

# ArcelorMittal: Green Steel for Europe, Blast Furnaces for India

Questions for Investors Over Ability to Meet  
2050 Emissions Target

Simon Nicholas, Energy Finance Analyst  
Soroush Basirat, Energy Finance Analyst (Steel Sector)



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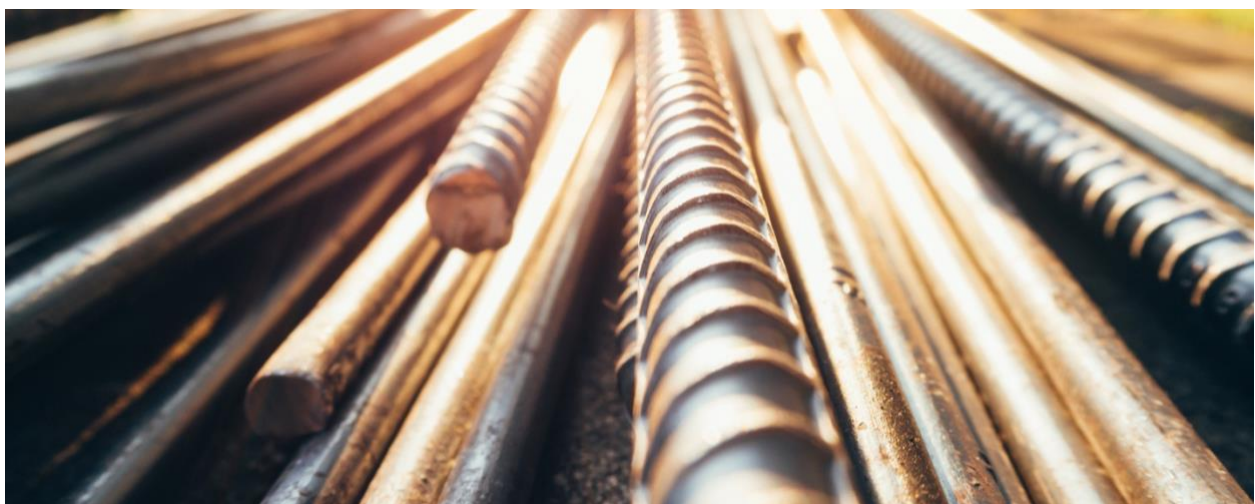
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## Key Findings

**ArcelorMittal has a 2050 net zero emissions target and is planning to shift from blast furnaces to green hydrogen-based steelmaking in Europe and Canada, but is still building coal-consuming blast furnaces in India.**

ArcelorMittal appears to be planning a two-speed decarbonisation with ready-to-deploy DRI technology to be installed overwhelmingly in developed nations while the developing Global South is on the slower pathway involving more blast furnaces and as yet unproven CCUS technology.

With no major breakthrough in CCUS for coal-based steelmaking on the horizon, investors should be asking questions about ArcelorMittal's Indian expansion and how it's compatible with a 2050 net zero emissions target.



## Executive Summary

Global steelmaking giant ArcelorMittal has committed to reach net zero emissions by 2050 yet it is building new coal-consuming blast furnaces in India. With no major breakthrough in carbon capture utilisation and storage (CCUS) for coal-based steelmaking on the horizon, investors should be asking questions that challenge ArcelorMittal about its Indian expansion, the technology choices being made and how that aligns with the company's 2050 net zero emissions target.

Luxembourg-based ArcelorMittal has entered the Indian steel market via a 60:40 joint venture with Nippon Steel of Japan — ArcelorMittal Nippon Steel India (AM/NS India). AM/NS India has now begun construction of two new blast furnaces at Hazira, Gujarat, is planning a further expansion of capacity to 20 million tonnes per annum (Mtpa) as well as new integrated steel plants at Kendrapara (24Mtpa) and Paradip (6Mtpa) in the state of Odisha. The steelmaking technology under consideration for these new sites has not been disclosed.

## A Two-Speed Decarbonisation Plan

ArcelorMittal's plans for more coal-based steelmaking in India contrasts markedly with its developments in Europe and Canada, where the company is planning a transition away from blast furnaces to direct reduced iron (DRI)-based steelmaking using green hydrogen under its 'Innovative DRI' decarbonisation pathway. In October 2022, ArcelorMittal broke ground on its US\$1.3 billion transition to DRI-based steelmaking in Ontario, Canada, and it has similar plans in Spain, France, Belgium and Germany.



**ArcelorMittal's plans for more coal-based steelmaking in India contrasts markedly with its developments in Europe and Canada, where the company is planning a transition away from blast furnaces.**

As a result, ArcelorMittal appears to be planning a two-speed decarbonisation with hydrogen-ready DRI technology to be installed overwhelmingly in developed nations while the developing Global South is on the slower pathway involving more coal-consuming blast furnaces and as yet unproven CCUS technology under its 'Smart Carbon' decarbonisation pathway.

Proposed CCUS and bioenergy technologies being considered by the company to reduce emissions from blast furnaces under its 'Smart Carbon' pathway are not being used at scale. ArcelorMittal's "flagship" CCUS project will capture only a small fraction of the emissions at its Belgian operation. In IEEFA's opinion, there is a risk to the company that the 'Smart Carbon' pathway could be perceived as "greenwash", used to justify the continued installation of new blast furnaces in developing nations. This risk has heightened since the COP27 climate conference in November 2022 where the United Nations warned that company net zero emissions commitments often amount to little more than greenwashing while recommending new standards to hold companies to account.

## A two-speed decarbonisation plan

### ArcelorMittal's Indian expansion plans

Location (Capacity)	Technology
Hazira 1A (6Mt Steel)	Coal-based BF-BOF
Hazira 1B (5Mt Steel)	Not disclosed
Kendrapara (24Mt Steel)	Not disclosed
Paradip (6Mt Steel)	Not disclosed

VS

### ArcelorMittal's hydrogen DRI plans

Location (Capacity)	Technology
Gijón (2.3Mt DRI, 1.1Mt Steel) 	H <sub>2</sub> ready DRI-EAF
Bremen & Eisenhuttenstadt (3.5Mt Steel), Hamburg (0.1Mt H <sub>2</sub> DRI) 	H <sub>2</sub> ready DRI-EAF
Dunkirk (2.5Mt DRI) 	H <sub>2</sub> ready DRI-EAF
Ghent (2.5Mt DRI) 	H <sub>2</sub> ready DRI-EAF
Hamilton (2.5Mt DRI, 2.4Mt Steel) 	H <sub>2</sub> ready DRI-EAF

### Options to decarbonise BF-BOF

CCS

Bioenergy

- Only partial emissions reductions
- Unproven or with history of failure
- High cost with no reductions in sight
- Questionable metallurgical coal investment outlook

### Options to decarbonise DRI & EAF

Green hydrogen

Renewable electricity

- 100% emissions reduction potential
- Proven technologies
- Expected to be cost competitive by 2030
- Growing investment & demand globally



Figure source: IEEFA

A 2021 report by think tank E3G and the U.S. Department of Energy’s Pacific Northwest National Laboratory found that any blast furnaces without CCUS will need to be phased out by 2045 for the global steel sector to be on an orderly 1.5°C pathway and no more new blast furnaces without CCUS should come online after 2025 to avoid stranded assets. AM/NS India’s expansion plan will see two new blast furnaces — without CCUS — brought online in 2025 and 2026 with the likelihood that further blast furnaces are being planned for the greenfield sites in Odisha.

**“Blast furnaces without CCUS will need to be phased out by 2045 for the global steel sector to be on an orderly 1.5°C pathway and no more new blast furnaces without CCUS should come online after 2025 to avoid stranded assets.”**

## Carbon Capture Technology Has a Long History of Failure

As major iron ore miner BHP noted in October 2022, “There are no full scale operational CCUS facilities in blast furnace steelmaking operations at present, with only a limited number of small capacity carbon capture or utilisation pilots underway or in the planning phases globally.”

As well as virtually no track record in the steel sector, the history of CCUS in other sectors is not impressive. A September 2022 IEEFA report found that underperforming carbon capture projects considerably outnumber successful projects globally, and by large margins. With hydrogen-based DRI projects now shifting from announcements to investment decisions and construction, CCUS in the steel industry faces being left behind in the same way it was in the power sector as wind and solar power became ever cheaper, increasingly widespread and far more financially viable.

## Future Coking Coal Availability and Cost in Question

Concerns are also rising about the future availability and cost of coking coal due to a lack of investment in new mining capacity. In November 2022, the CEO of BHP — the world’s largest shipper of coking coal — stated that the company has no “growth capital” allocated to coking coal. South32 also made clear in 2022 that it will not be investing in any new coking coal projects and will wind down its coal business as existing mines are depleted.

In a significant development, HSBC announced an updated energy policy in December 2022 which prohibits it from providing finance for new coking coal mines. It can be expected that other banks will now follow suit — similar to how thermal coal finance restrictions rolled out across banks globally — as it becomes increasingly clear that alternatives to coal-based steelmaking are viable.

With increasing questions over the long-term future of coking coal production in Australia, ArcelorMittal’s joint venture partner in India is considering making more coking coal investments in Australia itself in order to shore up supply. Steelmakers are coming under increasing pressure to decarbonise their operations. This pressure will only escalate if they start to increase their own investment in coking coal mines as incumbent miners and financiers exit the sector.

## Green Hydrogen a Promising Alternative

While reliance on coking coal has the potential to cause India a further energy security headache, green hydrogen could conceivably provide a solution for a nation highly dependent on fossil fuel imports. A June 2022 report by Indian public policy think tank NITI Aayog and RMI found that growing global momentum on the transition towards green hydrogen is a good fit for India given its energy security, emissions reduction and development concerns.



**Growing global momentum on the transition towards green hydrogen is a good fit for India given its energy security, emissions reduction and development concerns.**

The cost of green hydrogen could fall to approximately \$1.60/kg by 2030 and \$0.70/kg by 2050 according to NITI Aayog and RMI, which could see hydrogen and DRI-based steel production becoming cost competitive with natural gas-based DRI by 2027. By 2030, they see green hydrogen-based DRI being the most cost-competitive steelmaking route in India, cheaper than blast furnace-based operations.

In November 2022, the International Energy Agency stated that “hydrogen-based steelmaking has picked up significant momentum”, highlighting the tripling of the number of steelmakers’ announcements to use such technology over the prior 12 months. The second half of 2022 saw a number of steelmakers move from green steel announcements and pilot projects towards commercial-scale investment decisions and construction, that will see new, low-carbon installations operational in just 3–4 years and ready-to-use green hydrogen to reduce emissions further.

In January 2023, the Indian government approved a US\$2 billion plan to promote domestic green hydrogen production and utilisation.

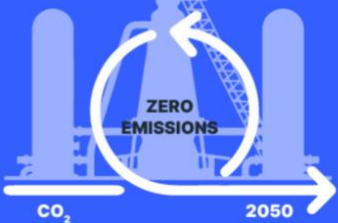



## A Critical Market

Major international steelmakers like ArcelorMittal are keen to enter the Indian market because it is the key steel growth market globally, with a planned doubling in capacity this decade alone.

Europe is already starting to shift away from reliance on coal-based steelmaking but efforts to bring the global steel sector towards net zero emissions will not be achieved if India relies on new coal-based steelmaking to meet demand growth. The technology pathway that India chooses for its capacity expansion will to a large extent define the success or failure in achieving net zero emissions in the steel sector worldwide.

## Questions for ArcelorMittal Investors

Signatories to the Climate Action 100+ initiative make up almost half of ArcelorMittal's top 20 shareholders — Amundi, BlackRock, Invesco, AllianceBernstein, DWS Investment, State Street Global Advisors and Ninety One. Those investors and others should challenge the company on how its capital expenditure plans in India are aligned with its 2050 net zero target. More specifically:

<p>How is the construction of new blast furnaces in India aligned with ArcelorMittal's target to reach <b>net zero emissions by 2050</b>?</p>	
<p>What steelmaking technology is AM/NS India planning for further expansions at <b>Hazira</b> and in <b>Odisha</b> state?</p>	
<p>What technologies is ArcelorMittal planning to use to <b>mitigate the emissions</b> from its new steel plants in India?</p>	
<p>If CCUS is part of the plan to mitigate emissions from new blast furnaces in India, what is the <b>timeline for when blast furnaces will be retrofitted</b>? And what <b>measures</b> have been put in place to mitigate the risk of future CCUS implementation <b>failure</b> as has been experienced in other sectors?</p>	



## Introduction

ArcelorMittal is the world's second-largest steel producer with 79 million tonnes (Mt) of crude steel production in 2021, behind only Chinese steelmaking giant Baowu Group.<sup>1</sup> The Luxembourg-based giant steel and mining group owns steel manufacturing facilities in 16 countries and has more than 158,000 employees.

The company's steelmaking is more carbon-intensive than the global average. In 2020, the average carbon intensity of their steel business per tonne of crude steel was 2.08 against the global average of 1.83. This is due to the high percentage of steel — 80% of total output in 2020 — that the company produces through coal-consuming blast furnaces.<sup>2</sup>

ArcelorMittal has a target to reach net zero emissions by 2050. The company's 2030 target is an emissions intensity reduction (CO<sub>2</sub>e per tonne of steel) not an absolute emissions reduction goal. ArcelorMittal is targeting a 25% reduction of the group's carbon dioxide equivalent (CO<sub>2</sub>e) emissions intensity (Scope 1 and 2) by 2030 against a 2018 baseline. The target for operations in Europe is a 35% reduction in emission intensity. ArcelorMittal is developing a range of steel decarbonisation projects in Europe and Canada.



**Despite the company's low-carbon development plans in the developed world, ArcelorMittal is developing more blast furnaces in India through its joint venture with Nippon Steel of Japan.**

However, despite the company's low-carbon development plans in the developed world, ArcelorMittal is developing more blast furnaces in India through its joint venture with Nippon Steel of Japan — ArcelorMittal Nippon Steel India (AM/NS India).

Given the lack of progress on the ground for carbon capture utilisation and storage (CCUS) in the steel industry (in common with other sectors), it is unclear how ArcelorMittal can meet its 2050 net zero emissions target while highly carbon-intensive capacity expansions are under development in India.

## ArcelorMittal's Green Steel Plans

ArcelorMittal is following two main pathways to reduce its carbon footprint: 'Innovative DRI' and so-called 'Smart Carbon' (code for CCUS). A third, longer-term technology pathway, direct iron ore electrolysis, is still a long way off from commercial viability.<sup>3</sup> ArcelorMittal is the consortium leader in the Siderwin project seeking to develop carbon-free steelmaking through the electrolytic process of

<sup>1</sup> World Steel Association. [World Steel in Figures 2022](#).

<sup>2</sup> ArcelorMittal. [Climate Action Report 2](#). July 2021.

<sup>3</sup> Ibid.

electrowinning. ArcelorMittal was also the lead investor in a recent finance raising by Boston Metal, a company seeking to develop molten oxide electrolysis for zero-emissions steelmaking.<sup>4</sup>



**CCUS – the key technology ArcelorMittal wants to deploy under its ‘Smart Carbon’ pathway – is not ready for commercial deployment with no clear indication as to when it will be.**

‘Innovative DRI’ is focused on using hydrogen in the direct reduced iron (DRI) process. DRI technology based on natural gas is a well-established technology and new DRI installations that will use green hydrogen to produce low-emissions steel are now under development.<sup>5</sup> By contrast, CCUS — the key technology ArcelorMittal wants to deploy under its ‘Smart Carbon’ pathway — is not ready for commercial deployment with no clear indication as to when it will be (see ‘Carbon Capture Technology Has a Long History of Failure’ below). As a result, ArcelorMittal appears to be planning a two-speed decarbonisation with ready-to-deploy, hydrogen-ready DRI technology to be installed overwhelmingly in developed nations while the developing Global South is on the slower pathway involving more blast furnaces and as yet unproven CCUS technology.

## ‘Innovative DRI’

ArcelorMittal’s green hydrogen-based DRI developments are largely limited to the developed world — Europe and Canada (Table 1).

The Sestao project in Spain,<sup>6</sup> Bremen, Eisenhüttenstadt<sup>7</sup> and Hamburg H2 projects<sup>8</sup> in Germany, Dunkirk<sup>9</sup> in France and Contrecoeur<sup>10</sup> in Canada are among the most significant H<sub>2</sub>DRI-EAF (electric arc furnace) projects in the ArcelorMittal group.

In September 2021, ArcelorMittal announced another €1.1 billion DRI-EAF investment in Ghent, Belgium, with the DRI capacity of 2.5Mt combined with two EAFs.<sup>11</sup> In October 2022, the company broke ground on a US\$1.3 billion, 2.5Mt DRI-EAF installation at Hamilton, Canada. The plant will initially use natural gas but is intended to later transition to green hydrogen as the reductant.<sup>12</sup>

However, ArcelorMittal’s green hydrogen-based DRI developments are not necessarily limited to developed nations. ArcelorMittal announced in May 2022 that it had signed a memorandum of understanding (MoU) with Mauritanian iron ore miner SNIM — the second-largest iron ore producer

<sup>4</sup> Boston Metal. [Boston metal Announces \\$120M Series C Financing Led by ArcelorMittal](#). 27 January 2023.

<sup>5</sup> Renew Economy. [German steel giant tech breakthrough to steer industry away from coal](#). 28 September 2022.

<sup>6</sup> ArcelorMittal. [ArcelorMittal Sestao to become the world’s first full-scale zero carbon emissions\[1\] steel plant](#). 13 July 2021.

<sup>7</sup> ArcelorMittal. [ArcelorMittal plans major investment in German sites, to accelerate CO2 emissions reduction strategy and leverage the hydrogen grid](#). 29 March 2021.

<sup>8</sup> ArcelorMittal. [Hamburg H2](#).

<sup>9</sup> ArcelorMittal. [ArcelorMittal accelerates its decarbonisation with a €1.7 billion investment programme in France, supported by the French Government](#). 4 February 2022.

<sup>10</sup> ArcelorMittal. [ArcelorMittal successfully tests partial replacement of natural gas with green hydrogen to produce DRI](#). 2 May 2022.

<sup>11</sup> ArcelorMittal. [Belgium: Showcasing the full spectrum of our decarbonisation technologies](#).

<sup>12</sup> ArcelorMittal. [ArcelorMittal breaks ground on first transformational low-carbon emissions steelmaking project](#). 13 October 2022.

in Africa. ArcelorMittal and SNIM are investigating the possibility of producing iron ore pellets and DRI in Mauritania, including the potential for the African nation to produce green hydrogen.<sup>13</sup>

**Table 1: ArcelorMittal's Advanced Hydrogen-Based Direct Reduced Iron Plans Are All Located in Europe and Canada**

<b>Sestao &amp; Gijón, Spain</b>	It will become world's first full-scale zero-carbon emissions steel plant by 2025. €1 billion MoU with the Spanish government for investment in hydrogen DRI plant and hybrid electric arc furnace to produce 1.6Mtpa. 50% reduction in carbon emissions within next 5 years. Strategic alliance with HyDeal España to deliver competitive renewable hydrogen to our operations.
<b>Hamburg, Germany</b>	Testing hydrogen DRI instead of natural gas in Europe's only DRI-EAF plant and carbon-free DRI in EAF steelmaking process. Aiming for 100,000 tonnes of DRI per year by 2025. Supported by planned €55 million investment from the German federal government.
<b>Fos-sur-Mer, Dunkirk &amp; Mardyck</b>	Investment of €1.7 billion in decarbonisation of both sites with EAF at Fos-sur-Mer and 2.5Mt DRI unit and additional EAF at Dunkirk. Operational by 2027, it will reduce company's carbon emissions in France by around 40% by 2030. Investment of €300 million in Mardyck to produce electrical steels for industry and electromobility. Scheduled to start up in 2024. Supported by the French government. Partnering with Air Liquide: implementing solutions to produce low-carbon steel in Dunkirk by combining a Direct Reduction Plant with arc furnaces, expected to produce 2Mt of hot metal/year, using low carbon hydrogen. Planned for 2025.
<b>Ghent, Belgium</b>	€1.1 billion investment in 2.5Mt DRI plant and 2 EAFs. Letter of Intent with governments of Belgium and Flanders to invest in Ghent's decarbonisation. The DRI plant and electric furnaces will operate alongside modified BF taking waste wood and plastic as fossil carbon substitute. Planned carbon emissions reduction of 3.9Mtpa by 2030.
<b>Hamilton, Canada</b>	Joint investment with governments of Canada and Ontario of CAD\$1.8 billion in decarbonisation to transition to DRI-EAF from BF-BOF. Will reduce Hamilton's carbon emissions by 60% by 2028.
<b>Contrecoeur, Canada</b>	2022 test of hydrogen injection in DRI plant.

Source: ArcelorMittal. *Integrated Annual Review 2021*, p. 28.

## 'Smart Carbon'

'Smart Carbon' is ArcelorMittal's term for a range of technologies it believes can contribute to its 2050 net zero emissions target. The key technology included is CCUS, but it also involves powering blast furnace operations with renewable energy and using biomass and hydrogen in blast furnaces to replace some coal consumption.



There is a risk to the company that the 'Smart Carbon' pathway will be perceived as "greenwash", used to justify the continued installation of new blast furnaces in developing nations.

<sup>13</sup> ArcelorMittal. [ArcelorMittal signs MoU with SNIM to evaluate the opportunity to jointly develop a pelletisation plant and DRI production plant in Mauritania](#). 25 May 2022.

None of these technologies is yet being used at any meaningful scale. In IEEFA's opinion, there is a risk to the company that the 'Smart Carbon' pathway will be perceived as "greenwash", used to justify the continued installation of new blast furnaces in developing nations. This risk has heightened since the COP27 climate conference in November 2022 where the United Nations warned that company net-zero emissions commitments often amount to little more than greenwashing while recommending new standards to hold companies to account.<sup>14</sup>

Steelanol, Torero, and 3D are among the most prominent projects being developed by ArcelorMittal under its 'Smart Carbon' pathway.

December 2022 saw the inauguration of ArcelorMittal's "flagship" Steelanol CCU project at its steel plant in Ghent, Belgium.<sup>15</sup> The project aims to produce ethanol from blast furnace top gases. The initiative is an industrial-scale demonstration and has the capacity to capture 125,000 tonnes of CO<sub>2</sub> and produce 80 million litres of ethanol. The project will capture a tiny fraction of the Ghent plant's carbon emissions. ArcelorMittal has stated that the replacement of one of its two blast furnaces at Ghent with a new DRI-EAF plant will save 3 million tonnes of CO<sub>2</sub> emissions a year by 2030.<sup>16</sup> The 125,000 tonnes of CO<sub>2</sub> captured by the Steelanol CCU project represents just 4% of this total.



**ArcelorMittal has stated that the replacement of one of its two blast furnaces at Ghent with a new DRI-EAF plant will save 3 million tonnes of CO<sub>2</sub> emissions a year by 2030. The 125,000 tonnes of CO<sub>2</sub> captured by the Steelanol CCU project represents just 4% of this total.**

ArcelorMittal is also set to introduce another project at the Ghent plant in the first quarter of 2023. The Torero project will use waste wood in a blast furnace as a substitute for coal. This project aims to reduce CO<sub>2</sub> emissions by 112,500 tonnes per year, with planned project capacity set to double two years thereafter.<sup>17</sup>

ArcelorMittal is a partner in the 3D project. Launched in 2019 by a consortium of 11 European companies and backed by the European Union, the project aims to capture CO<sub>2</sub> from the ArcelorMittal steel mill in France and store it in the North Sea. The first pilot industrial scale was due to capture 0.5 tonnes of CO<sub>2</sub> per hour by 2021.<sup>18</sup> ArcelorMittal updated the expected completion date for the 3D pilot to 2023 in its most recent Climate Action Report. While the company is setting back the pilot start date, there are more barriers ahead as the project ramp-up requires CO<sub>2</sub> transport and storage infrastructures in other regions where ArcelorMittal operates.<sup>19</sup>

<sup>14</sup> Reuters. COP27 – [Corporate climate pledges rife with greenwashing – U. N. expert group](#). 9 November 2022.

<sup>15</sup> ArcelorMittal. [ArcelorMittal inaugurates flagship carbon capture and utilisation project at its steel plant in Ghent, Belgium](#). 8 December 2022.

<sup>16</sup> ArcelorMittal. [ArcelorMittal signs letter of intent with the governments of Belgium and Flanders, supporting €1.1 billion investment in decarbonisation technologies at its flagship gent plant](#). 28 September 2021.

<sup>17</sup> Ibid.

<sup>18</sup> ArcelorMittal. [Launch of the "3D" project for the capture and storage of CO<sub>2</sub>](#). 27 May 2019.

<sup>19</sup> ArcelorMittal. [Climate Action Report 2](#). July 2021.

In October 2022, ArcelorMittal signed a collaboration agreement with BHP and Mitsubishi Heavy Industries Engineering to trial carbon capture technology at ArcelorMittal's steelmaking site in Ghent, as well as another site in the U.S.<sup>20</sup>

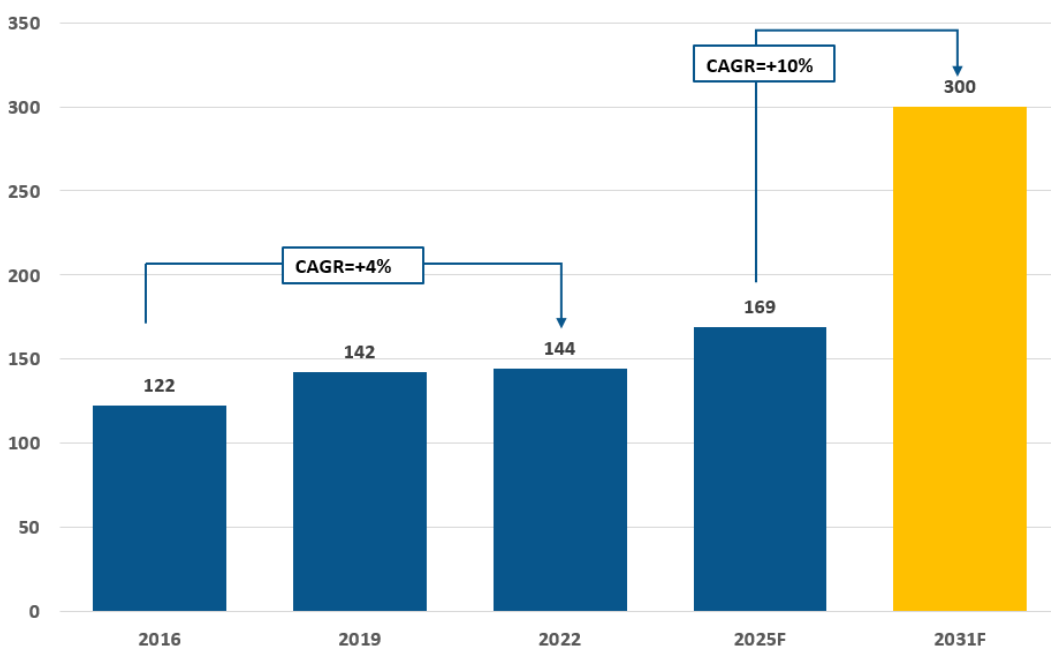
In its most recent Climate Action Report, ArcelorMittal stated that it will accelerate its decarbonisation transition in regions that have targeted policies to support the transition such as Europe and Canada. It also went on to note that: "Where these conditions do not yet exist ... it is difficult to 'Accelerate' without becoming uncompetitive in that market."<sup>21</sup> There was no coverage of India in its most recent Climate Action Report.

## India: The Key Global Steel Growth Market

It is clear why major international steelmakers like ArcelorMittal are keen to enter the Indian market. The fastest-growing large economy globally is already the world's second-largest steel producer but it will see a major increase in steel demand going forward as its economy develops further.

India's National Steel Policy 2017 targets 300Mt of crude steel capacity and production of 255Mt by FY2030–31 (Figure 1).<sup>22</sup> India has to double its capacity by the end of this decade to meet this target and Indian steel producers have aligned their growth strategy with this policy.

**Figure 1: India Crude Steel Production Capacity Estimates (Million Tonnes Per Annum)**



Source: AM/NS India, *Next frontier of the accelerated growth*, p. 29.

<sup>20</sup> BHP. [Carbon capture in the steel industry: ArcelorMittal, Mitsubishi Heavy Industries Engineering, BHP and Mitsubishi Development sign collaboration agreement](#). 27 October 2022.

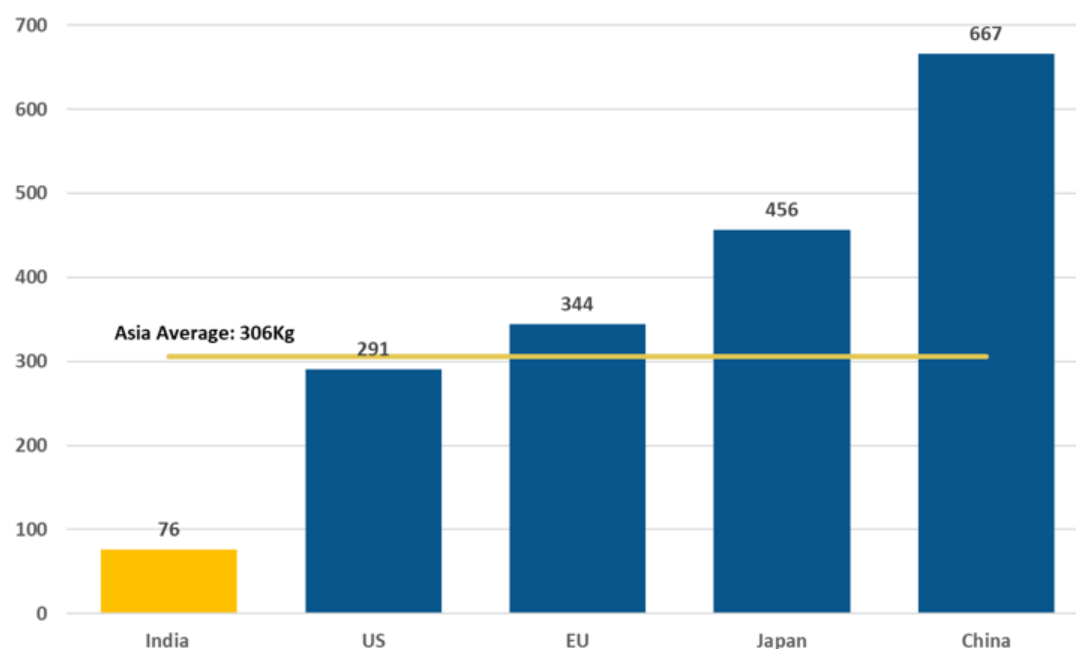
<sup>21</sup> ArcelorMittal. [Climate Action Report 2](#). July 2021

<sup>22</sup> Ministry of Steel. [India National Steel Policy 2017](#). 8 May 2017.

Indian crude steel capacity reached 154Mt in FY2021–22.<sup>23</sup> To reach the National Steel Policy’s 2031 target, a compound annual growth rate (CAGR) of 7.7% in steel capacity is needed. In 2021-22, India produced 120.29Mt of crude steel with a growth rate of 8.9% compared to the previous year. For production to reach 255Mt by 2031,<sup>24</sup> an additional 135Mt of steel above 2021-22 production levels would be needed, or 8.7% CAGR.

As well as these high growth rate targets for steel capacity and production, the government is targeting India’s low steel consumption. According to the World Steel Association, India’s apparent steel use per capita in 2021 was only 76kg while the average in Asia was 306kg (Figure 2).<sup>25</sup> The National Steel Policy 2017 aims to increase per capita steel consumption to 160kg by 2030–31.<sup>26</sup>

**Figure 2: Apparent Steel Use Per Capita (kg), 2021**



Source: World Steel Association. *2022 World Steel in Figures*.

According to International Energy Agency (IEA), Indian steel production will double by end of this decade and quadruple by 2050.<sup>27</sup> While China may be at or close to peak steel production, India — the second-largest steel producer with a high economic growth rate — is an attractive market for steel investors.<sup>28</sup>

India’s National Steel Policy limits the share of the blast furnace-blast oxygen furnace (BF-BOF) route process to 60–65% of total crude steel production by 2030–31.<sup>29</sup> However, the expansion plans of

<sup>23</sup> Ministry of Steel. [Investment Facilitation & Make in India](#).

<sup>24</sup> Ibid.

<sup>25</sup> World Steel Association. [World Steel in Figures 2022](#).

<sup>26</sup> Ministry of Steel. [India National Steel Policy 2017](#). 8 May 2017.

<sup>27</sup> IEA. [Iron and steel technology roadmap](#). October 2020.

<sup>28</sup> IEEFA. [India’s technology path key to global steel decarbonisation](#). 14 February 2022.

<sup>29</sup> Ministry of Steel. [India National Steel Policy 2017](#). 8 May 2017.

large steelmakers in India including AM/NS India are dominated by BF-BOF projects so there is a likelihood of India going over the 60–65% cap.<sup>30</sup>

With steel demand and steel sector emissions in China — by far the world's largest producer — perhaps already in permanent decline, India is the key growth market globally. Europe is already starting to shift away from reliance on coal-based steelmaking<sup>31</sup> but efforts to bring the global steel sector towards net zero emissions will not be achieved if India relies on new coal-based steelmaking to meet demand growth. The technology pathway that India chooses for its capacity expansion will to a large extent define the success or failure in achieving net zero emissions in the steel sector worldwide.<sup>32</sup>

## ArcelorMittal in India

ArcelorMittal holds a 60% share in the AM/NS India joint venture and Nippon Steel 40%. In 2019, AM/NS India acquired Essar Steel India Ltd for US\$5.7 billion. Essar Steel had been in insolvency since 2017.<sup>33</sup> AM/NS India is now an integrated flat steel producer with an annual capacity of 9Mt. The company operates blast furnace, Corex and DRI plants for ironmaking and uses EAF and CONARC in the steelmaking stage.<sup>34</sup>

AM/NS India runs 20Mt of pelletising plants in eastern India where two captive mines with the capacity of 13Mt and third parties supply the iron ore required for concentrate plants.<sup>35</sup>

## Expansion Plans

AM/NS India's Hazira capacity expansion from 9Mtpa to 15Mtpa is now underway with the construction of two new blast furnaces to begin production in 2025 and 2026.<sup>36</sup> Beyond this, a further expansion at Hazira to 20Mtpa is being considered. The steelmaking technology being considered for this further expansion does not appear to have been disclosed.<sup>37</sup>



**AM/NS India's Hazira capacity expansion from 9Mtpa to 15Mtpa is now underway with the construction of two new blast furnaces to begin production in 2025 and 2026.**

Beyond this, AM/NS India is planning expansions in Odisha state. The Odisha government approved the AM/NS India proposal to establish a US\$12 billion, 24Mtpa greenfield steel plant at Kendrapara in

<sup>30</sup> Centre for Science and Environment. [Decarbonising India. Iron and steel sector](#). 28 September 2022.

<sup>31</sup> IEEFA. [Green finance has begun to flow into green steel funding](#). 11 November 2022.

<sup>32</sup> IEEFA. [India's technology path key to global steel decarbonisation](#). 14 February 2022.

<sup>33</sup> ArcelorMittal. [ArcelorMittal and Nippon Steel win 'Deal of the Year' for acquisition of Essar Steel](#). 6 July 2020.

<sup>34</sup> ArcelorMittal. [Fact Book 2021](#).

<sup>35</sup> ArcelorMittal-Nippon Steel India. [Next frontier of accelerated growth](#). 27 September 2022.

<sup>36</sup> ArcelorMittal-Nippon Steel India. [ArcelorMittal Nippon Steel India commences Rs 60,000 crore expansion project in Gujarat](#). 28 October 2022.

<sup>37</sup> ArcelorMittal-Nippon Steel India. [Next frontier of accelerated growth](#). 27 September 2022.

December 2021.<sup>38</sup> In January 2023, the joint venture received approval in Odisha for another, US\$4.7bn steel plant.<sup>39</sup> The planned steelmaking technology for these new proposed plants does not appear to have been disclosed.

AM/NS India is seeking to be self-sufficient in raw material supply. The company has acquired two other mines yet to be commissioned that will supply iron ore concentrate for pelletising plants. The Eklama mine will add 3Mt by 2026 and Satarda 2Mt by 2028.<sup>40</sup>

In May 2022, AM/NS India revealed their intention to increase capacity at the Vizag pelletising plant from 8Mt to 11Mt by the end of 2023.<sup>41</sup> Based on the prefeasibility study for the Hazira plant expansion project, 12Mt of BF-grade pellet will be supplied from Visag and Paradeep.<sup>42</sup>

AM/NS India also announced in late 2022 that they had reached an agreement to acquire infrastructure assets and facilities from Essar Group (including ports, power plants and transmission line) for US\$2.4 billion. AM/NS India has been battling for more than three years for these facilities, which were not part of the initial Essar Steel acquisition in 2019.<sup>43</sup>

AM/NS India has also secured 20% of its electricity requirement for its operations from renewable energy through an off-take agreement with ArcelorMittal. Owned and funded by ArcelorMittal, and designed and operated by Greenko, the project has a nominal capacity of 975MW and is a combination of solar, wind and pumped hydro storage. The project is to be commissioned in 2024 and AM/NS India will offtake 250MW of uninterrupted renewable energy annually for the next 25 years. The project is expected to reduce carbon emissions at the Hazira plant by 1.5Mt per year.<sup>44</sup>



**Adding new blast furnaces at Hazira will increase carbon emissions by approximately 2 tonnes per tonne of crude steel produced — that is, approximately 12Mt of additional CO<sub>2</sub>e emissions.**

However, adding new blast furnaces at Hazira will increase carbon emissions by approximately 2 tonnes per tonne of crude steel produced — that is, approximately 12Mt of additional CO<sub>2</sub>e emissions after expansion if running at full capacity. The excess emissions from the BF-BOF expansion will dwarf the carbon emissions reduction from the renewable energy offtake.

<sup>38</sup> ETNOWNEWS.COM. [Odisha govt okays ArcelorMittal Nippon Steel's plan to set up integrated steel plant, will create 16,000 jobs](#). 19 December 2021.

<sup>39</sup> Reuters. [ArcelorMittal-Nippon Steel venture wins approval for \\$4.7 bln Indian steel plant](#). 20 January 2023.

<sup>40</sup> ArcelorMittal. [Investor presentation: Next frontier of accelerated growth](#). 27 September 2022.

<sup>41</sup> Business Standard. [ArcelorMittal Nippon Steel India to invest Rs 1,000 crore in capacity expansion at Vizag plant](#). 24 May 2022.

<sup>42</sup> Ministry of Environment, Forest and Climate Change. [Pre-Feasibility Report on Expansion of Integrated Steel Plant from 9.6 to 15.6 in Surat District Gujarat](#). September 2021.

<sup>43</sup> Business Standard. [AM/NS India to acquire infra assets from Essar Group for \\$2.4 billion](#). 26 August 2022.

<sup>44</sup> ArcelorMittal. [ArcelorMittal establishes strategic renewable energy partnership with Greenko Group in India](#). 22 March 2022.



## Increasing Risks Associated with Coal-based Technologies

A 2021 report by think tank E3G and the U.S. Department of Energy's Pacific Northwest National Laboratory found that any blast furnaces without CCUS will need to be phased out by 2045 for the global steel sector to be on an orderly 1.5°C pathway and that no new blast furnaces without CCUS should come online after 2025 to avoid stranded assets.<sup>45</sup> AM/NS India's expansion plan will see two new blast furnaces — without CCUS — brought online in 2025 and 2026, plans for further expansion at Hazira and — in the longer term — a 24Mtpa greenfield plant planned in Kendrapara, Odisha, and a 6Mtpa integrated steel plant at Paradip, Odisha. Feasibility studies are underway for both Kendrapara and Paradip.<sup>46</sup>

This raises the question as to how ArcelorMittal will reach its 2050 net zero emissions target if it still has blast furnaces operating in India by that date, given the lack of progress of CCUS in the steel sector globally.

## Carbon Capture Technology Has a Long History of Failure

As major iron ore miner BHP noted in October 2022: "There are no full scale operational CCUS facilities in blast furnace steelmaking operations at present, with only a limited number of small capacity carbon capture or utilisation pilots underway or in the planning phases globally."<sup>47</sup>

Tata Steel did have plans to use CCUS to reduce emissions at its Ijmuiden site in the Netherlands but abandoned this project<sup>48</sup> in favour of hydrogen-based DRI in September 2021.<sup>49</sup> Without any significant technology progress for steel CCUS on the ground, claims by steel company leaders that CCUS will enable net zero carbon emissions targets to be met while continuing to build blast furnaces should be questioned by stakeholders.



**A September 2022 IEEFA report found that underperforming carbon capture projects considerably outnumber successful projects globally, and by large margins.**

As well as virtually no track record in the steel sector, the history of CCUS in other sectors is not impressive. A September 2022 IEEFA report found that underperforming carbon capture projects considerably outnumber successful projects globally, and by large margins.<sup>50</sup> Of 13 CCUS projects studied — comprising 55% of total operating capacity globally — seven underperformed, two failed

<sup>45</sup> E3G. [1.5C Steel: Decarbonising the steel sector in Paris-compatible pathways](#). 26 October 2021.

<sup>46</sup> ArcelorMittal-Nippon Steel India. [Next Frontier of Strategic Growth](#). 27 September 2022.

<sup>47</sup> BHP. [Carbon capture in the steel industry: ArcelorMittal, Mitsubishi Heavy Industries Engineering, BHP and Mitsubishi Development sign collaboration agreement](#). 27 October 2022.

<sup>48</sup> S&P Global. [Dutch CCS project scrapped after Tata Steel opts for hydrogen DRI production route](#). 21 September 2021.

<sup>49</sup> Tata Steel. [Tata Steel opts for hydrogen route at its Ijmuiden steelworks](#). 15 September 2021.

<sup>50</sup> IEEFA. [The Carbon Capture Crux – Lessons Learned](#). 1 September 2022.

and one has been mothballed. This is despite the fact that CCUS is not new — such projects have been attempted for decades with very little success. The fact that integrated blast furnace-based steelmaking produces carbon emissions at several stages of the process means that CCUS is likely to be an expensive option to reduce steelmaking emissions. Successful implementation of CCUS in the steel industry would also need access to suitable storage or usage options. These options are likely to be limited and incur an additional cost to transport captured carbon.

In its second Climate Action Report released in 2021, ArcelorMittal stated: “In many respects, the challenges confronting steelmaking today resemble those faced by renewable energy over a decade ago. In that case, the importance of solar and wind power was widely acknowledged yet the technology remained economically prohibitive.”<sup>51</sup> What then happened over the following decade was that the declining cost of renewable energy left CCUS in the power sector far behind. Today, CCUS is making virtually no contribution to emissions reduction in the power sector while the roll-out of renewables accelerates.



**With hydrogen-based DRI projects now shifting from announcements to investment decisions and construction, CCUS in the steel industry faces being left behind in the same way it was in the power sector.**

With hydrogen-based DRI projects now shifting from announcements to investment decisions and construction,<sup>52</sup> CCUS in the steel industry faces being left behind in the same way it was in the power sector as wind and solar power became ever cheaper, increasingly widespread and far more financially viable.

## Future Coking Coal Availability and Cost in Question

Tata Steel’s CEO and Managing Director T. V. Narendran was in Australia in August 2022 expressing concern that the world’s largest coking coal exporter was not investing enough in future mine capacity.<sup>53</sup> Imports account for 85–90% of India’s coking coal supply with Australia being its main supplier.

Narendran stated that Tata Steel intends to build new blast furnaces in India for at least another ten years and that they will operate for at least 20 years. Tata Steel is pinning its hopes on unproven CCUS technology to meet its 2045 net zero emissions target.

Tata Steel’s concern over coking coal mine investment in Australia is not misplaced as there are early signs that Australian miners are rethinking the role coking coal will play in their portfolios moving forward. In November 2022, the CEO of BHP — the world’s largest shipper of coking coal — stated that the company has no “growth capital” allocated to coking coal.<sup>54</sup>

<sup>51</sup> ArcelorMittal. [Climate Action Report 2](#). July 2021.

<sup>52</sup> IEEFA. [Green finance has begun to flow into green steel funding](#). 11 November 2022.

<sup>53</sup> Australian Financial Review. [This global boss says Australia is not investing enough in coal](#). 11 August 2022.

<sup>54</sup> Bloomberg. [BHP Shareholders Reject Calls to Lobby Government on Climate](#). 10 November 2022.

South32, another major Australian coking coal exporter, also made clear in 2022 that it will not be investing in new coking coal projects and will wind down its coal business as existing mines are depleted. The company will instead focus on “metals critical to a low carbon future”.<sup>55</sup>

Chief Executive Officer of South32, Graham Kerr, has been warning about investors’ views on metallurgical coal for some time. In 2021, the company elected not to proceed with the Eagle Downs metallurgical coal project in Queensland. Kerr stated, “the reality is the world’s view on met coal has actually changed” while highlighting that the forecast returns on the project were not attractive enough to offset the criticism it would receive for starting a new coal mine. Kerr also said that investor concerns about metallurgical coal “have got louder quicker than I would have expected” and of investor meetings noted that “in 80 per cent of our meetings people ask questions about met coal”.<sup>56</sup>

At the same time, mining coal in Australia is getting harder. The difficulty in getting new mine projects started will increase going forward as more financial institutions cease providing funding for coal. This is a process that is now well advanced in the thermal coal sector<sup>57</sup> but will undoubtedly spread to coking coal as pressure on climate action tightens.

In a significant development, HSBC announced an updated energy policy in December 2022 which prohibits it providing finance for new coking coal mines.<sup>58</sup> It can be expected that other banks will now follow suit as it becomes increasingly clear that alternatives to coal-based steelmaking are viable.<sup>59</sup>

In addition, issues such as labour shortages<sup>60</sup> and flooding<sup>61</sup> are limiting Australian coal production/export and look like long-term trends that are set to worsen. Local opposition to new coal mines is also rising, making it harder to get new mines off the ground. In November 2022, Gautam Adani — Chair of India’s Adani Group —acknowledged that, with hindsight, he would not have proceeded with the controversial Carmichael coal mine in Queensland given the level of opposition to the project.<sup>62</sup>



**The Indian steel industry has been burned by extra raw material costs during 2022 thanks to high coking coal prices.**

India’s steel ministry is already concerned about a lack of coking coal supply and has reportedly requested that import taxes be waived.<sup>63</sup> Short supply also leads to higher prices; the Indian steel industry has been burned by extra raw material costs during 2022 thanks to high coking coal

<sup>55</sup> Bloomberg. [Hydrogen Could Replace Coking Coal in Two Decades, South32 Says](#). 25 August 2022.

<sup>56</sup> IEEFA. [South32’s Dendrobium decision highlights increasing investor pressure on metallurgical coal projects](#). 4 September 2022.

<sup>57</sup> Reuters. [Bankers pour cold water on red hot coal](#). 24 November 2022.

<sup>58</sup> HSBC. [Our energy policy to support net zero transition](#). 14 December 2022.

<sup>59</sup> IEEFA. [German steel giant breakthrough to steer industry away from coal](#). 28 September 2022.

<sup>60</sup> IEEFA. [Coal cost trends: Higher labour costs could continue into the long term](#). 15 November 2022.

<sup>61</sup> IEEFA. [Coal cost trends: Climate impacts on coal mining likely long term](#). 24 November 2022.

<sup>62</sup> Financial Times. [Asia’s richest man Gautam Adani reveals global media ambitions](#). 25 November 2022.

<sup>63</sup> ET Energyworld. [India’s steel ministry seeks import tax waiver for coking coal-Sources](#). 6 December 2022.

prices.<sup>64</sup> The steel industry is low margin and is sensitive to the market fluctuations of key input prices. Coking coal comprises 40% of the production cost and prices surged 70% in the second half of 2022.<sup>65</sup> Given the energy security concerns that result from this, it is no surprise that the Indian government is keen to try to diversify its coking coal import sources.<sup>66</sup>

India's steelmaking capacity is clearly set for expansion. If that expansion is based on blast furnaces it faces a risk that sufficient coking coal supply is not available. This could lead to shortages and/or frequent periods of very high prices. We've seen the outlook for thermal coal decline significantly over the past decade as financiers increasingly rule out funding. Technology transitions have a habit of occurring faster than expected and it is likely that coking coal will suffer a similar fate to thermal coal over the rest of this decade.

With increasing questions over the long-term future of coking coal production in Australia, ArcelorMittal's joint venture partner in India is considering making more coking coal investments itself in order to shore up supply. Nippon Steel is seeking to add to the stakes in coking coal mines that it already holds.<sup>67</sup>

Steelmakers are coming under increasing pressure to decarbonise their operations. This pressure will only escalate if they start to increase their own investment in coking coal mines as incumbent miners and financiers exit the sector.<sup>68</sup>

## Green Hydrogen a Promising Alternative

While reliance on coking coal has the potential to cause India a further energy security headache on top of oil and gas imports, green hydrogen could conceivably provide a solution for a nation highly dependent on fossil fuel imports.



**While reliance on coking coal has the potential to cause India a further energy security headache on top of oil and gas imports, green hydrogen could conceivably provide a solution.**

A June 2022 report by Indian public policy think tank NITI Aayog and RMI found that growing global momentum on the transition towards green hydrogen is a good fit for India given its energy security, emissions reduction and development concerns. The report found that a major adoption of domestically produced green hydrogen in India could save between US\$246 billion and US\$348 billion in energy imports, reduce price volatility for inputs into Indian industries and provide a foreign exchange advantage.<sup>69</sup>

<sup>64</sup> ET Energyworld. [High coking coal prices may hit steel companies' margin recovery](#). 6 September 2022.

<sup>65</sup> Reuters. [Column: Coking coal price surge backed by demand as supply woes add froth](#). 7 February 2023.

<sup>66</sup> ET Energyworld. [Govt preparing 'coking coal mission' to diversify raw material sources: Steel minister](#). 22 June 2022.

<sup>67</sup> The Japan Times. [Nippon Steel eyes more stakes in coking coal mines to secure stable supply](#). 25 November 2022.

<sup>68</sup> IEEFA. [HSBC joins major miners in turning away from further metallurgical coal development](#). 30 January 2023.

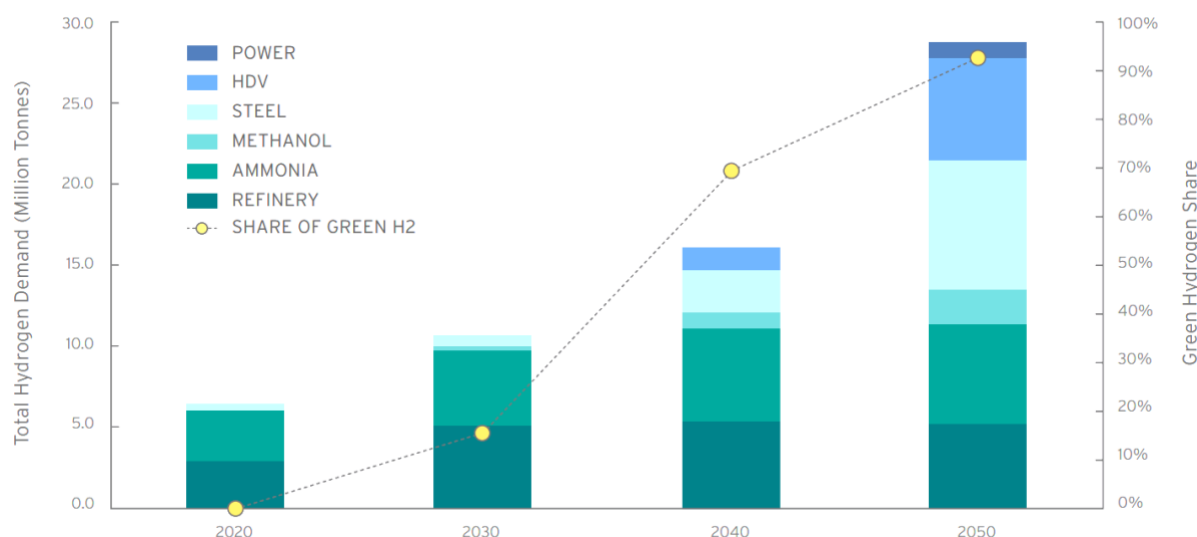
<sup>69</sup> NITI Aayog and RMI. [Harnessing Green Hydrogen: Opportunities for deep decarbonisation in India](#). June 2022.

NITI Aayog and RMI report that India's hydrogen demand could be four times bigger by 2050 with the country representing 10% of global demand. Indian demand growth would initially come from existing uses such as industrial feedstock and chemical processes but longer-term, steel will become a major source of new demand. By 2050, green hydrogen would account for 94% of India's hydrogen supply (Figure 3).<sup>70</sup>

The Indian government is now reportedly eyeing a huge increase in green hydrogen production to 25Mt by 2047 to reduce energy imports.<sup>71</sup> A National Hydrogen Mission was launched on 15 August 2021 — India's Independence Day — and the government revealed the first part of its hydrogen roadmap in February 2022, which included free interstate transmission of renewable energy as it seeks to become a global green hydrogen hub.<sup>72</sup>

In January 2023, India approved a US\$2 billion incentive plan to support green hydrogen production. The government is aiming to produce 5Mt of green hydrogen annually by the end of this decade, reducing fossil fuel imports by one trillion rupees. The government expects Indian investment in green hydrogen will reach almost US\$100 billion by 2030.<sup>73</sup>

**Figure 3: Indian Hydrogen Demand Outlook and Potential Green Hydrogen Share at Cost Parity (Without Policy Intervention)**



Source: NITI Aayog and RMI, *Harnessing Green Hydrogen*, p. 14.

India's ambition is matched by accelerating interest in green hydrogen globally. The number of countries that have completed or are in the process of setting hydrogen roadmaps is at least 43.<sup>74</sup> In its October 2022 World Energy Outlook report, the IEA noted that the Russian invasion of Ukraine

<sup>70</sup> Ibid.

<sup>71</sup> Bloomberg. [India Plans to Become Green Hydrogen Giant to Cut Energy Imports](#). 2 September 2022.

<sup>72</sup> Bloomberg. [India Unveils Hydrogen Plan to Speed Shift From Fossil Fuels](#). 17 February 2022.

<sup>73</sup> Reuters. [India OKs \\$2 bln incentive plan for green hydrogen industry](#). 5 January 2023.

<sup>74</sup> NITI Aayog and RMI. [Harnessing Green Hydrogen: Opportunities for deep decarbonisation in India](#). June 2022.

has boosted momentum behind the shift towards low-carbon hydrogen. The IEA sees global low-emissions hydrogen production reaching 30Mtpa under its Announced Pledges Scenario, a huge increase from the 1Mtpa produced today.<sup>75</sup> Low-emissions hydrogen refers to both green and blue hydrogen — the latter produced from fossil fuels where the resultant carbon emissions are theoretically captured. However, the IEA also noted in 2022 that blue hydrogen had seen little progress, with the level of production in 2021 no greater than in the prior year.<sup>76</sup> There remain important question marks over the suitability of green hydrogen for long distance shipping.<sup>77</sup> In IEEFA's opinion, it looks increasingly likely that use of domestically produced green hydrogen in key sectors such as iron/steel and fertiliser production will make more sense than seaborne hydrogen exports.

In November 2022, the IEA stated that “hydrogen-based steelmaking has picked up significant momentum”, highlighting the tripling of the number of steelmakers' announcements to use such technology over the prior 12 months.<sup>78</sup>



**The second half of 2022 has actually seen a number of steelmakers move from green steel announcements and pilot projects towards commercial-scale investment decisions and construction.**

The second half of 2022 has actually seen a number of steelmakers move from green steel announcements and pilot projects towards commercial-scale investment decisions and construction that will see new, low-carbon installations operational in just 3–4 years and ready to use green hydrogen to reduce emissions further.

In July 2022, the board of Salzgitter AG approved the first capital funding for its switch to hydrogen-based DRI and orders for central components were placed in August 2022.<sup>79</sup> Then in September 2022, ThyssenKrupp announced a €2 billion investment in its ambitious decarbonisation plan to replace the first of four blast furnaces using hydrogen-based DRI technology. The first new DRI plant is intended to start its 2.5Mtpa production by 2026. The three remaining blast furnaces will then be replaced progressively.<sup>80</sup>

In October 2022, ArcelorMittal itself broke ground on its US\$1.3 billion transition to DRI-based steelmaking in Ontario, Canada. As with other new DRI developments, the plant will initially use natural gas but will be built ready to transition to green hydrogen.<sup>81</sup> Also in October, Swedish steel venture H2 Green Steel announced that a number of leading European financial institutions have

<sup>75</sup> IEA. [World Energy Outlook 2022](#). October 2022.

<sup>76</sup> IEA. [Global Hydrogen Review 2022](#). September 2022.

<sup>77</sup> Bloomberg NEF. [Liebreich: The Unbearable Lightness of Hydrogen](#). 22 December 2022.

<sup>78</sup> IEA. [Coal in Net Zero Transitions](#). November 2022.

<sup>79</sup> Salzgitter AG. [Salzgitter AG places first order for SALCOS plant](#). 24 August 2022.

<sup>80</sup> IEEFA. [German steel giant breakthrough to steer industry away from coal](#). 28 September 2022.

<sup>81</sup> ArcelorMittal. [ArcelorMittal breaks ground on first transformational low-carbon emissions steelmaking project](#). 13 October 2022.

committed to providing billions in financing for the construction of its hydrogen-based steel plant in northern Sweden.<sup>82</sup>

In the most recent announcement, Norwegian company Blastr revealed its intention to invest €4 billion in Finland to establish a 2.5Mt integrated hydrogen-based steelmaking facility with production planned to start by 2026.<sup>83</sup>

Low-cost renewable energy is already firmly established in India, giving it a clear advantage when it comes to producing competitive green hydrogen. NITI Aayog and RMI see Indian green hydrogen achieving cost parity with gas-based hydrogen by 2030. The two main cost drivers of green hydrogen production are renewable electricity and electrolyser price. With the cost of both set for decline, the cost of green hydrogen could fall to approximately \$1.60/kg by 2030 and \$0.70/kg by 2050 according to NITI Aayog and RMI, which could see hydrogen and DRI-based steel production becoming cost-competitive with natural gas-based DRI by 2027. By 2030, they see green hydrogen-based DRI being the most cost-competitive steelmaking route in India, cheaper than blast furnace-based operations.<sup>84</sup>



**By 2030, NITI Aayog and RMI see green hydrogen-based DRI being the most cost-competitive steelmaking route in India, cheaper than blast furnace-based operations.**

India is already seeing major interest in green hydrogen from some of its key corporate players. The Adani Group has announced adding 45GW of hybrid renewables (wind and solar) for 3Mt green hydrogen production by 2030 as part of a US\$70 billion investment.<sup>85</sup> Furthermore, Adani will also construct a 5GW capacity hydrogen electrolyser factory.<sup>86</sup>

Indian billionaire and the owner of Reliance Industries — Mukesh Ambani — has also announced significant green hydrogen investment plans. In January 2022, Reliance announced US\$75 billion of investment in renewable energy and hydrogen electrolyser manufacturing. The group is one of the largest producers of gas-based hydrogen in the world and aims to start green hydrogen production by 2025 while expanding the group's solar manufacturing capacity to 20GW.<sup>87</sup>

Global steel giant POSCO is also eyeing the green hydrogen market in India. In September 2022, POSCO signed an MoU with Greenko — the second-largest renewable energy company in India — to establish a new green hydrogen/ammonia value chain. Greenko has 7.2GW of renewables capacity and by adding pumped-hydro storage capacity can generate round-the-clock renewable power. India's growing and cheap renewable energy capacity and new green hydrogen policy

<sup>82</sup> IEEFA. [Green finance has begun flowing into green steel funding](#). 11 November 2022.

<sup>83</sup> Hydrogen Central. [Norwegian Company Blastr Green Steel \(Blastr\) to Establish a Green Steel Plant with an Integrated Hydrogen Production Facility in Finland, 4B EUR Investment](#). 3 January 2023.

<sup>84</sup> NITI Aayog and RMI. [Harnessing Green Hydrogen: Opportunities for deep decarbonisation in India](#). June 2022.

<sup>85</sup> ET Energyworld. [Adani to build 3 giga factories as part of \\$70 billion green investment](#). 7 September 2022.

<sup>86</sup> ET Energyworld. [Adani to invest USD 100 bn across new energy, data centres](#). 27 September 2022.

<sup>87</sup> The Economic Times. [Reliance's green energy juggernaut may be pushed further as Ambani aims to double investment](#). 30 August 2022.

support have attracted POSCO to India.<sup>88</sup> Indian renewable energy company ReNew Power is also seeking to set up green hydrogen hubs both in India and around the world.<sup>89</sup>

## Questions for ArcelorMittal Investors

ArcelorMittal's investors ought to have questions for the company as to how it intends to meet its 2050 net zero target while continuing to build blast furnaces in India and no CCUS progress on the horizon. Table 2 shows the top 20 ArcelorMittal shareholders.

**Table 2: Top 20 ArcelorMittal Shareholders**

#	Investor Name	Shareholding	Value (US\$ millions)
1	Mittal Family	38.66%	10,549
2	BlackRock Investment Management (UK) Ltd.	4.74%	1,226
3	Norges Bank Investment Management (NBIM)	2.93%	823
4	The Vanguard Group, Inc.	1.52%	350
5	BlackRock Institutional Trust Company, N.A.	1.28%	296
6	GQG Partners, LLC	0.73%	173
7	INVESCO Asset Management Limited	0.68%	159
8	Amundi Asset Management, SAS	0.61%	141
9	BlackRock Advisors (UK) Limited	0.46%	107
10	Geode Capital Management, L.L.C.	0.42%	97
11	Fidelity Management & Research Company LLC	0.41%	97
12	Capfi Delen Asset Management	0.29%	61
13	AllianceBernstein L.P.	0.28%	67
14	Magallanes Value Investors, S.A., SGIIC	0.27%	53
15	DWS Investment GmbH	0.25%	57
16	Charles Schwab Investment Management, Inc.	0.24%	55
17	Deka Investment GmbH	0.22%	52
18	Odey Asset Management LLP	0.21%	40
19	Thompson, Siegel & Walmsley LLC	0.20%	48
20	State Street Global Advisors (US)	0.20%	47

Source: Refinitiv, downloaded 24 January 2023

Environmental, social and governance (ESG) concerns of the world's major investors have increased substantially in recent years. With the IEA now expecting that the global energy crisis sparked by the Russian invasion of Ukraine will accelerate the transition away from fossil fuels,<sup>90</sup> companies that are continuing to construct new fossil fuel-based assets and infrastructure are likely to receive even more attention from responsible investors. In addition, with more and more

<sup>88</sup> Green Steel World. [POSCO Holdings and India's Greenko sign green hydrogen production project MOU](#). 14 September 2022.

<sup>89</sup> Bloomberg. [ReNew Power Plans Green Hydrogen Hubs in India, Overseas](#). 3 November 2022.

<sup>90</sup> IEA. [World Energy Outlook 2022 shows the global energy crisis can be a historic turning point towards a cleaner and more secure future](#). 27 October 2022.



companies committing to net zero emissions, investor attention will turn towards questioning how these commitments will be met.

The number of global investors who have signed up to the Climate Action 100+ initiative has now reached 700 totalling US\$68 trillion in assets under management. Climate Action 100+ is an investor-led initiative seeking to make sure the world's largest corporate carbon emitters are taking action to reduce emissions. It has become the world's largest investor engagement initiative on climate change.<sup>91</sup>



**Signatories to the Climate Action 100+ initiative make up almost half of ArcelorMittal's top 20 shareholders.**

Signatories to the Climate Action 100+ initiative make up almost half of ArcelorMittal's top 20 shareholders — Amundi, BlackRock, Invesco, AllianceBernstein, DWS Investment and State Street Global Advisors.

The Climate Action 100+ Net Zero Company Benchmark assessments analyse focus companies' performance against three goals: reducing greenhouse gas emissions, improving governance and strengthening climate-related financial disclosures. The most recent October 2022 ArcelorMittal assessment found that the company currently fails to meet a number of criteria. Specific failures to meet criteria include that ArcelorMittal has no short-term (2025) greenhouse gas emissions reduction target, its medium-term (2026–2035) target is not aligned with the goal of limiting global warming to 1.5°C and it has failed to decarbonise its capital expenditures.<sup>92</sup>

On decarbonisation of its capital expenditure, Climate Action 100+ found that ArcelorMittal does not meet the following criteria:

- The company explicitly commits to align its capital expenditure plans with its long-term greenhouse gas emissions reduction target OR to phase out planned expenditure in unabated carbon-intensive assets or products.
- The company explicitly commits to align its capital expenditure plans with the Paris Agreement's objective of limiting global warming to 1.5°C AND to phase out investment in unabated carbon-intensive assets or products.

The shortcomings identified by the Climate Action 100+ analysis will be of interest to some of ArcelorMittal's major investors who are increasingly focused on capital expenditure plans in a climate context and the need for transparent short- and medium-term plans along the pathway to net zero by 2050. The climate approach of some of ArcelorMittal's key shareholders is outlined below.

<sup>91</sup> Climate Action 100+. [About](#).

<sup>92</sup> Climate Action 100+. [Company Assessment: ArcelorMittal S. A.](#) October 2022.

## BlackRock

BlackRock is the world's largest asset manager with around US\$8 trillion in assets under management. It is the largest holder of ArcelorMittal shares outside of the Mittal family with holdings across a number of subsidiaries.

BlackRock's Chief Executive Officer Larry Fink has been outspoken about the need to address climate change. In the 2022 iteration of his widely read annual "letter to CEOs", Fink stated "we are asking companies to set short-, medium-, and long-term targets for greenhouse gas reductions. These targets, and the quality of plans to meet them, are critical to the long-term economic interests of your shareholders. It is also why we ask you to issue reports consistent with the Task Force on Climate-related Financial Disclosures (TCFD): because we believe these are essential tools for understanding a company's ability to adapt for the future."<sup>93</sup>

Fink also stated that "the pace of change will be very different in developing and developed countries. But all markets will require unprecedented investment in decarbonization technology."<sup>94</sup>

Climate remains one of BlackRock's engagement priorities. Its key performance indicator on climate engagement reinforces the expectation that investee companies disclose short- and medium-term emissions reduction targets as part of their overall disclosure on how they are aligning their businesses to reach 2050 net zero emissions targets:

We encourage companies to discuss in their reporting how their business model is aligned to a scenario in which global warming is limited to well below 2°C, moving towards global net zero emissions by 2050. Companies help investors understand their approach when they provide disclosures aligned with the four pillars of the TCFD—including scope 1 and 2 emissions, along with short-, medium-, and long-term science-based reduction targets, where available for their sector.<sup>95</sup>

BlackRock has recently been criticised on ESG performance. This has come both from fossil fuel-backing political interests in the U.S. who want BlackRock to reduce its focus on issues like carbon emissions as well as stakeholders who feel it is not doing enough.

UK activist investor Bluebell Capital Partners has complained that BlackRock has not lived up to Larry Fink's past comments on sustainability.<sup>96</sup> In September 2022, New York City's comptroller warned BlackRock that it wasn't taking a tough enough stand with companies over climate change and that it was reassessing its business. BlackRock manages US\$43 billion for three of the city's pension funds.<sup>97</sup>

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<sup>93</sup> BlackRock. [Larry Fink's 2022 Letter to CEOs](#).

<sup>94</sup> Ibid.

<sup>95</sup> BlackRock. [BlackRock Investment Stewardship: Engagement Priorities](#). February 2022.

<sup>96</sup> Financial Times. [BlackRock chief Larry Fink pressured to resign over ESG 'hypocrisy'](#). 7 December 2022.

<sup>97</sup> Bloomberg. [Activist Bluebell Urges BlackRock to Oust Fink as CEO Over ESG](#). 7 December 2022.

## Amundi

Europe's largest asset manager, with over €2 trillion in assets under management, began a three-year action plan in 2018 with the aim of mainstreaming ESG investing. Since then, its company engagement and voting efforts have focused on two priority themes: energy transition and social cohesion.<sup>98</sup>

Amundi put in place and gradually extended a thermal coal policy in 2016 which has resulted in the exclusion of some companies and issuers from its funds.

In July 2021, Amundi joined the Net Zero Asset Managers Initiative, a group of almost 300 global asset managers with US\$66 trillion in assets under management that have pledged to support investment aligned with the target of net zero emissions by 2050. BlackRock, DWS, State Street Global Advisors and Deka Investment are other major investors listed in Table 2 above that are signatories to the Net Zero Asset Managers Initiative.<sup>99</sup> Vanguard, another major ArcelorMittal investor, recently withdrew from the initiative prompting a significant backlash from a range of stakeholders.<sup>100</sup>

In 2021, Amundi engaged with 547 companies on the transition towards a low carbon economy and has a target to engage with an additional 1,000 companies by 2025. The company stated in 2022 that it expected its investee companies to:<sup>101</sup>

- commit to reducing their overall carbon footprint at a pace that is compatible with reaching global carbon neutrality by 2050
- disclose their climate plan and their achievements, annually
- submit these items to an annual shareholder vote at their annual general meetings.

In 2022, Amundi also asked companies that have previously submitted a climate strategy to present comprehensive targets and a precise agenda with short-, medium- and long-term objectives as well as earmark the resources to achieve their climate goals. Amundi assessed each strategy in full against its alignment with the Paris Agreement, which influenced the way it voted on climate strategies submitted to shareholders. Amundi subsequently voted for less than 40% of "Say on Climate" resolutions tabled by investee companies.<sup>102</sup>



**Amundi was among the three major institutional investors that filed the first institutional investor-led climate shareholder proposals in Japan in 2022.**

<sup>98</sup> Amundi. [Amundi's Shareholder Engagement Priorities in 2022](#). 27 April 2022.

<sup>99</sup> The Net Zero Asset Managers Initiative. [Signatories](#).

<sup>100</sup> Bloomberg. [Vanguard Defends Strategy as Critics Pile In After Net-Zero Exit](#). 12 December 2022.

<sup>101</sup> Amundi. [Amundi's Shareholder Engagement Priorities in 2022](#). 27 April 2022.

<sup>102</sup> Amundi. ["Say on Climate": 2022 approach](#). 24 June 2022.

In a move particularly relevant to ArcelorMittal's Indian joint venture partner Nippon Steel, Amundi was among the three major institutional investors that filed the first institutional investor-led climate shareholder proposals in Japan in 2022. The group called on Japanese coal-fired power operator J-Power to align its business plan and capital expenditure with Paris Agreement emissions reduction targets and disclose plans to achieve them.<sup>103</sup>

## Norges Bank Investment Management

The world's largest sovereign wealth fund — Norway's US\$1.3 trillion Government Pension Fund Global (also known as the Oil Fund) — is managed by Norges Bank Investment Management (NBIM). The fund pledged in December 2022 to become more aggressive and vocal on ESG issues and plans to vote against companies that do not have a net zero emissions target.<sup>104</sup>

This follows a Norwegian finance ministry white paper released in 2022 making clear that “through active ownership, Norges Bank will be a driving force for the companies in the portfolio to align their business models towards a long-term goal of global net zero emissions”. NBIM will deepen work on the decarbonisation pathway of individual companies and use these in future engagement.<sup>105</sup>

As a result, NBIM's 2025 climate action plan makes clear it will change how it engages with the more than 9,000 companies it is invested in by asking for science-based short-term, medium-term and 2050 net zero targets, improved disclosures on performance and credible transition plans. These plans will be held up to scrutiny including analysis of capital allocation frameworks. NBIM also makes clear that achieving action on long-term net zero emissions goals requires companies to take action now, stating “the current decade is crucial for achieving an orderly climate transition in line with the goals of the Paris Agreement”.<sup>106</sup>

The Norwegian Ministry of Finance introduced specific exclusion criteria to the fund for coal companies in 2016 and it has since divested from a number of coal miners. Over the 2012–2021 period, the fund has made 366 risk-based divestments, almost half of which were related to climate change. The new “active ownership” focus will be based on engagement but the fund can still use the divestment option where appropriate.<sup>107</sup>

Given NBIM's updated approach, it may have questions for ArcelorMittal over the status of its short- and medium-term emissions reduction targets and capital expenditure plans.

<sup>103</sup> ACCR. [First institutional investor group-led climate shareholder proposals filed in Japan](#). 11 May 2022.

<sup>104</sup> Financial Times. [Norwegian oil fund to vote against companies without net zero targets](#). 8 December 2022.

<sup>105</sup> NBIM. [Speech: Norges Bank's management of the Government Pension Fund Global](#). 3 May 2022.

<sup>106</sup> NBIM. [2025 climate action plan](#).

<sup>107</sup> NBIM. [Speech: Norges Bank's management of the Government Pension Fund Global](#). 3 May 2022.

## Key Questions for Investors

With ArcelorMittal planning new blast furnaces in India and CCUS a long way from being a realistic option to mitigate emissions from coal-based steelmaking, there are a number of questions company investors should be asking:

- How is the construction of new blast furnaces in India aligned with ArcelorMittal's target to reach net zero emissions by 2050?
- What steelmaking technology is being planned for the Phase 1B expansion of Hazira steelmaking capacity to 20Mtpa?<sup>108</sup>
- What steelmaking technology is being planned for the 24Mtpa greenfield expansion at Kendrapara, Odisha, for which a Memorandum of Understanding has been signed?<sup>109</sup>
- What steelmaking technology is being planned for the 6Mtpa integrated steel plant at Paradip, Odisha?<sup>110</sup>
- What technologies is ArcelorMittal planning to use to mitigate the emissions from its new steel plants in India?
- If CCUS is part of the plan to mitigate emissions from new blast furnaces in India, what is the timeline for when blast furnaces will be retrofitted? And what measures have been put in place to mitigate the risk of future CCUS implementation failure as has been experienced in other sectors?

<sup>108</sup> ArcelorMittal. [Investor presentation: Next frontier of accelerated growth](#). 27 September 2022.

<sup>109</sup> Ibid.

<sup>110</sup> Ibid.

## About IEEFA

The Institute for Energy Economics and Financial Analysis conducts research and analyses on financial and economic issues related to energy and the environment. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. [www.ieefa.org](http://www.ieefa.org)

## About the Authors

### Simon Nicholas

Simon Nicholas is an energy finance analyst with IEEFA in Australia. Simon holds an honours degree from Imperial College London and is a Fellow of the Institute of Chartered Accountants of England and Wales. He has 16 years' experience working within the finance sector in both London and Sydney at ABN Amro, Macquarie Bank and Commonwealth Bank of Australia.

### Soroush Basirat

Soroush Basirat is an energy finance analyst focused on the steel sector with IEEFA in Australia. Soroush has extensive experience in corporate development and investment in the steel industry. He has an MBA and industrial engineering degree and previously worked on projects related to corporate strategy, financial modelling and valuation in various large-scale industries and SMEs.

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