmakers and trading houses that support steelmakers) to inform their investment decisions to lock in future green iron supply chains.

- The government's renewable hydrogen measures will support Australia being seen as attractive for such investment relative to other regions and jurisdictions that are competing for the new investment.

c. What impact do the government's policies to incentivise renewable electricity generation, storage and transmission have on your transition?

- These policies are essential for trade to nations and regions mandating low carbon emission intensity standards in supply chains.
- For example, the EU's Carbon Border Adjustment Mechanism (CBAM), which will apply its definitive regime from 2026, will require EU importers to declare the carbon emissions embedded in their imports. Other trade regions are expected to follow the EU's lead regarding CBAM introduction, creating global commercial incentives favouring supply chains from regions offering very low carbon emissions embedding in the trade products.
- For Australia, accelerating renewable electricity generation, storage and transmission will enable our "comparative advantage", relative to our key trading partners and commencing with the EU, to be realised.
- Regarding green iron production, accelerating renewable electricity generation, storage and transmission supports the generation of green hydrogen at scale, critical to attracting investment in green iron – see answer to 22(b) above.

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

For example:

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

- **National Green Iron Strategy** – the success of establishing a competitive Green Iron Industry in Australia will be best supported by national recognition of a stated outcome and alignment of the principles for policy support to achieve that outcome.

We suggest the following 9 key elements for inclusion in a National Green Iron Strategy:

1. A statement of Australia's vision for a domestic Green Iron Industry.
2. The inclusion of magnetite or high purity iron ore on the Australian Critical Minerals or Strategic Materials list, signaling the government's intention to support new production.

3. The identification of priority projects or "green iron hubs" to be developed that will result in the acceleration of production and export of Hot Briquetted Iron (HBI).
4. The identification and financial support from Federal and State Governments for key common user infrastructure required to be developed to support the industry including transport (port and rail), renewable power and water.
5. The introduction of financial incentives in the form of subsidies or tax policy designed to decrease risk for industry investment in projects.
6. The development of a pathway to the operation of Hydrogen-based DRI facilities in Australia, recognising the role of natural gas as a transition fuel capable of delivering short-term emissions reductions.
7. Advocacy for a timeline that introduces a mandate for the use of green steel regardless of the technology implemented, starting with government procurement policy.
8. Streamlining of regulatory approvals, enabling projects to move from design to production faster.
9. International awareness of the role Australia seeks to play in a global green iron industry, and the potential for partnering with key regional trading partners.

- The provision of **Multi-user enabling infrastructure** will be the biggest project aid to developing magnetite production from the Braemar Iron Region, the location of Magnetite Mines' Razorback Iron Ore Project, along with other projects in development by others. Developed to support a green iron industry, this region has the potential to be of similar significance to Australia as the Pilbara or Bowen Basin (in terms of economic output and jobs).

  We suggest a tripartite agreement where Federal Government, State Government and Industry partners fund essential infrastructure such as water and power to the region, would be the most significant and effective government support for the green metals industry.

  Federal and State government investment in this infrastructure would support project economics, improving confidence and leading to earlier final investment decisions by project developers and international investors.

  Australia has seen the setbacks in the Pilbara, where private infrastructure built by multiple companies caused inefficiency and blocked others from participating.

  Without essential infrastructure investment to support the rapid development of new DR-grade magnetite production, and at least initial ownership by the Government, we can expect Australia to miss the green iron opportunity at the expense of the economy.

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

- We believe both are required: grant-based funding to support private sector risk taking in the form of first mover or demonstration facilities, as well as co-funding for enabling

infrastructure where it does not currently exist; and tax/fee/royalty-relief incentives for early years production to help protect private investment during the riskiest financial period (i.e., commissioning and ramp up). Applying these incentives through the delineation of Special Economic Zones that provide surety of economic tenure for international investors, will help Australia attract investment away from green iron competitor countries and regions.

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

- We agree that, to support a new green iron industry, a 'contract for difference' scheme would help incentivise private investment by reducing revenue risk in an emerging new market where trade economics have yet to be borne out.

Question 24: Are there parts of the value-chain that require particular support (for example, energy inputs, green alumina or iron inputs, or green aluminum or steel production)?

a. Should support be prioritised towards certain parts of the value chain in the first instance?

- Major investment decisions in downstream green iron and steel making facilities will not be possible without first the establishment of proven long-term supplies of very-high quality magnetite concentrates.
- Magnetite concentrates currently produced in Australia do not meet the necessary quality criteria and are currently exported to high-carbon emission steelmaking facilities.
- Australia does not have a dedicated facility to test and demonstrate the production of green iron from Australian magnetite iron ores.
- Additionally, green iron making facilities require initially a source of natural gas, and importantly a source of competitive green hydrogen, which in turn requires large amounts of renewable energy.
- **In summary**, the three key value chain items that require priority for the establishment of a green iron industry are:

    1. Establishment of a **Green Iron Centre of Excellence** (laboratory / research centre / demonstration facility) in South Australia's Upper Spencer Gulf that demonstrates the production of export-quality green iron from locally produced green hydrogen and Braemar magnetite concentrates.
    2. **High-quality magnetite concentrates production**: with a focus on fast-tracked mining approvals and the provision of enabling infrastructure (see Q 12).
    3. **Rapid expansion of renewable energy sources** on grid to support green hydrogen production at scale.