STEELWATCH

Bringing climate urgency to steel

Too Little Too Late

Corporate Climate Assessment of Nippon Steel 2024

May 2024

Acknowledgements

This report was authored by the **SteelWatch** team. Additional thanks to those who provided external review and input and the numerous allies who have helped along the way.

Design and production provided by Abbie Darley.
Translation: EcoNetwork.
This report is also available in Japanese on our **website**.

Any inquiries can be directed to **info@steelwatch.org**

Cover photo: *Aerial photo shows Nippon Steel Nagoya Works in Tokai City*. Credit: Alamy.com/Satoshi Oga.

Citation: **SteelWatch, 2024; Too Little Too Late: Corporate Climate Assessment of Nippon Steel**

Disclaimer: The English language version of this report is the original version. The Japanese translation has been provided for convenience's sake only.

STEELWATCH
Bringing climate urgency to steel

Table of Contents

List of acronyms

AM/NS India: ArcelorMittal/Nippon Steel India
BF-BOF: blast furnace-basic oxygen furnace
CCUS: carbon capture, utilisation and storage
CO_2: carbon dioxide
CO_2e: carbon dioxide equivalent
DRI: direct reduced iron
EAF: electric arc furnace
GHG: greenhouse gas
H_2-DRI: hydrogen-based direct reduced iron
H_2: hydrogen
Met coal: metallurgical coal
Mt: million tonnes
Mtpa: million tonnes per annum
SBTi: Science-Based Targets initiative
tCO_2: tonnes of carbon dioxide
t: tonne

List of tables, figures and boxes

Executive summary

Nippon Steel is the world's fourth largest steel producer. Its footprint extends far beyond its Japanese home base, with subsidiaries and minority stakes in mining, ironmaking and steelmaking in the Americas, Europe, as well as South and Southeast Asia.

In Japan, Nippon Steel is a very influential company that has been denounced for blocking climate policy action and the renewable energy transition. It owns 11 of the 19 blast furnaces in operation in the country, and these coal-based facilities represent an overwhelming share of its iron and steel production capacity.

Nippon Steel's addiction to coal is all the more worrying in that the company is doubling down on it at three levels. First, it is expanding its investments in coal mining, recently in Australia and Canada. Second, while reducing its steel production capacity in Japan due to declining demand, it is pursuing ambitious growth plans overseas, notably through the acquisition of other coal-dependent companies like US Steel and the construction of greenfield blast furnaces in India. Third, unlike competitors already planning to phase out coal in iron and steel production, Nippon Steel intends to keep its blast furnaces alive by trying to reduce their CO_2 emissions with unproven technologies.

SteelWatch considers that Nippon Steel's strategy is not just 'too little, too late'; it represents a danger both for the global climate and for the company's own future.

While Nippon Steel does have a 2050 target of 'carbon neutrality', that is not enough. An emissions pathway compatible with a 1.5C climate scenario requires not only an endpoint close to zero in 2050, but also that from today, emissions decrease over time at a sufficient pace so that cumulative emissions to 2050 remain within a 1.5C compatible carbon budget.

Nippon Steel also has an intermediary target to lower its CO_2 emissions (scope 1 and 2) by 30% by 2030 against a 2013 baseline. However, their climate targets are filled with inadequacies.

This corporate assessment will detail and demonstrate:

- Nippon Steel is not explicitly committed to a 1.5C climate scenario, and its targets are not aligned with such a scenario.
- Nippon Steel's 2030 target is expressed in absolute emission levels, with no carbon intensity target, and the company is on its way to meet it by slashing output in Japan rather than by decarbonising production processes.
- A growing share of Nippon Steel's production capacity is located overseas, with unequal coverage by Nippon Steel's own climate commitments due to complex ownership structures and insufficiently detailed reporting at the group level.
- Nippon Steel has no target for its scope 3 emissions even though they already add up to an average of 23% of the company's reported scope 1 and 2 emissions.

In addition to these insufficient targets, SteelWatch finds that Nippon Steel's plan to meet them relies on outdated comparisons between decarbonisation technologies.

On the one hand, Nippon Steel depicts the green H_2-DRI-EAF production route as unproven, despite the fact that large-scale electric arc furnaces (EAF) have been in use for years and that direct reduction of iron ore with 100% hydrogen made in electrolysers powered by renewable electricity (green H_2-DRI) is expected to come online at a commercial scale already in 2026 after a world's first successful demonstration in 2021. Major iron ore supplier, Australia, has started investing in green iron production for export.

On the other hand, Nippon Steel's preferred decarbonisation solution, COURSE50 and its upgraded version Super COURSE50, relies on a combination of hydrogen injection in blast furnaces and carbon capture, utilisation and storage (CCUS) whose replicability at scale appears today uncertain. So far, COURSE50 and Super COURSE50 have only been tested in miniature furnaces of 12m³ — 400 times smaller than commercial-scale blast furnaces — whereas the carbon storage component is dependent on the development of adequate facilities, which are today nonexistent in Japan.

Even if these problems were overcome, Nippon Steel currently states that the CO_2 emissions abatement potential of Super COURSE50 is 50%. Thus, not only would Super COURSE50-equipped blast furnaces remain very far from near-zero levels needed to contain climate change, but they would also lag well behind competing with green H_2-DRI-EAF systems which, if powered with renewable electricity, can come close to zero emissions and be aligned with a 1.5C climate scenario.

SteelWatch sees this as a serious business risk for Nippon Steel, because customers such as those participating in SteelZero and the First Movers Coalition are committed to sourcing low-emission steel. Nippon Steel's rivals are beginning to break away from coal, and if it does not take decisive action to transition to clean steel, it will be left behind.

Shovel and coal in coal mine. Credit: Shutterstock/xtrekx.

1. Introduction and context

The purpose of this Nippon Steel climate assessment

SteelWatch exists to speak for what a stable planet and future generations need from the steel industry. That requires honest and informed challenges to steelmakers whenever and wherever they are falling short. Nippon Steel dominates the steel industry in Japan and is the fourth largest steel producer globally. The company says it recognises the grave threat climate change poses to humanity and claims to be contributing to decarbonising steelmaking through technological innovation.[1] However, the reality is that Nippon Steel's continued focus on coal-based steelmaking will lock in high carbon emissions for decades to come.

Nippon Steel's policies are not aligned with the Paris Agreement to limit the increase in global temperature to 1.5C. This report explores the gap between Nippon Steel's claims and the reality.

Nippon Steel may believe it is making genuine efforts, but the company's technology choices are setting it up for failure. This report aims to draw attention to this and the need for Nippon Steel to act now, and avoid locking in choices it will regret later.

SteelWatch reached out to Nippon Steel in writing and online to discuss our concerns but did not receive a response prior to publication.

Japan begins to move on climate change

In late October 2020, then Prime Minister Suga set Japan on a new path with the announcement that Japan would achieve a decarbonised society by 2050.[2] Before this, the steel industry, as represented by the Japan Iron and Steel Federation, intended to decarbonise by 2100, with decades still remaining for research and development.[3]

With both the country and the science of climate change requiring far more rapid decarbonisation, in December 2020, Nippon Steel announced its pledge to achieve carbon neutrality by 2050[4] with a broad climate and business roadmap. It released its *Carbon Neutral Vision 2050* in March 2021.[5]

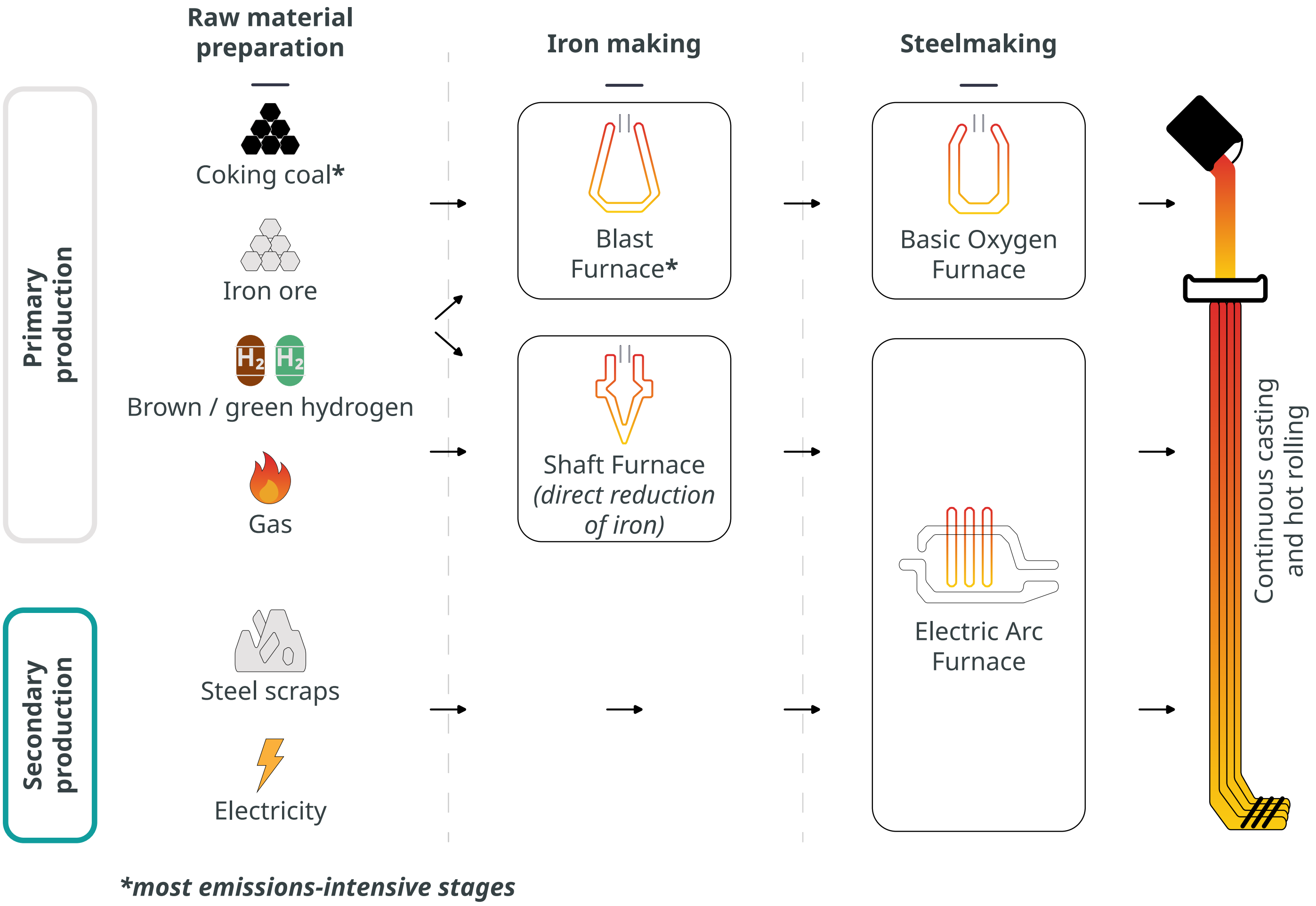
Steel production driving climate change

Coal-based steel production is a major, but under-recognised driver of climate change. Steel production contributes at least 7% to annual global greenhouse gas (GHG) emissions, and that is without accounting for the substantial climate impacts of coal mining. As SteelWatch's report, *Sunsetting Coal in Steel Production,* laid out,[6] in the five core stages of steel production, the majority of emissions come from the carbon dioxide (CO_2) that is released when iron ore is 'reduced' (oxygen is removed) in blast furnaces using metallurgical coal (met coal). In addition, met coal mining produces substantial methane emissions, which have serious warming implications. **Coal use is at the core of the steel's climate problem**, and the only way to resolve it is by immediately ceasing all investment in blast furnaces. This includes not extending their lifespans by 'relining' furnaces, retrofitting them with emissions abatement technologies, or building any new ones.

Our *Sunsetting Coal in Steel Production* report found that should coal-based steel production persist on a 'business as usual' trajectory, it would consume almost a quarter of the remaining global carbon budget - for all sectors and societies - between now and 2050. What happens to coal-based steel facilities is the critical issue steelmakers, including Nippon Steel, must address.

[1] Nippon Steel, *Nippon Steel's Sustainability Materiality. Retrieved on 8 May 2024.*
[2] Prime Minister's Office of Japan, *Policy Speech by the Prime Minister to the 203rd Session of the Diet,* 28 October 2020.
[3] Japan Iron and Steel Federation, *JISF Long-term vision for climate change mitigation- A challenge towards zero-carbon steel*, September 2019.
[4] Nikkei Asia, *Nippon Steel pledges to be carbon neutral by 2050,* 20 December 2020.
[5] Nippon Steel, *Carbon Neutral Vision 2050*, March 2021.
[6] SteelWatch, *Sunsetting Coal in Steel Production,* 2023

Figure 1: The basics of steel production



Source: *Adapted from Reclaim Finance 2024.*

2. Nippon Steel company profile

Nippon Steel is the world's fourth largest steel producer according to the World Steel Association,[7] with output of over 40 million tonnes of crude steel per year and a reported revenue of over USD51 billion.[8] It has a broad footprint, with its iron-making and steelmaking operations spanning across numerous countries worldwide (mainly in Asia, South America, and North America[9]). The company reported 106,068 employees as of March 31, 2023.[10]

From a business point of view, Nippon Steel has a high level of vertical integration across its value chain. Key activities include iron ore mining, coal mining, and iron and steel production. The company produces a diverse range of steel products, from steel sheets to flat products, serving a wide range of sectors, largely automotive and construction.

Today, coal-based primary steel production using blast furnaces dominates Nippon Steel's production, with the company owning 11 of the 19 blast furnaces still in operation in Japan.

The company also has global ambitions. In pursuit of its strategic objectives to achieve a global crude steel production capacity of 100 million tonnes and consolidate a business profit of 1 trillion yen (USD6.4 billion),[11] **Nippon Steel aims for 60% of its integrated steel production capacity to come from the expansion of its overseas operations.** This includes a joint venture in the Indian steel sector, known as ArcelorMittal Nippon Steel India (AM/NS India), which will include two new blast furnaces at their Hazira site.[12]

Nippon Steel is expanding its investments in coal mining, stating a goal of doubling its control of raw materials.[13] Recently, the company increased its holdings of coal mines in Australia[14] and Canada.[15]

Historically, Nippon Steel has had great influence in Japan and has been a critical blocker of the renewable energy transition. According to non-profit think tank InfluenceMap, Nippon Steel was ranked the world's 8th most influential company blocking climate policy action and is also a key member of one of the top 10 most negatively influential industry associations, the Japan Iron and Steel Federation, which ranked 7th.[16] The company scored a D on the think tank's platform, indicating increasingly obstructive climate policy engagement,[17] mainly due to it holding back Japan's progress on renewable energy and carbon pricing.[18]

By making better choices to transform its steel production, Nippon Steel could make a major contribution towards unlocking the decarbonisation of the steel industry in Japan and globally, while remaining competitive in a rapidly decarbonising world.

Nippon Steel stands as the world's fourth largest steel producer, holding significant influence within Japan's industry and political sphere. Its steelmaking operations are expanding across continents, from Asia to North America to Europe. Business as usual for Nippon Steel involves a heavy dependency on coal for steel production.

---

[7] World Steel Association, *Top steel-producing companies 2022/2021*. Retrieved on 15 April 2024.
[8] Nippon Steel, *Revenue Nippon Steel Group (consolidated) -IFRS*, 2023. Retrieved on 22 April 2024.
[9] Nippon Steel, *Nippon Steel Integrated Report*, 2023. Retrieved on 15 April 2024.
[10] ibid.
[11] ibid.
[12] Nippon Steel, *Strengthening the Steelmaking Business Base in AM/NS India Decision Made to Invest in Upstream and Hot-rolling Facilities at the Hazira Steel Mill, and Acquire Port and Power-related Equipment Companies*, 28 September 2022.
[13] Reuters, *Nippon Steel to hunt for more coking coal, iron ore assets-executive*, 30 November 2023.
[14] The Japan Times, *Nippon Steel eyes more stakes in coking coal mines to secure stable supply*, 25 November 2022.
[15] Nippon Steel, *Nippon Steel to indirectly acquire a 20% interest in the steelmaking coal business of Teck Resources Limited, Press Release*, 14 November 2023.
[16] InfluenceMap, *Corporate Climate Policy Footprint- The 25 Most Influential Companies Blocking Climate Policy Action Globally*, October 2022.
[17] LobbyMap, *Nippon Steel Corporation*. Retrieved on 8 May 2024.
[18] InfluenceMap, *Asian Steel Sector Climate Policy Engagement- An InfluenceMap Briefing*, November 2023.

3. Assessment of Nippon Steel's climate targets

Climate targets: four shortcomings

#1. Climate targets are not aligned with a 1.5C climate scenario

#2. Climate targets do not cover all Nippon Steel assets

#3. Carbon intensity target is missing

#4. Scope 3 emissions reduction target is missing

Nippon Steel's climate strategy is laid down in the company's *Carbon Neutral Vision 2050*, adopted in 2021, with the accompanying Q&A.[19,20] The content of this strategy can be divided into two parts: climate targets and technological pathways.

Nippon Steel's *Carbon Neutral Vision 2050* sets two climate targets for the company:

- 2030 target of '30% or more' absolute CO_2 emissions reductions, compared with a 2013 baseline of 102 $MtCO_2$ (scope 1 and 2).
- 2050 target of 'carbon neutrality'.

#1. Climate targets are not aligned with a 1.5C climate scenario

Nippon Steel does not explicitly refer to the Paris Agreement as a direct guidance for its climate targets. The Paris Agreement stated aim is to 'pursue efforts to limit the temperature increase to 1.5C above pre-industrial levels.'[21] Instead, the company refers to its contribution to Japan's nationwide commitment to achieve net zero GHG emissions by 2050.[22]

This lack of direct reference to global climate targets is visible in several ways. First, the 2013 baseline year does not meet global standards. Nippon Steel followed the Japanese government in adopting fiscal year 2013[23] as a baseline for establishing its 2030 climate target. This choice is significant because 2013 was a year of historically high emissions in Japan, influenced by increased fossil fuel use following the 2011 Great East Japan Earthquake.[24] Using this high emissions year as a baseline gives an impression of deeper reductions. Had the baseline been fiscal year 2017 or 2018, achieving the same 2030 emissions target would have only required a reduction of approximately 23%.

---

[19] Nippon Steel, *Nippon Steel Carbon Neutral Vision 2050*, 30 March 2021.
[20] Nippon Steel, *Nippon Steel Carbon Neutral Vision 2050 Briefing*, 30 March 2021.
[21] UNFCCC, *Paris Agreement*, 2015.
[22] Nippon Steel, *Carbon Neutral Vision 2050*, March 2021.
[23] Nippon Steel, *Financial results*. Retrieved on 15 April 2024. In line with Nippon Steel's reporting methodology and unless stated otherwise, fiscal years refer to Japanese fiscal years, which span from April 1st to March 31st next year (fiscal year 2022 begins on 1 April 2022 and ends on 31 March 2023).
[24] Nature, Long, Y., Yoshida, Y., Liu, Q. et al., *Japanese carbon emissions patterns shifted following the 2008 financial crisis and the 2011 Tohoku earthquake, Communications Earth & Environment, 15 June 2021.*

Steelworker at work near an arc furnace. Credit: Envato Elements/miraclemoments.

Secondly, regardless of baseline year, a 30% reduction is simply not enough to meet the urgent demands of climate change. Japan has an economy-wide reduction target of 46% from 2013 levels by 2030.[25] Japan's national climate policy has faced global criticism for being insufficient.[26] The Japanese government is currently considering a new 2035 target to reduce emissions 66% below 2013 levels.[27]

Thirdly, 'net zero' emissions by 2050 does address what happens between now and then. How insufficient are 30% by 2030 and net zero by 2050? Investor analysis firm MSCI ESG Research stated that "An Implied Temperature Rise of above 3.2C indicates that NIPPON STEEL CORPORATION is strongly misaligned with global climate goals. Its contribution to catastrophic climate change is higher than most."[28] This misalignment means the company is "exceeding its fair share of the remaining 1.5C global carbon budget."[29] According to Climate Action 100+ Net Zero Company Benchmark, this 2030 target "does not meet any criteria" in terms of alignment with the goal of limiting global warming to 1.5C.[30] Simply achieving net zero emissions by 2050 is insufficient; the total emissions released between now and then will ultimately determine the extent of global warming.

Nippon Steel's targets are not committed to, nor aligned with, a 1.5C-compatible climate scenario and lack science-based validation.

Fourthly, Nippon Steel does not have targets validated by the Science-Based Targets Initiative (SBTi). Nippon Steel did participate in the Expert Advisory Group (EAG)[31] to the SBTi Steel project, which published guidelines in 2023 for setting corporate-level climate targets aligned with 1.5C, yet does not have its own science-based target.[32]

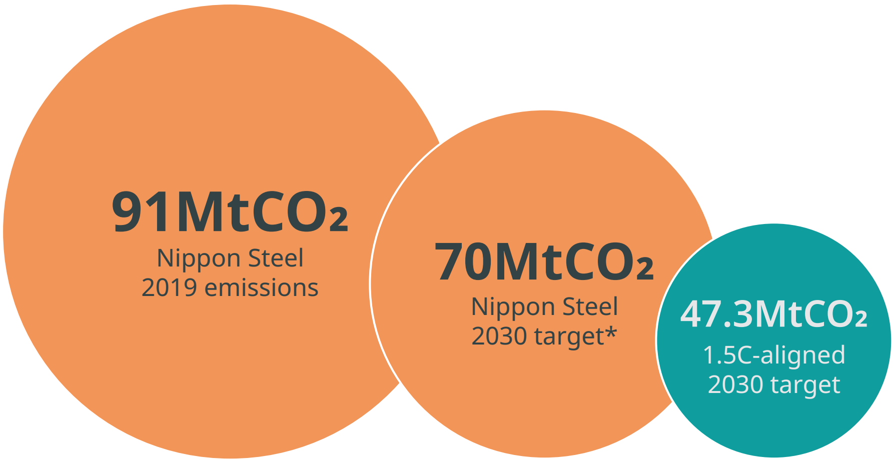
Fifthly, despite pressure from financial institutions, Nippon Steel has not improved its targets. In November 2023, Nippon Steel, alongside over 2,100 high-emitting companies, was asked by 367 financial institutions and multinational companies to set science-based 1.5C-aligned emissions reduction targets, as part of a campaign led by the CDP (formerly known as the Carbon Disclosure Project).[33]

For Nippon Steel to claim itself as one of the global leaders in the steel sector, it must take direct guidance from the Paris Agreement and align its climate target with 1.5C.

---

[25] Ministry of Foreign Affairs of Japan, *Intended Nationally Determined Contributions (INDC): Greenhouse Gas Emission Reduction Target in FY2030,* 26 July 2021.
[26] Climate Action Tracker, *Country summary: Japan*. Retrieved 14 May, 2024.
[27] Nikkei Asia, *Japan to set fiscal 2040 energy mix goal to spur investments,* 16 April 2024.
[28] MSCI, *ESG Ratings & Climate Search Tool- Nippon Steel Corporation*. Retrieved 26 April 2024.
[29] MSCI ESG Research LLC, *Implied Temperature Rise Methodology,* February 2024.
[30] Climate Action 100+, *Nippon Steel Corp. Company Assessment- Net Zero Company Benchmark.* Retrieved on 15 April 2024.
[31] Science Based Targets, *Steel*. Retrieved on 15 April 2024.
[32] Science Based Targets, T*arget dashboard.* Retrieved on 15 April 2024.
[33] CDP, *367 financial institutions and multinational companies worth $33 trillion join forces to demand science-based targets in race to 1.5C* , 1 November 2023. Retrieved on 15 April 2024.

Figure 2: Nippon Steel Company 2030 emissions target vs. 1.5C-aligned climate scenario



** This target does not count group companies. Nippon Steel 2019 emissions and 2030 are taken from* ***Nippon Steel****, Nippon Steel Integrated Report 2023, p. 71, and* ***Nippon Steel****, Fact Book 2022 - Environmental Considerations. Retrieved on 15 April 2024. The 1.5C-aligned 2030 target was determined by applying a 48% reduction to the 2019 emissions level, reflecting the recommendations from* ***IPCC****, Climate Change 2023: Synthesis Report. Summary for Policymakers, 2023, doi:10.59327/IPCC/AR6-9789291691647.001.*

#2. Climate targets do not cover all Nippon Steel assets

In its *Carbon Neutral Vision 2050* and the accompanying Q&A, Nippon Steel stated that both the 2030 and 2050 climate targets were applicable to Nippon Steel Corporation (the 'Company'), not the entire Nippon Steel Group. However, given that in 2021, "the Company alone accounts for most of the total CO_2 emissions of the Group",[34] the difference in scope was deemed negligible.

Since then, it seems that Nippon Steel has clarified the coverage of its 2030 climate target with:

- A CO_2 absolute emissions target of 70 Mt for Nippon Steel Corporation (the 'Company'), including Nippon Coke & Engineering Co., Ltd. and three Sanso Center companies;[35]
- A CO_2 absolute emissions target of 75 Mt for Nippon Steel Corporation (the 'Company'), the three Sanso Center companies, and also 10 associated EAF mills (Osaka Steel, Sanyo Special Steel, Nippon Steel Stainless Steel, Oji Steel, Tokai Special Steel, Nippon Steel Structural Shapes Corporation, Tokyo Kohtetsu, Ovako, Sanyo Special Steel Manufacturing India, and Standard Steel).[36]

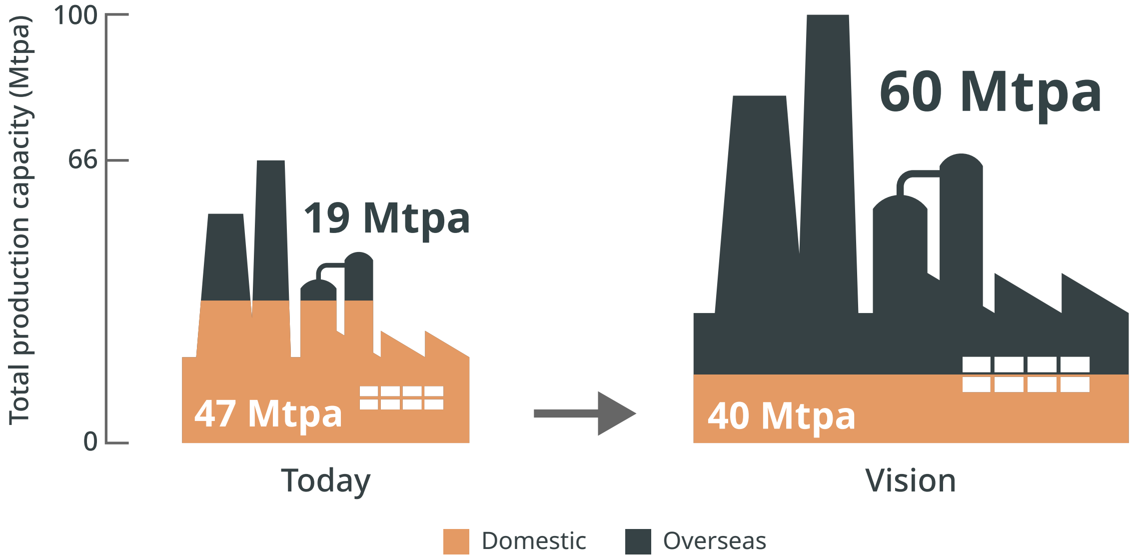
[34] Nippon Steel, *Nippon Steel Carbon Neutral Vision 2050 Briefing*, 30 March 2021, p. 1. Retrieved on 15 April 2024.
[35] Nippon Steel, *Fact Book 2022 - Environmental Considerations*. Retrieved on 15 April 2024.
[36] Nippon Steel, *Nippon Steel's Activities against climate change*. Retrieved on 15 April 2024.

Among the 'Nippon Steel associated EAF mills,' Ovako is headquartered in Sweden with production sites in Sweden, Finland, France and Italy.[37] Standard Steel is situated in the United States while Sanyo Special Steel Manufacturing India operates in India.

However, this list does not include all iron and steelmaking assets outside Japan over which Nippon Steel has an ownership stake. A recent analysis by Transition Asia[38] highlights Nippon Steel's majority stakes in two Thailand-based steelmakers, G Steel and G J Steel, acquired in 2022,[39] along with its joint ventures with ArcelorMittal - AM/NS Calvert in the United States and AM/NS India. The latter is set to emerge as a significant steel producer and substantial GHG emitter with plans to increase production capacity from 9.6 Mtpa today[40] to up to 40 Mtpa in 2035,[41] with two new blast furnaces already planned to come online by 2026 (See Box 1).[42]

Concerningly, overseas assets, including those minority-owned, are precisely the segment of Nippon Steel portfolio that is expected to grow and contribute the most to the company's ambition to expand its global production capacity to 100 million tonnes of crude steel per year. It would increase from the current level of 66 Mt,[43] whereas Japan-based annual production capacity would decline from 50 to 40 million tonnes.[44]

Figure 3: Changing split between domestic and overseas steel production capacity (Mtpa), today and vision



[37] Ovako, *Production sites.* Retrieved on 15 April 2024.
[38] Transition Asia, *Nippon Steel's internationalisation of integrated steel operations: an analysis of EAF-based steel,* 15 April 2024.
[39] Reuters, *Nippon Steel buys majority stakes in two Thai steelmakers,* 4 April 2022.
[40] Government of India, Ministry of Environment, Forest and Climate Change (Impact Assessment Division), *Grant of Environmental Clearance (EC) to the proposed Project of Expansion of Integrated Steel Plant of ArcelorMittal Nippon Steel India Limited from 9.6 to 15.6 MTPA (Liquid Steel), located at Hazira Village in Surat District, Gujarat,* 3 October 2022.
[41] Business Standard, Ishita Ayan Dutt, *AM/NS India will have 'robust financial discipline' while expanding: CFO*, 11 April 2024.
[42] Nikkei Asia, Shuhei Ochiai, *Nippon Steel to add 2 blast furnaces at Indian JV with ArcelorMittal*, 29 September 2022.
[43] Nippon Steel, *Nippon Steel Integrated Report 2023*, p. 13. Retrieved on 15 April 2024.
[44] Nippon Steel, *Nippon Steel Corporation Announces Medium- to Long-term Management Plan,* 5 March 2021, and related presentation. Retrieved on 15 April 2024.

A Blast furnace. *Credit: Envato Elements/miraclemoments.*

The exact timeline of this transformation, contingent upon factors like the attempted acquisition of US Steel, remains undisclosed. However, the potential outcome is a scenario where Nippon Steel's Japan-based production capacity would be smaller than its overseas capacity. **Nippon Steel's climate targets and emissions reporting need to cover the fast-growing climate footprint associated with its expanding overseas production.**

Nippon Steel cannot avoid responsibility for these emissions as it did in a Q&A when the company stated that it lacked controlling stakes in most of its overseas group companies with high CO_2 emissions, and thus couldn't initiate plans for them.[45]

Nippon Steel's majority-owned group companies tend to have lower emissions due to being EAF-based. In contrast, it holds smaller stakes in assets that are more GHG-intensive. Although Nippon Steel's influence over these assets varies, they are all included in its business ambition of achieving a global annual crude steel production of 100 million tonnes. In contrast, the Carbon Neutral Vision 2050 does not include and specify their roles in the company's climate strategy.[46]

While European subsidiaries like Ovako boast robust climate policies and commendable achievements, others like AM/NS India have weak climate targets and have yet to demonstrate notable progress in emissions reductions.[47] As a parent company or a shareholder, Nippon Steel needs to be transparent about the climate footprint of its subsidiaries, providing more detailed company-level reporting in its group-level integrated reports. Doing so would also reveal the actual carbon intensity of Nippon Steel Corporation in Japan, which is heavily dominated by GHG-intensive BF-BOF plants. Currently, its emissions are only reported together with 'associated EAF mills' that have a lower carbon intensity.[48]

Nippon Steel must also put all these subsidiaries under adequate 1.5C-aligned climate commitments, in particular in order to avoid offshoring GHG emissions from Japan to other countries. Currently, for certain subsidiaries, Nippon Steel reports its aggregate GHG emissions in proportion to Nippon Steel's equity stake in a single 'Investments' line among other scope 3 emissions[49] that are in turn not subject to climate targets - see the next section.

---

[45] Nippon Steel, *Nippon Steel Carbon Neutral Vision 2050 Briefing*, 30 March 2021, p. 1. Retrieved on 15 April 2024.
[46] Nippon Steel, *Nippon Steel Integrated Report 2023*, p. 28. Retrieved on 15 April 2024.
[47] Transition Asia, *Nippon Steel's internationalisation of integrated steel operations: an analysis of EAF-based steel,* 15 April 2024.
[48] Nippon Steel, *Nippon Steel Integrated Report 2023*, p. 72. Retrieved on 15 April 2024.
[49] ibid.

Box 1: Example of overseas emissions left out of climate target: expansion in India

Nippon Steel has had steel production assets in India since 2010,[50] but a turning point happened in 2019 when Nippon Steel and ArcelorMittal took over Essar Steel, an ailing local iron and steelmaker with a crude steel production capacity of 9.6 Mt per year. The new operation took the form of a joint venture: ArcelorMittal Nippon Steel India (AM/NS India),[51] in which ArcelorMittal and Nippon Steel own a 60% and 40% share, respectively, while management is based on equal partnership with the same number of directors for both owners.[52]

AM/NS's India business is buoyed by India's strong economic growth and massive infrastructure build-out. This is why it has very ambitious growth plans,[53] with one blast furnace expansion and the construction of two new blast furnaces already underway. Both furnaces are expected to come online in 2026, pushing up production capacity to 15.6 Mtpa.[54] This project is supported by Japanese banks.[55]

Future plans, though less detailed, include a further expansion of the Hazira plant from 15.6 to 20 Mtpa,[56] and the construction of a greenfield 14 Mtpa steel plant in Kendrapara,[57] with an overall goal of reaching up to 40 Mtpa capacity in 2035.[58] While it is not certain today whether these plans will be implemented and what iron and steelmaking production technologies they will use, the limited ambition of AM/NS India 2030 climate target and absence of 2050 net zero target heightens the risk that these plants will be coal-based, leaving India with decades of increased air pollution and CO_2 emissions. Burdening developing nations like India with outdated, highly-polluting technologies is inequitable.

Nippon Steel's climate targets do not cover all relevant assets. To have meaningful targets, they must include all of its global operations including subsidiaries and joint ventures.

[50] Nippon Steel, *Nippon Steel Integrated Report 2021*, p. 47. Retrieved on 19 April 2024.
[51] AM/NS India.
[52] Nippon Steel, *ArcelorMittal and Nippon Steel Complete Joint Acquisition of Essar Steel in India*, 16 December 2019.
[53] Nippon Steel, *Nippon Steel Integrated Report 2023*, pp. 29-30. Retrieved on 15 April 2024.
[54] Government of India, Ministry of Environment, Forest and Climate Change (Impact Assessment Division), *Grant of Environmental Clearance (EC) to the proposed Project of Expansion of Integrated Steel Plant of ArcelorMittal Nippon Steel India Limited from 9.6 to 15.6 MTPA (Liquid Steel), located at Hazira Village in Surat District, Gujarat,* 3 October 2022. Retrieved 12 April 2024.
[55] JBIC, *Loan for Joint Steelmaking Business between Nippon Steel Corporation and ArcelorMittal S.A. of Luxembourg through ArcelorMittal Nippon Steel India Limited of India,* 31 March 2023. Retrieved on 27 April 2024.
[56] ArcelorMittal, *ArcelorMittal Annual Report*: 2023, p. 103.
[57] ArcelorMittal, *Roadshow: 4Q 2023 and FY 2023*, February 2024, p. 22
[58] Business Standard, Ishita Ayan Dutt, *AM/NS India will have 'robust financial discipline' while expanding: CFO,* 11 April 2024. Retrieved on 12 April 2024.

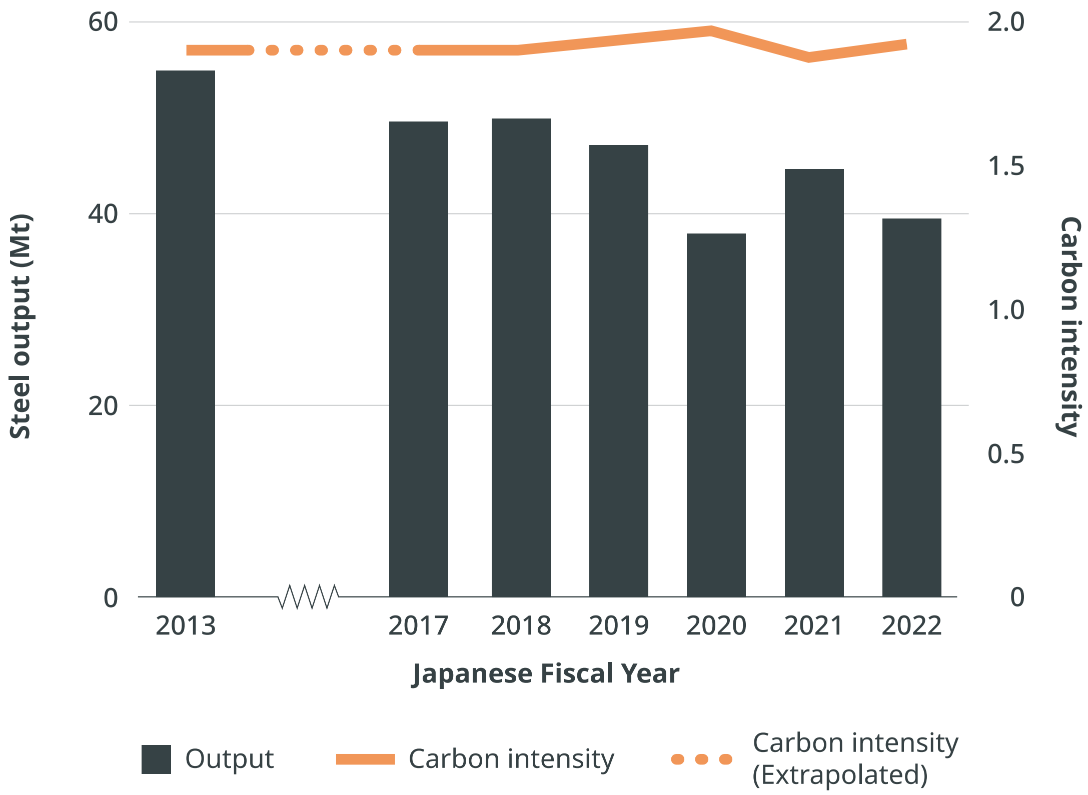
#3. Carbon intensity target is missing

Nippon Steel does not have a 2030 target for reducing carbon intensity; it only specifies a target to reduce absolute tonnage of CO_2 emissions. This is despite the fact that the company does track and report its steel production's carbon intensity in tonnes of CO_2 per tonne of crude steel produced.

Carbon intensity is a critical indicator as the company is largely achieving reductions in CO_2 emissions by decreasing steel production — declining from 45.7 Mt in fiscal year 2013 to 34.3 Mt in fiscal year 2022[59] — rather than through the decarbonisation of its production processes.

For Nippon Steel to remain viable as a business in a decarbonising world it must shift to cleaner production methods, not just close facilities.

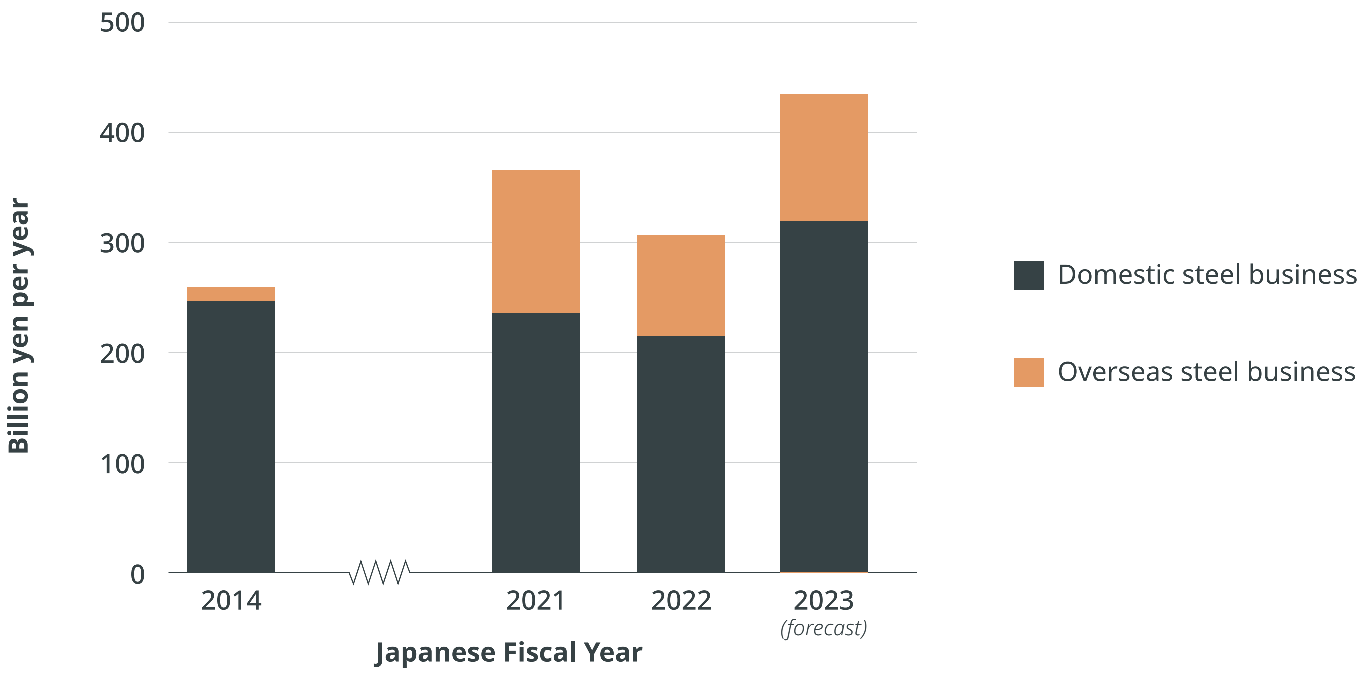
Figure 4: Nippon Steel's carbon intensity remains flat



Nippon Steel steel output (Mt) and carbon intensity (tonnes of CO_2 per tonne of crude steel),[60] reveals no reduction in emissions intensity.
Sources*: Nippon Steel Sustainability Report 2023 (p. 20), Nippon Steel Sustainability Report 2023 (p. 19).[61,62] Data points for years 2014, 2015 and 2016 are missing in the absence of reported steel output and carbon intensity for these years with the same scope of companies.*

[59] Nippon Steel, *Production- History of Crude Steel Production by the Japanese Steel Industry and Nippon Steel.* Retrieved on 17 April 2024
[60] Includes Nippon Steel's Japanese operations and associated EAF mills (Osaka Steel, Sanyo Special Steel, Nippon Steel Stainless Steel, Oji Steel, Tokai Special Steel, Tokyo Kohtetsu, Nippon Steel Structural Shapes Corporation, Ovako, Sanyo Special Steel Manufacturing India, and Standard Steel). The data collection period used is each company's accounting period.
[61] Nippon Steel, *Nippon Steel Sustainability Report 2023*, p. 20. Retrieved on 15 April 2024.
[62] Nippon Steel, *Nippon Steel Sustainability Report 2023*, p. 19. Retrieved on 15 April 2024.

Figure 5: Nippon Steel profit targets with growth increasingly overseas



#4. Scope 3 emissions reduction target is missing

For steelmakers, the most substantial scope 3 emissions are likely to originate upstream, particularly in the procurement of raw materials, especially coal, for steel production.

Firstly, it is positive that Nippon Steel publicly reports its scope 3 emissions.[63] However, these emissions are **not** included in its climate targets, despite constituting an average of 23% additional CO_2 emissions compared to scope 1 and 2 emissions in recent years. **Nippon Steel should set a target to limit scope 3 emissions and reduce them over time.**

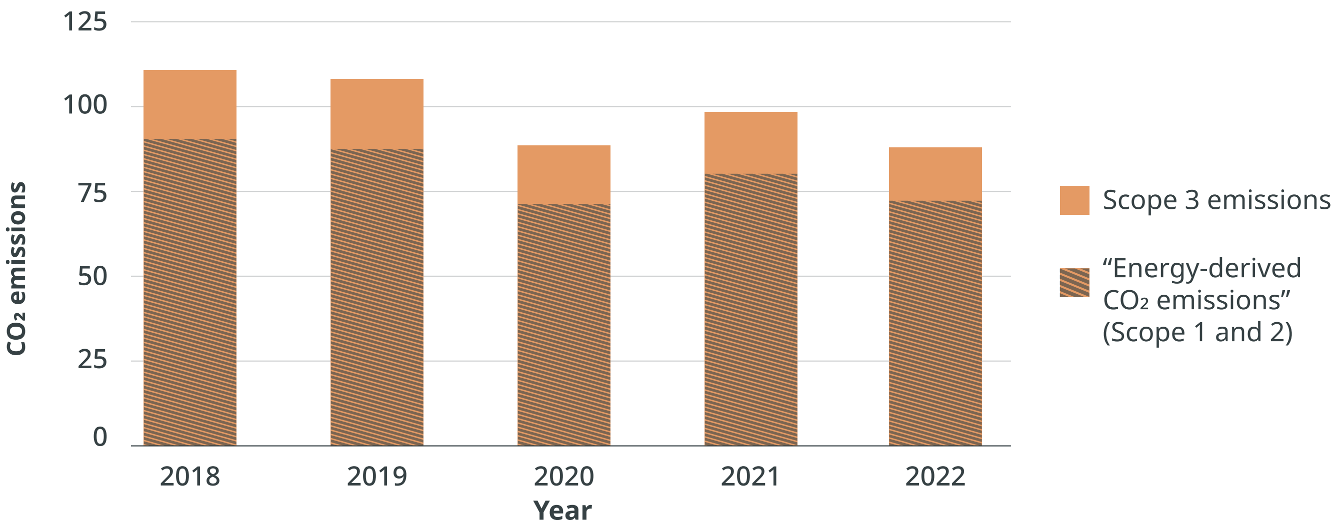
There is no target to drive reductions in scope 3 emissions and emissions may be higher than reported.

[63] Nippon Steel, *Nippon Steel Integrated Report 2023*, p. 72. Retrieved on 15 April 2024.

Box 2: What are scope 3 emissions?

An organisation's scope 3 greenhouse gas emissions are emissions that do not directly originate from the organisation's owned or controlled sources (these would be scope 1 emissions), nor from the generation of purchased electricity (these would be scope 2 emissions), but occur in the organisation's value chain, both upstream and downstream, and can therefore be attributed to the organisation's activities.[67]

Figure 6: Reported scope 3 emissions are significant and uncapped



***Note**: Nippon Steel Company reported CO_2 emissions data ('energy-derived' can be interpreted as scope 1 and 2, scope 3 emissions in orange) with scope 3 emissions significant but having no limit.*

***Sources**: Nippon Steel Integrated Report 2023 (pp. 71-72), Nippon Steel Integrated Report 2022 (pp. 75-76), Nippon Steel Integrated Report 2021 (pp. 17-18).[64,65,66] Previous editions did not provide scope 3 emissions.*

Secondly, Nippon Steel's current method of assessing scope 3 emissions relies on the use of emissions factors provided by the Japanese Ministry of the Environment and the Agency for Natural Resources and Energy,[68] rather than actual data from suppliers. This method can hide wide differences in emissions levels between suppliers, and does not encourage the reporting company to leverage its market power to push suppliers to improve their climate performance. Whether Nippon Steel has a supplier engagement policy is unknown, as the World Benchmarking Alliance notes that the company "lacks a transparent supplier engagement strategy and procurement policy."[69]

[64] Nippon Steel, Nippon Steel Integrated Report 2023, pp. 71-72. Retrieved on 15 April 2024.
[65] Nippon Steel, Nippon Steel Integrated Report 2022, pp. 75-76. Retrieved on 15 April 2024.
[66] Nippon Steel, Nippon Steel Integrated Report 2021, pp. 17-18. Retrieved on 15 April 2024.
[67] World Resources Institute and World Business Council for Sustainable Development, The Greenhouse Gas Protocol. A Corporate Accounting and Reporting Standard. Revised Edition, 2004.
[68] Nippon Steel, *Nippon Steel Integrated Report 2023*, p. 72. Retrieved on 15 April 2024.
[69] World Benchmarking Alliance, *Heavy Industries Benchmark - Nippon Steel.* Retrieved on 16 April 2024.

4. High emissions from betting on wrong technologies

Three (not so) 'breakthrough technologies' of Nippon Steel

Nippon Steel Carbon Neutral Vision 2050 describes three 'breakthrough technologies' to achieve its climate targets:

- "High-grade steel production in large-sized EAFs"
- "Hydrogen injection into blast furnaces" (and carbon capture)
- "100% hydrogen use in direct reduction"

The first, production of high-grade steel in large electric arc furnaces, is an existing technology, with the grade dependent on the quality of the input materials.

The second technology, hydrogen injection into blast furnaces, would, as the name indicates, not involve the retirement of coal-based blast furnaces. Iron ore would mainly continue to be reduced (oxygen removed) using coal in the blast furnace, with hydrogen substituting for a portion of the coal. Carbon capture, utilisation and storage (CCUS) is presented separately but is combined with hydrogen injection in 'COURSE50' and 'Super COURSE50' projects as a means to attempt to reduce emissions from blast furnaces - these projects are presented in more detail in the next section.

The third technology, direct reduction, does away with blast furnaces and takes place in a different type of furnace with a variety of possible reducing agents, the cleanest being hydrogen made using electrolysers powered by 100% renewable electricity ('green' hydrogen). The reduced iron is then made into steel in an electric arc furnace.

Nippon Steel acknowledges they "have no idea of the ratios of EAF, BF, and hydrogen DRI in 2030 and 2050" as they are subject to "change depending on future technological developments".[70] In their assessment of Nippon Steel, the World Benchmarking Alliance notes that the company "should provide a well-defined timescale, stakeholder feedback process and a review and update process for its low-carbon transition plan."[71]

Nippon Steel is pursuing three 'breakthrough technologies' to achieve its climate targets, but not only are they falling short, they are betting on the wrong technologies and are many years behind their competitors.

[70] Nippon Steel, *Nippon Steel Carbon Neutral Vision 2050 Briefing*, 30 March 2021, p. 2. Retrieved on 15 April 2024.
[71] World Benchmarking Alliance, *Heavy Industries Benchmark - Nippon Steel - Risks and Opportunities - Decarbonisation planning*, Retrieved on 16 April 2024

What are the emissions implications of deploying these technologies?

SteelWatch modelled the CO_2 emissions of Nippon Steel Company (excluding associated EAF mills and overseas assets) from now until 2050 in three different scenarios: 'business-as-usual', 'stated policies' and SteelWatch's proposed 'green transition.' These scenarios are compared with a 1.5C-aligned emissions pathway, which requires a 48% reduction by 2050, from 2019 emissions levels, as outlined in the IPCC Climate Change 2023: Synthesis Report, Summary for Policymakers.[72]

Assumptions for all three scenarios:

- Nippon Steel Company's fleet of blast furnaces will shrink from 11 today to 10 in 2025 (closure of Kashima BF No. 3) and 9 in 2030 (replacement with EAF at Yawata), as already announced by the company (NS Integrated Report 2023 p.25, p.32).
- Blast furnaces are relined every 20 years.
- Two 'large-scale EAFs' (2.5 Mtpa capacity) come online in 2030 as stated in the company's plans (NS Integrated Report 2023 p. 32).
- A total constant annual total output of 35 Mt of crude steel (based on Japanese fiscal year 2022 ending spring 2023 - NS Integrated Report 2023, p. 18). This assumption is intended to eliminate variations in emissions due to changes in output rather than production processes. Temporary production pauses from relinings are also ignored for the same reason.
- Nippon Steel Company's scope 2 emissions will decrease over time regardless of the company's actions thanks to the growing share of renewables in Japan's grid electricity.

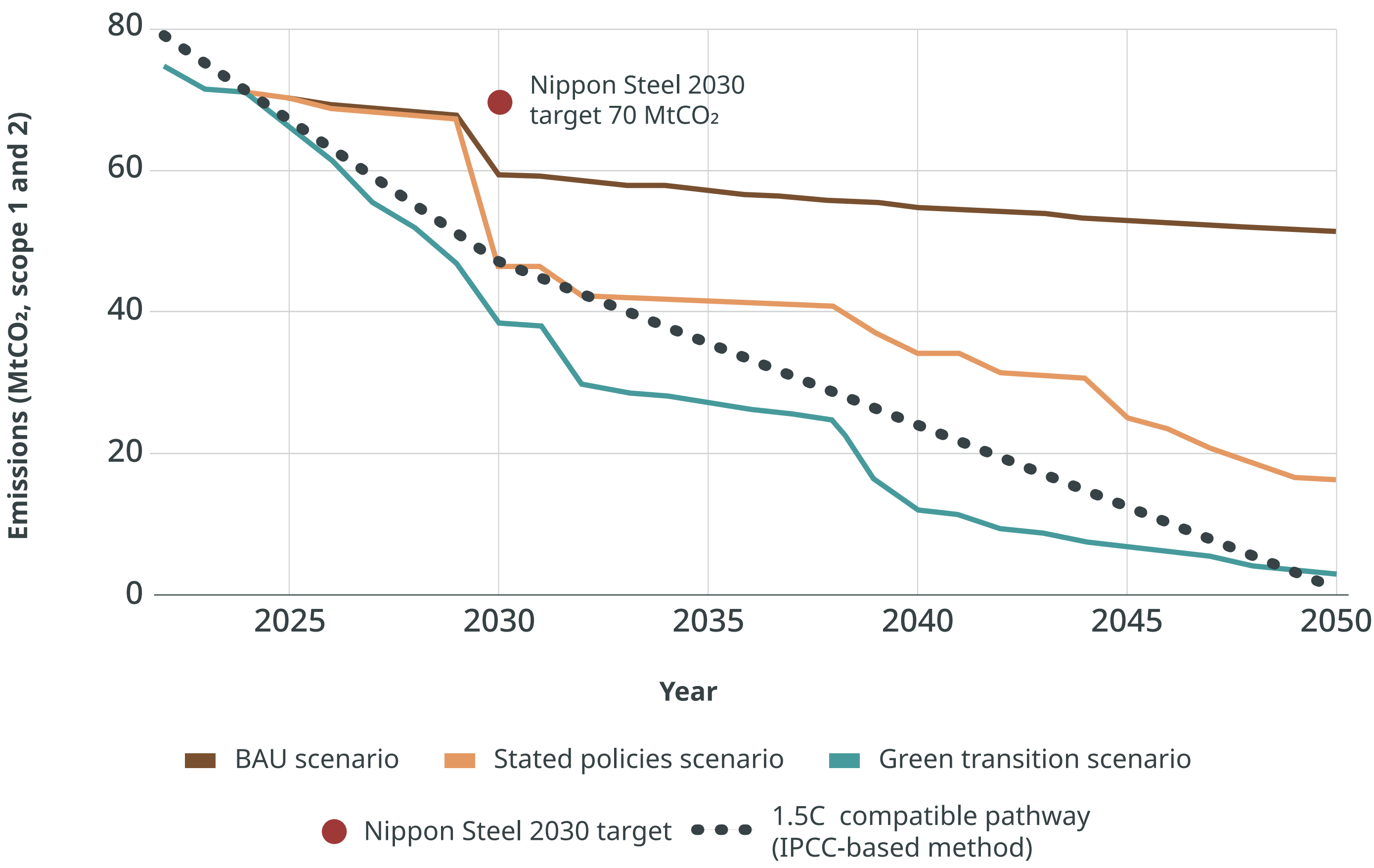
(See the Appendix for full assumptions behind our model)

Three scenarios

- The **business-as-usual** scenario assumes no change nor any other feature than those mentioned in the assumptions, so that blast furnaces coming to end-of-life are simply relined.
- The **stated policies** scenario relies on the optimistic assumption that all of Nippon Steel's plans regarding COURSE50 and Super COURSE50 are implemented to their entire extent, on time, and at scale, despite today's experimental character of these technologies and the absence of visibility on the development of CCS infrastructure. The stated policies scenario also assumes a 50/50 share between H_2-DRI and Super COURSE50-equipped blast furnaces in the late 2040s.
- The SteelWatch **green transition** scenario has no role for COURSE50/Super COURSE50 and CCUS. It also precludes any relining of blast furnaces from 2024. Instead, when a blast furnace reaches its end of life, it is replaced by an EAF fed with green direct reduced iron (assumed to be imported green HBI). In this scenario, the last blast furnace closes in late 2041.

[72] IPCC, *Climate Change 2023: Synthesis Report. Summary for Policymakers*, 2023, doi: 10.59327/IPCC/AR6-9789291691647.001

Figure 7: Contrasting CO_2 emissions from Nippon Steel production in Japan under three scenarios



Note: *In all 3 scenarios, Nippon Steel Company's fleet of blast furnaces will shrink from 11 today to 9 in 2030, as already announced by the company, whereas two 'large-scale EAFs' (2.5 Mtpa capacity) will come online in 2030 (NS Integrated Report 2023 p.25, p.32). A constant total annual output of 35 Mt of crude steel is assumed over the entire period.*

Scenario specifics:

- *Business-as-usual: no change nor any other feature than those mentioned in the assumptions, blast furnaces coming to end-of-life are relined;*
- *Stated policies: COURSE50 and Super COURSE50 are implemented to their entire extent, on time, and at scale;*
- *SteelWatch green transition: no COURSE50, Super COURSE50, CCUS, nor relining of blast furnaces from 2024. Blast furnaces reaching end of life are replaced with EAFs fed with imported green HBI.*

Our conclusions from this modelling exercise:

- The business-as-usual scenario shows that the contraction of Nippon Steel's fleet of blast furnaces is sufficient for the company to meet its 2030 target, without any effort to decarbonise its production process, demonstrating how unambitious this target is.
- **Neither the business-as-usual scenario nor the stated policies scenario would make Nippon Steel 1.5C-aligned, *even* despite the optimistic assumptions made in the Stated Policies Scenario.**
- SteelWatch's green transition scenario would make Nippon Steel 1.5C-aligned. Further emissions reductions could be achieved by the use of power purchase agreements to source renewable electricity instead of using grid electricity to power EAFs.

COURSE50 and Super COURSE50 perpetuate coal addiction

What are COURSE50 & Super COURSE50?

COURSE50 was initiated as a research project back in 2008[73] with the participation of the three largest Japanese steelmakers — Nippon Steel, JFE, and KOBELCO / Kobe Steel with the support of the New Energy and Industrial Technology Development Organisation (NEDO), Japan's main public research and development arm for energy, industrial and environmental technologies.[74]

COURSE50 aims to reduce CO_2 emissions coming from blast furnaces through two ways:

- the partial substitution of coal-based products, in particular coke, with hydrogen already present today in off-gases generated in BF-BOF steel plants.
- the development of CCUS technologies.

In terms of concrete CO_2 emissions reductions and timeline, COURSE50 targets a 30% CO_2 emissions reduction from blast furnaces (10% with the use of hydrogen, 20% with CCUS) by 2030.[75]

Given the insufficiency of COURSE50 relative to the goals of the 2015 Paris Agreement, in 2018 the Japan Iron and Steel Federation outlined an approach towards achieving 'Zero Carbon Steel' and included a new 'Super COURSE50' in their roadmap.[76] This received government backing from NEDO in 2020[77] as well as the 'Green Innovation Fund', which launched in 2021 to help companies achieve the newly adopted national net zero target.[78]

As an enhanced version of COURSE50, Super COURSE50 also relies on hydrogen injection into blast furnaces and CCUS, but it aims for a total 50% or more CO_2 emissions reduction from blast furnaces thanks to the addition of larger amounts of externally produced hydrogen.[79]

Nippon Steel's most recent announcements indicate the deployment of a demonstration-scale COURSE50 system from late 2025 to early 2026, a full-scale COURSE50 project by 2031,[80] while Super COURSE50 is *'hoped'* to be commercially available by 2040.[81]

COURSE50 and Super COURSE50 are insufficient as carbon reduction technologies, with low abatement potential, high costs and low maturity.

[73] The Japan Iron and Steel Federation, *COURSE50 - Research*. Retrieved 17 April 2024.
[74] New Energy and Industrial Technology Development Organization, *About NEDO*. Retrieved 17 April 2024.
[75] Hydrogen Steelmaking Consortium, *Technology to reduce CO_2 emissions from blast furnaces*. Retrieved 17 April 2024.
[76] Japan Iron and Steel Federation, *JISF Long-term vision for climate change mitigation- A challenge towards zero-carbon steel*, September 2019.
[77] NEDO, *Developing Technologies to Achieve 'Zero Carbon Steel.'* (Japanese) May 2021.
[78] Ministry of Economy, Trade and Industry, *Green Innovation Fund*. Retrieved 7 May 2024.
[79] ibid.
[80] Nippon Steel, *Promotion of innovative technology development.* Retrieved 17 April 2024.
[81] The Government of Japan, *The Road to Net Zero with Green Steel*, 1 March 2024.

COURSE50 and Super COURSE50— too little, too late

High emissions intensity

First, **even if Super COURSE50, the more ambitious of the two, meets its goal of reducing CO_2 emissions from blast furnaces by 50%, the carbon intensity would remain around 1tCO_2 per tonne of crude steel - very far from a near-zero level and nearly twice as high as commercial definitions of 'green steel'** (maximum 0.4 tCO_2 per tonne of crude steel when no scrap is used).[82] Nippon Steel's self-proclaimed status as "the best steelmaker"[83] would be at serious risk of losing sales to premium customers committed to sourcing low-emission steel, such as those participating in SteelZero or the First Movers Coalition.[84,85]

Unproven at scale

Second, the likelihood that COURSE50 and Super COURSE 50 achieve their theoretical CO_2 emissions reduction targets in full-scale conditions appear uncertain today. So far, the two projects have been tested in miniature furnaces of 12 m^3.[86] However, as Nippon Steel acknowledges, a commercial-scale blast furnace is 5,000 m^3 — over 400 times bigger — and scaling up the technology is a 'challenge'.[87]

Dependent on outside factors

It must be added that both COURSE50 and Super COURSE50 depend on the realisation of external conditions over which Nippon Steel has limited influence. Regardless of the actual performance of CO_2 capture technologies developed by Nippon Steel, the emissions still need to be permanently stored. As of today, Japan has a minimal geological storage potential,[88] with no current CO_2 storage facilities,[89] and targets to reach 6-12 MtCO_2 storage capacity per year by 2030[90] which were announced only in January 2023.

Hydrogen of questionable emissions intensity

Regarding the injection of externally produced hydrogen in blast furnaces, Nippon Steel's plans do not specify how this hydrogen would be produced. If it is to be produced directly from fossil fuels, or in electrolysers powered by emissions-intensive sources of electricity, the CO_2 emissions reduction claimed by Super COURSE50-equipped blast furnaces must be reduced by the amount of CO_2 emissions caused by the hydrogen production.

Outdated comparisons

Despite all these downsides, COURSE50 and Super COURSE50 seem to be Nippon Steel's preferred options. 'High-grade steel production in large-sized EAFs' is presented by the company as less productive due to the smaller volumes of EAFs and longer times needed to reach melting temperature, whereas '100% hydrogen use in direct reduction' is described as a group of 'high-hurdle unproven processes that have never been demonstrated before'.[91]

---

[82] Ali Hasanbeigi and Adam Sibal, *What is Green Steel? Definitions and Scopes from Standards, Initiatives, and Policies around the World*, January 2023, p. 3.
[83] Nippon Steel, *Be the Best Steelmaker.* Retrieved 17 April 2024.
[84] The Climate Group, *SteelZero*. Retrieved 17 April 2024.
[85] First Movers Coalition, *Members*. Retrieved 17 April 2024.
[86] Chikashi Kamijo et al, *Development of Technology for Reduction of CO_2 Emission from Blast Furnace Using 12 m^3 Experimental Blast Furnace,* Nippon Steel Technical Report No. 127, January 2022, and Nippon Steel, *Verified the World's Highest Level of CO_2 Emissions Reduction at 33% by Heated Hydrogen Injection in the Super COURSE50 Test Furnace*, 6 February 2024. Retrieved 17 April 2024.
[87] Nippon Steel, *Carbon Neutral Vision 2050*, 30 March 2021, p. 28.
[88] Renewable Energy Institute, *Bottlenecks and Risks of CCS Thermal Power Policy in Japa*n, May 2022, pp. 8-9.
[89] IEA, *CCUS Projects Explorer*. Retrieved 17 April 2024.
[90] Ministry of Economy, Trade and Industry, *CCS Long-term Roadmap Review Committee Final Summary (draft)* (Japanese), Jan. 2020.
[91] Nippon Steel, *Carbon Neutral Vision 2050*, 30 March 2021.

A steel and iron worker. Credit: iStock/sdlgzps.

These descriptions are not up to date nor accurate. While it is true that EAFs have historically been associated with so-called 'minimills' — hence the relatively small average size of EAFs — newer EAFs can be 3-4 times larger. In fact, Tokyo Steel has been operating a large 2.6 Mtpa capacity EAF since 2009.[92] The 'large-sized EAFs' Nippon Steel considers for introduction at the Yawata Area Works and Setouchi Works (Hirohata) around 2030[93] would also be 300 tonnes per charge type[94] (or annually 2.5 Mtpa), and therefore not considered breakthrough technology.

Regarding the limitations of EAFs in terms of quality, EAF-based steelmakers like Arvedi (Italy), Nucor (USA) and Steel Dynamics (USA) have been making high-quality flat steel products for years, including for the demanding automotive industry.[95,96,97] The fact that important suppliers to the automotive industry like ArcelorMittal Dofasco (Canada) have decided to switch to DRI-EAFs in the coming years is also a demonstration that both in terms of scale and quality, DRI-EAFs are working alternatives to BF-BOF systems.[98] Even for the most complex steel grades like interstitial free steel, the renowned technology provider Primetals Technologies — incidentally owned by the Japanese company Mitsubishi Heavy Industries — confirms they can be produced in EAFs.[99]

Hydrogen direct reduction closest to commercialisation at scale

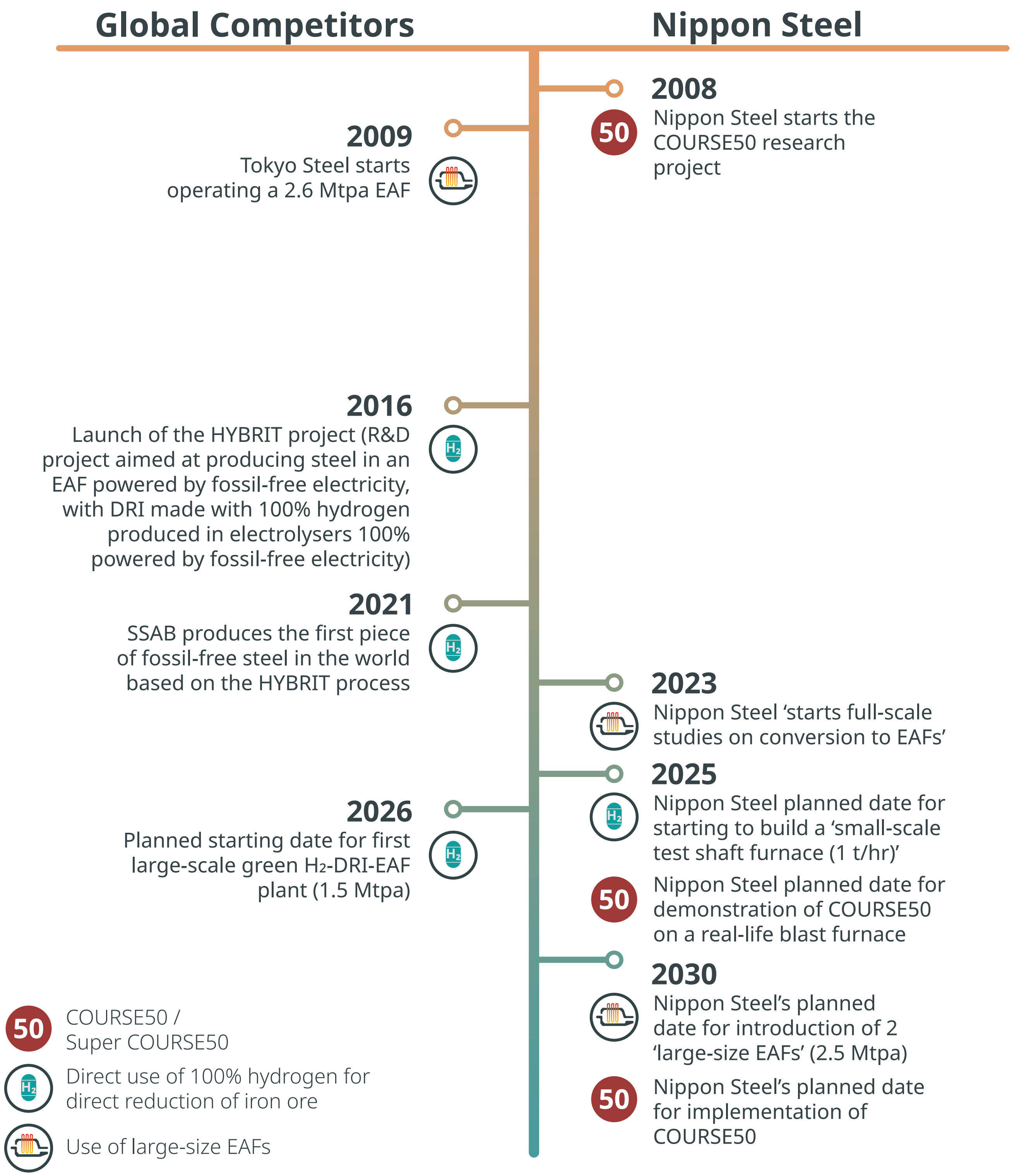
The direct use of 100% green hydrogen in iron ore reduction has been successfully demonstrated, with the resulting iron used to produce steel, which was then used to manufacture a vehicle.[100] This process is at the core of several large-scale steel plants, with the first planned to come online in the United States in 2026.[101] A growing number of offtake agreements confirms the market appetite for green steel.[102]

Curiously, Nippon Steel seems to treat the direct use of 100% hydrogen in iron ore reduction as an experimental technology, with a plan to build a 'small-scale test shaft furnace (1 t/hr)' at its Hasaki Research and Development Center by 2025.[103] While this may be a first in Japan,[104] the provider of the furnace, Tenova, is already supplying large-scale versions to other companies, for example LKAB in Sweden.[105]

---

[92] Global Energy Monitor, *Tokyo Steel Tahara plant.* Retrieved 17 April 2024.
[93] Nippon Steel, *Nippon Steel Sustainability Report 2023*, p. 23.
[94] Nippon Steel, *Nippon Steel Carbon Neutral Vision 2050 Briefing*, 30 March 2021, p. 2.
[95] Arvedi. Retrieved on 15 April 2024.
[96] Nucor, *Products- Steel- Sheet.* Retrieved on 15 April 2024.
[97] Steel Dynamics, *Flat roll.* Retrieved on 15 April 2024.
[98] ArcelorMittal, *ArcelorMittal North America Announces Supply Agreement with General Motors for North American-Sourced Sustainable XCarb® Steel,* 7 June 2023. Retrieved on 15 April 2024.
[99] Primetals, P*ioneers Talk #21: Pushing the Limits in Electric Steelmaking*, 23 February 2024.
[100] SSAB, *The world's first vehicle made with fossil-free steel.* Retrieved 18 April 2024.
[101] SSAB, *Fossil-free steel.* Retrieved 18 April 2024.
[102] Australasian Centre for Corporate Responsibility, *Forging pathways: insights for the green steel transformation,* 6 March 2024, p.16.
[103] Hydrogen Steelmaking Consortium, *Technology for direct reduction of iron ore using hydrogen*. Retrieved 17 April 2024.
[104] Steel Times International, *Matthew Moggridge, Tenova to provide the first hydrogen experimental DRI plant in Japan,* 20 March 2024. Retrieved 17 April 2024.
[105] Danieli, *LKAB selects Energiron® for demonstration plant in north Sweden,* 12 February 2024. Retrieved 18 April 2024.

Figure 8: Nippon Steel technology timeline versus global competitors



Sources: *Nippon Steel Integrated Report 2023, p.3 and p.32; GEM Tokyo Steel Tahara plant profile.*[106] *GEM SSAB Oxelösund steel plant profile;*[107] *SSAB, "The world's first vehicle made with fossil-free steel".*[108]

[106] Global Energy Monitor, Tokyo Steel Tahara plant. Retrieved 17 April 2024.
[107] Global Energy Monitor, SSAB Oxelösund steel plant. Retrieved 17 April 2024.
[108] SSAB, SSAB presentation at Stålbyggnadsdag, 22 October 2020.

Nippon Steel & Sumitomo Metal steel works factory at the Yawata Works district.
Credit: Shutterstock/Keith Tarrier.

Nippon Steel's slowness towards H_2-DRI seems to stem partly from a general scepticism about the technical aspects of the process,[109] partly from its desire to develop its own process instead of relying on existing and well-established technologies, and partly because of concerns about the availability of high-grade iron ores usually associated with DRI production.[110] Yet solutions are being developed to expand the range of iron ore grades and the volumes of iron ore suitable for DRI production, for example, with the use of electric smelters.[111] This year, Nippon Steel has belatedly joined this race with a research project supported by NEDO.[112]

Time to change course and end development of false solutions

Nippon Steel needs to do a sober revision of the technological pathways capable of reducing CO_2 emissions at the scale and speed needed to remain within the limits of a 1.5C climate scenario. After 16 years of development of COURSE50, the technology remains confined to a miniature blast furnace. Even Super COURSE50, which is not expected to be implemented until after 2040, would not provide sufficient CO_2 emissions reductions to produce the green steel demanded by customers. Neither will put the company on track with a 1.5C-compatible climate scenario.

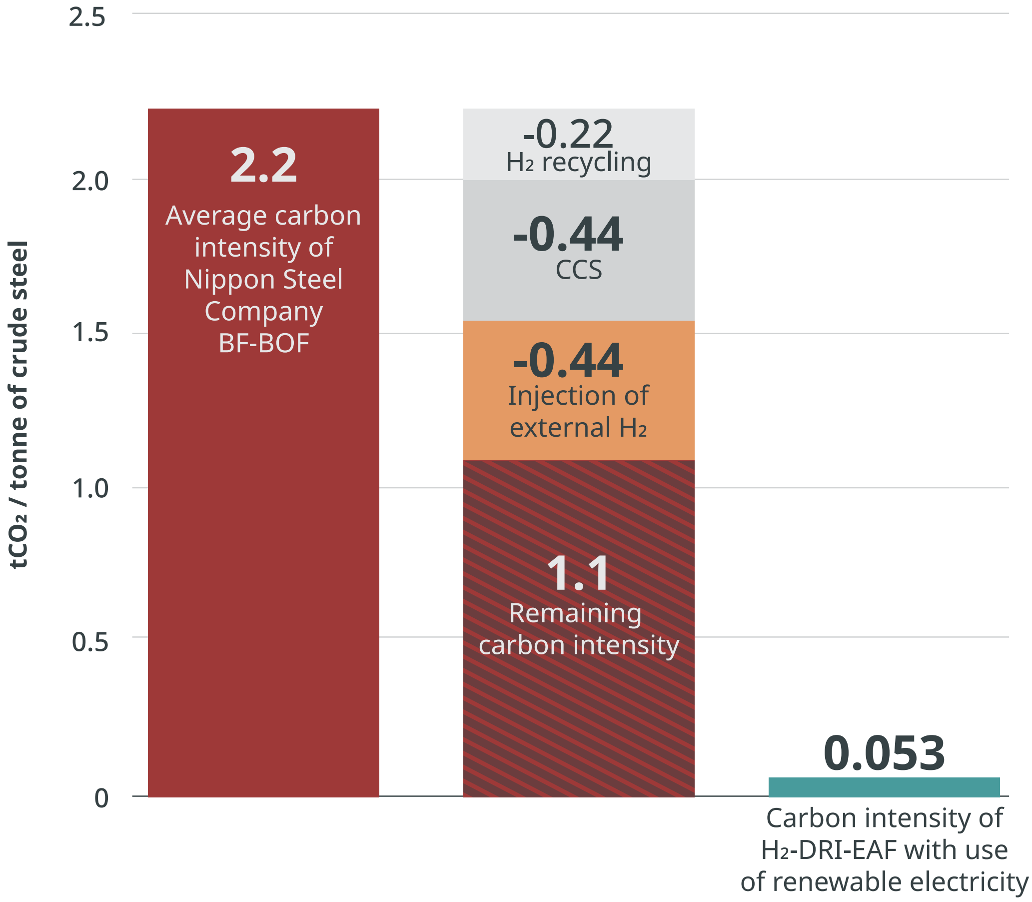
COURSE50 and Super COURSE50 are simply too little, too late. We question whether either will be fully implemented as they rely on external conditions over which Nippon Steel has limited influence, in particular the development of a CO_2 transport and storage infrastructure. Given the poor record of CCUS technologies globally,[113,114] this is a dangerous bet not only from a climate perspective, but also economically and financially for the company. For these reasons, **we consider the blast furnace route a technological dead end, and these marginal abatement technologies are false solutions that waste valuable time and resources.**

The H_2-DRI-EAF alternative has proven to be technically mature, scalable, and capable of reducing carbon intensity to meet customer climate commitments and align with a 1.5C-compatible climate scenario. It is time to divert R&D resources to these promising technologies and begin sourcing or producing near-zero emissions green iron.

---

[109] Nippon Steel, *Nippon Steel Carbon Neutral Vision 2050 Briefing*, 30 March 2021, p. 3.
[110] ibid.
[111] Australasian Centre for Corporate Responsibility, *Forging pathways: insights for the green steel transformation*, 6 March 2024, pp. 18-19.
[112] Nippon Steel, *FY2023 Earnings Summary*, 9 May 2024 pp. 44-45.
[113] Institute for Energy Economics and Financial Analysis, *Simon Nicholas and Soroush Basirat, Carbon Capture for Steel? CCUS will not play a major role in steel decarbonisation*, 17 April 2024.
[114] Transition Asia, *Explainer — Carbon capture in the steel sector; BF-BOF abatement*, April 2024.

Figure 9: Carbon intensity of Nippon Steel's alternative steel production technologies



Sources:

- *Average carbon intensity of Nippon Steel Company BF-BOF - SteelWatch calculations based on production and emissions data from Nippon Steel Integrated Report 2023, (pp. 71-72), Nippon Steel Integrated Report 2022, (pp. 75-76), Nippon Steel Integrated Report 2021, (pp. 17-18) and the Nippon Steel Factbook 2023.*[115]
- *COURSE50 and SuperCOURSE50: Hydrogen Steelmaking Consortium, "Technology to reduce CO_2 emissions from blast furnaces".*[116]
- *Valentin Vogl, Max Åhman, Lars J. Nilsson, "Assessment of hydrogen direct reduction for fossil-free steelmaking", Journal of Cleaner Production, Volume 203, 2018, pp. 736-745, https://doi.org/10.1016/j.jclepro.2018.08.279*

There is a real danger that if Nippon Steel continues to prioritise technologies that are 'false solutions' that it will not only damage its own competitiveness, but this will also have negative ramifications across the steel sector. In talking up 'hydrogen technology' when referring to COURSE50 hydrogen injection into blast furnaces it risks confusing others, such as investors, for whom the fundamental difference between hydrogen injection and green hydrogen-based DRI may not be immediately apparent. Nippon Steel may also export its coal-addicted technology to other parts of the world as it expands. Now is the time to prioritise technologies with the potential to achieve near zero emissions.

[115] Nippon Steel, *Production- History of Crude Steel Production by the Japanese Steel Industry and Nippon Steel.* Retrieved on 17 April 2024.
[116] Hydrogen Steelmaking Consortium, *Technology to reduce CO_2 emissions from blast furnaces.* Retrieved 17 April 2024.

5. Not too late

Nippon Steel must urgently fulfil its decarbonisation commitments to achieve its stated goal of net zero by 2050. The company needs to define a precise roadmap for reducing cumulative emissions from now until 2050. Additionally, Nippon Steel should strengthen its interim 2030 target to align with a 1.5C trajectory by 2030 and extend this target to include all global subsidiaries.

Goals are only as good as their implementation, and the company should adopt an asset-level transformation plan to ensure all investments are aligned with these commitments. This is less daunting than it appears: as Nippon Steel's fleet of coal-based blast furnaces is ageing they would require additional investment to extend their lifespans, including capital intensive relinings. **This ageing asset base presents a window of opportunity to redirect capital to truly low-emissions technologies as blast furnaces reach the end of their useful lives.**

Nippon Steel's rivals are beginning to break away from coal. Korean steel giant POSCO is working closely with the Australian government to develop green ironmaking facilities in Australia.[117] It continues to develop the HyREX fluidized bed reactor technology to reduce low-grade ore.[118]

Sweden's SSAB produced the world's first fossil fuel-free primary steel in 2021 using the HYBRIT fossil-free hydrogen Direct Reduced Iron (DRI) technology. Its commercialisation at scale is backed by the US government's industrial decarbonisation strategy that will 'spend up to USD6 billion on new technologies to cut carbon dioxide emissions from heavy industries,' with an announcement to support building the first commercial-scale facility using the HYBRIT technology.[119]

H2 Green Steel of Sweden will also produce steel via a coal-free, green hydrogen-based direct reduction process.[120]

As for Chinese steelmakers, some are developing alternatives to traditional BF-BOF plants, with Baosteel beginning production at a hydrogen-ready DRI facility in Zhanjiang[121] along with an MOU with automakers, including Mercedes-Benz Group, to reduce emissions, specifically highlighting which referenced this facility.[122]

This shows a clear signal: **The end of coal-based steel is inevitable, and gaining necessary momentum every day. The transition to clean steel is happening globally, and decisive action today can keep Nippon Steel from being left behind.**

---

117 UN Journal, Lee Kap-soo, *POSCO Chairman Choi Jeong-woo meets with Australia's resources minister,* 5 May 2024.
118 POSCO, *Breakthrough hydrogen reduction ironmaking technology with near-zero emission.* Retrieved on 7 May 2024.
119 The New York Times, Brad Plumer, *Energy Dept. Awards $6 Billion for Green Steel, Cement and Even Macaroni Factories,* 25 March 2024.
120 H2 Green Steel, *Segments*. Retrieved on 7 May 2024.
121 Tenova, *First-ever DRI production for Baowu in China,* 9 January 2024
122 Beijing Benz Automotive Co. *BBAC and Baosteel join forces to build a green steel supply chain,* 16 February 2023. Retrieved on 7 May 2024.

How Nippon Steel can regain its leadership position

Summary of our Asks:

1. Set 1.5C-aligned emissions targets

- Set science-based verified emissions reduction targets in line with 1.5C pathways and immediately develop plans and interim targets to ensure delivery.
- Ensure 1.5C-aligned plans include emissions intensity targets and cover domestic and international operations, including joint ventures and minority-owned assets.
- Set targets to limit and reduce scope 3 emissions.

2. Abandon false solutions and adopt transformative green technologies

- End research and development of insufficient technologies that prolong fossil fuel-based steelmaking including COURSE50, Super COURSE50 and carbon capture.
- Focus investment on transformative green technologies with a global shift to renewable-powered EAFs fed by near-zero-emissions green iron and steel scrap.
- Present detailed transition plans by April 2026 to replace all existing fossil-based facilities and technologies with near zero-emissions steelmaking.

3. Phase-out coal

- No new investment into coal-based steelmaking in Japan or overseas, including in any joint ventures or minority-owned investments.
- End coal-based steelmaking by 2040 at the latest, with no relining of blast furnaces, and a global phaseout in line with investment cycles.
- No new investments or expansions of coal mining for metallurgical and thermal coal and phase out all ownership and investment in coal mining by 2040 at the latest.

Appendix: assumptions behind the model

Coverage	Nippon Steel non-consolidated, which includes only production assets located in Japan. Existing fleet: • 11 blast furnaces, total capacity of 35 Mtpa • 4 EAFs, total capacity of 2.3 Mt ***Source***: *Nippon Steel Fact Book 2023, Outline of the Manufacturing Base.*[123]
Scope of emissions	1 + 2
Period	2022-2050 (Japanese fiscal year 2022 is the latest with actual data, the rest are projections).

Common sources of data and assumptions in all scenarios

- Reduction to 10 BF in 2025 (closure of Kashima BF No. 3 already announced) and 9 BF in 2030 (replacement with EAF at Yawata) - NS Integrated Report 2023 p. 25 and 32.
- Two 'large-scale EAFs' come online in 2030 - NS Integrated Report 2023 p. 32 and are modelled as 100% scrap-fed EAFs (EAF technology archetype from Mission Possible Partnership Steel Model), in the absence of more precise information.[124]
- Total annual output is assumed constant over the entire period (35 Mt of crude steel, like in Japanese fiscal year 2022 ending in spring 2023 - NS Integrated Report 2023, p. 18). This assumption is not aimed at being realistic, but at removing variations in emissions caused by changes in output rather than in production processes. For the same reason, the effects of relinings on pausing production are ignored.
- After the large-scale EAFs come online, blast furnaces run at lower capacity, as announced by Nippon Steel.
- Grid electricity carbon intensity sourced from Mission Possible Partnership Steel Model (varies over time).[125]
- Electricity is sourced from the grid, unless stated otherwise.
- Average carbon intensity of Nippon Steel Company BF-BOF: 2.2 tCO_2 / tonne of crude steel.

Business-as-usual scenario - assumptions

Apart from the reduction to 10, then 9 blast furnaces in 2030, and the introduction of two large-scale EAFs in 2030, nothing changes, with blast furnaces coming to end-of-life simply relined.

[123] Nippon Steel, Steel Making Operations- Outline of the Manufacturing Base, July 2023. Retrieved on 7 May 2024.
[124] Mission Possible Partnership Steel Model
[125] Mission Possible Partnership Steel Model

Stated policies scenario - assumptions

- COURSE50 achieves promised CO_2 emissions reductions (-10%) at scale and is first introduced in 2026 at Kimitsu BF No. 2.[126]
- Implementation of 'COURSE50 + CCS' to all other BFs starts in 2030, and achieves a total of -30% CO_2 emissions reductions (-10% from own hydrogen injection, -20% from CCS).[127]
- Between 2030 and 2050, 'all BFs will be converted into EAFs or Super-COURSE50 BFs'.
- Super COURSE50 lives up to its promise of -50% compared with a BF-BOF and becomes technically available in the 2040s (later than H_2-DRI, first introduction in 2046).[128]
- H_2-DRI appears somewhere between 2030 and 2050 in Nippon Steel's plans, we assume that this route represents 50% of NS primary production in 2050.

In absence of publicly available data from Nippon Steel regarding detailed technical parameters of COURSE50 and Super COURSE50, in particular for electricity consumption which are essential to account for scope 2 emissions, parameters were taken from Mission Possible Partnership Steel Model technology archetypes (BAT BF-BOF_H_2 PCI for COURSE50 and BAT BF-BOF_H_2 PCI+CCUS for Super COURSE50) with adjustments to reflect what Nippon Steel has made public about COURSE50 and Super COURSE50.[129]

Green transition scenario - assumptions

- No BF relining from now; a BF reaching end-of-life is replaced by an EAF fed with imported green HBI.
- No implementation of COURSE50, SuperCOURSE50 nor CCUS.
- Carbon intensity (tCO_2 / tonne of crude steel) in the imported green HBI (H_2-DRI-EAF) route: 0.91 in 2023, 0.24 in 2050 (doesn't factor in transport, carbon intensity remains higher than the best performance of green H_2-DRI-EAF due to the use of grid electricity to power EAFs) - adapted from Mission Possible Partnership Steel Model.[130]

[126] World Steel Association, Dr. Hideki Murakami, *Carbon Neutrality Initiatives in Japanese Steel Industry*, 5 December 2023.
[127] Hydrogen Steelmaking Consortium, *Technology to reduce CO_2 emissions from blast furnaces*. Retrieved 17 April 2024.
[128] Transition Asia, *Low Carbon Steel Development in Japan: Assessing industry preparedness to reduce emissions and become globally competitive in green steel production*, 15 November 2023.
[129] Mission Possible Partnership Steel Model.
[130] Mission Possible Partnership Steel Model.

Too Little Too Late

Corporate Climate Assessment of Nippon Steel 2024

SteelWatch is a civil society organisation with a vision for a steel industry that underpins a zero-emissions economy. Our mission is to turbo-charge the transformation to a decarbonised steel sector that enables the environment, communities and workers to thrive. We challenge the prevailing complacency, support civil society advocacy, and campaign for greater ambition and speedier climate action by steel companies internationally.

Descriptor: This report explores Nippon Steel's coal addiction, the extent of its climate footprint, and the inadequacy of its climate targets and decarbonisation pathways

info@steelwatch.org