

Nippon Steel's Green Transformation (GX) Initiatives

(15:00 JST, March 13, 2025)

Summary of Q&A¹

Presented by:

Eiji Orihashi, Managing Executive Officer, Head of Green Transformation Development

Shigeaki Tanaka, Executive Officer, Environmental Planning and Green Transformation

Carbon Neutral Technology Development and Implementation

Q Please explain what will be your judgment criteria for the composition of facilities for large-scale electric arc furnaces (EAFs), direct reduction furnaces, and hydrogen reduction blast furnaces (BFs) in the future. Also, which is more difficult, hydrogen reduction in BFs or production of direct reduced iron using hydrogen? It seems easier to implement hydrogen reduction in BFs as this method uses the existing BFs.

A The primary judgment criterion will be the timing of aging BFs requiring relining, and what level of technological maturity each breakthrough technology will have reached by then. In addition, EAFs require electric power and steel scrap, while shaft furnaces and BFs require hydrogen and ammonia, respectively. The availability of these materials and the speed at which the supply network is formed and functions are other factors. Decisions will be made case by case, taking into account economic rationality.

A short explanation of what is involved will be useful. Coke-based reduction in a BF is a highly efficient steelmaking method, as coke not only acts as a spacer to maintain the flow of reducing gas, but also facilitates exothermic reactions, making it easier to sustain the reduction process. Moreover, the BF can carry out both reduction and melting in an all-in-one setup, which is why it has remained in use from the past to the present. However, when hydrogen is used for reduction in a BF, an endothermic reaction occurs instead of the exothermic reaction and the reducing agent is changed from a solid to a gas, thus losing its function as a spacer. Since BFs were originally designed for use with coke, attempting to use hydrogen in such facilities—despite their otherwise excellent steelmaking performance—makes the conversion to hydrogen-based reduction somewhat more difficult. In contrast, in a direct reduction furnace, the direct reduction iron itself is reduced as a solid, to put it metaphorically, the upper part of the BF corresponds to the direct reduction furnace. In terms of the division of roles, we think that the technology of a direct reduction furnace is a little

¹ Based on information as of the date of the briefing unless specified otherwise.

less difficult because it does not require all-in-one treatment for reduction and melting as does a BF.

Q Four years have passed since you announced the Carbon Neutral Vision 2050. That was in March 2021. Could you tell us what has progressed or has not progressed since the initial forecast, what has progressed more compared to other BF steelmakers around the world, and what needs to be done to catch up with them?

A Regarding technical progress, what is notable is that considerable development has been materialized thanks to funding by the GI Fund. Symbolic of this is the 43% reduction of CO₂ emissions in the test BF. Even with regard to full-scale commercial equipment, more concrete plans are steadily progressing. On the other hand, while I cannot explain the details, we made unforeseen discoveries and encountered some high hurdles that we earlier knew of only in terms of theory.

Having carried out multiple tests using various facilities, although we cannot fully know the R&D activities of our competitors, we are steadily gaining confidence that we will not fall behind our global competitors. We believe that steady development of a model and repeating of tests, starting with a small reactor, is the way to ensure technological development, but it must be acknowledged that there are various approaches. In particular, with regard to BFs, China is conducting quite bold tests, such as blasting hydrogen into actual BFs. We believe that we are leading the way in the results of development with small furnaces, but there is a possibility that the Chinese will come up with an answer first with an actual facility without having validated the principles with small furnaces. We will roll up our sleeves and continue our development to lead us to full-scale implementation in a faster, surer manner.

Further, in considering the economic rationality of investment in actual implementation, we have achieved additional concrete outcomes, such as market formation and standardization, including engagement with the government.

Q You said that your carbon neutral investment is expected to expand from the initial forecast of 4 to 5 trillion yen. How much is it likely to be? Also, one-third of the GX Transition Bond subsidies will be applied to which of the three innovative technologies? Could you comment on the status of the application for subsidies for EAF conversion that was disclosed in October last year?

A Regarding how to select the technology to use from what is available in the multi-pathway approach, it is likely to be the combination of technology that will be mature by then. However, the combination has not been decided at this time and the amount of investment cannot be calculated. So we have to refrain from commenting at this stage.

Government support for capital expenditures, as of now, requires results to be shown by

2030, so our first target is the conversion of EAF, which is also the first move among the breakthrough technologies. It will take more time for the rest, which have 2040 as the target year and will be outside the scope of this support.

For this year, we are still in the application process and at the stage of coordinating with the government.

Q Nippon Steel has the “100 Million Tons/1 Trillion Yen” vision for its global crude steel production capacity and business profit and plans to expand overseas business. How do you incorporate the decarbonization plan and the transition plan when formulating overseas strategies?

A Our business strategy is to take on the challenge of investing and M&As in particularly promising markets, consistent with the “100 Million Tons/1 Trillion Yen” vision. In expanding our overseas capacity, we will make use of our technical know-how and resources for decarbonization, and in light of the policy situation in the local country, we will work together with local companies to consider how to plan and achieve carbon neutrality, including support for setting decarbonization targets and sharing technical expertise.

Q Could you explain your specific plans, such as the production and procurement of direct reduced iron (DRI), or investment in iron ore mines suitable for DRI production?

A For DRI, we are developing technology to reduce low-grade iron ore by use of hydrogen. However, if high-grade iron ore is used, DRI can be produced quickly within the scope of existing technology. As announced in December last year, we are conducting a feasibility study for investment in the Kami mine in Canada, which is likely to produce high-grade iron ore. While expanding such sources of procurement, we will concurrently develop direct reduction technology using low-grade iron ore. We are also examining the types of locations where this DRI process could be feasibly implemented. The combination of these two approaches is intended to enhance the feasibility of actual implementation.

GX Steel Related

Q Regarding the international standardization of GX steel, the Version 1 of the Guideline of the Worldsteel Association (WSA) has been published. What will be your next challenges?

A The WSA guidelines state that GX steel can be used to make deductions of both customers' Scope 3 and product carbon footprint. In this regard, customers have expressed the opinion that by being based on the provisions of the ISO, the standardization should be further enhanced so as to be considered more convincing. Therefore, we are now considering a new way of thinking that is based on ISO 14067, an international standard for carbon footprint.

We believe it will serve sufficiently as a standard. In order to further increase the level of confidence, we believe that if the interpretation is clearly stated in the ISO, more customers will feel more assured. Similarly, some customers assign more importance to the GHG protocol and SBTi standards. We would also like for our approach to reflect these standards so that many customers will be reassured and enjoy the benefits of the GX steel's CO₂ emission reduction value.

Q From the perspective of customers' awareness of paying a decarbonization premium when buying GX steel, is the status of your CO₂ emission reduction projects visible to customers? Also, would it be possible for customers to choose according to the content of each project?

A With regard to reduction projects, we recognize that it is important to determine what kinds of project will be subject to the current mass balance method. The current guidelines of Japan's Iron and Steel Federation and the WSA describe them as "projects with additionality." We acknowledge that earning our customers' trust is a challenge, and we will continue exploring what further steps we can take.

Regarding your latter question, we believe it would be difficult for our customers to select a specific project. As for decarbonization technology, we will carefully evaluate a complex set of factors to decide which technology and location are most appropriate for implementation, while the specific steelworks and steelmaking processes for products provided to customers are determined in advance according to the needs of customers, and the products are manufactured by a specific method at specific manufacturing facilities and processes, and the customers verified their quality requirements on the premise of this. Therefore, even if customers express a need, such as "we want the purchased products to be manufactured at your different steelworks that is implementing CO₂ reduction," or "we want the decarbonization technology to be introduced in the line where our purchasing products are currently manufactured," the location where the decarbonization technology is applied may not align with the location where the required products are manufactured. Given our production structure, during this transition period, we will need to manage the reduction results from each project on a company-wide basis, and products will be delivered to customers after receiving external certification. Please understand that this is an important business model for us to accelerate GX.

Q How much sales volume of GX steel produced by the mass balance method will you need in order to recover your carbon neutral investments?

A Currently, we produce around 35 million tons of crude steel per year. To ultimately achieve carbon neutrality by 2050, the differential cost that supports the carbon neutral investments

will be compensated by sales of all of these 35 million tons.

Meantime, during the transition period, part of the steel products to be produced and sold will be GX steel. Taking the conversion to EAFs as an example, one large EAF can produce about 2 million tons of steel per year. If half of the power used is green power, CO₂ generation will be almost halved, so one million tons—half of the two million tons produced by the EAF—will be GX steel. This means that the investment for steelmaking in the large-scale EAF must be recovered with a premium obtained from sales of one million tons of GX steel. In order to do so, we need to determine how much premium to charge and incorporate that into the price.

Q I understand that demand for GX steel will also be generated in public works and other fields. To what extent will high-grade steel be required for these public works?

A For example, steel plates for bridges are made of materials from BF steelmakers. In port construction, steel pipe piles are used for civil engineering work for the foundation, and they are also produced by BF steelmakers. Among steel sheet piles used in public works, larger ones are also the products of BF steelmakers. Some civil works require our products made from BF, not from EAFs. So we are holding discussions tailored to these cases with the Ministry of Land, Infrastructure, Transport and Tourism and other parties, and we would like to accelerate such discussions.

What is crucial is to create a society in which incremental costs for achieving carbon neutrality are borne across the entire value chain. In that sense, we believe it is important to supply GX steel to a wide range of sectors, rather than focusing on specific customers.

Advocacy to Society and Policy Disclosure

Q In today's materials, I have confirmed that your disclosure of policy engagement includes new information and has become more transparent than before. With regard to your stance on energy policy, could you explain details of your stance on coal and gas-fired power in Japan.

A Regarding our energy policy, we have expressed our opinion in various situations that decarbonized energy, including decarbonized power sources, is extremely important, and that a stable supply of decarbonized energy at a globally-competitive cost is a prerequisite for us to maintain innovation investments and operations, including GX investments, in Japan. We support the Japanese government's position that both renewable energy and nuclear power must be fully utilized as decarbonized power sources for the supply of stable and affordable decarbonized energy. If the ratio of renewable energy increases, additional balancing power will be required. Thermal power generation is included among the sources that can be used as adjustment power. We have argued that, in any case, it is crucial to achieve a stable energy mix that is reliably supplied.

Q Regarding additional balancing power, there are other options besides thermal power generation. For example, in the Kyushu region, the output control rate of renewable energy, including solar power generation, is expected to be 6.1% in fiscal 2024, and I find this a cheap decarbonized power source. Can you consider the procurement of such decarbonized power source when the Yawata Area of Kyushu Works is converting to EAFs? In addition, why not consider storage batteries to increase stability?

A In the case of Yawata, the project is to convert all the BF systems into EAFs. Our steelworks with BFs have been reusing by-product gas generated from BFs to generate power. If the BF steelmaking is converted to use EAFs, the total amount of power procured from outside sources will increase as generation of by-product gas will be reduced and the EAFs themselves will use power. For a little while, the power will be supplied by a joint thermal power plant jointly operated with Kyushu Electric Power, but since it is connected to an external grid, we can think of various ways to use external renewable energy power. At present, we are first studying whether there will be an excess or shortage of supply capacity, but we would like to consider procurement of such power source, if feasible.

We are also considering storage batteries, which may become an effective source in the future. However, since a certain amount of space is required, we will consider area efficiency as well.

Q Regarding policy engagement disclosure, do you plan to disclose the consistency between the strategy and 1.5°C scenario of Nippon Steel and those of industry groups?

A We are members of Keidanren (Japan Business Federation) and other organizations whose mission is strong policy engagement with the government. We also actively participate in the committee activities of these groups. In the case of the formulation of the Basic Energy Plan, we believe that we have actively participated in activities such as making policy recommendations. We take pride in the considerable resources we have invested in advocacy to the government and have made appropriate actions as a company. Our primary activities involve regular communication with counterparts. Due to the involvement of other parties, we kindly ask for your understanding that there are some restrictions on disclosure. As for disclosing information on the advocacy activities through industry groups, we would like to understand the motivation and underlying reasoning behind your request for such disclosure before considering it to the extent possible. While our policy engagement activities are mainly carried out as an individual company, we would like to ask investors through individual conversations and other means how the collection and evaluation of information

through industry groups contributes to the evaluation of our policy advocacy.

End

This document is not a disclosure document under the Financial Instruments and Exchange Act, and its issuer does not guarantee the accuracy or completeness of the information herein. In addition, the forward-looking statements in this document were made by the Company based on information available at the time of the briefing and contain uncertainties. Therefore, please do not rely solely on this document to make any investment decisions. The Company shall not be liable for any loss or damage arising from the use of this document.