



Hypothetical Cases for Avoided Emissions Disclosure

May 2024



Purpose of this document

This document is positioned as a supplementary document to The Working Group on Disclosure and Evaluation of Climate-related opportunities' "Basic Guidelines for Disclosure and Evaluation of Climate-related Opportunities" (Basic Guidelines). It explains the type of disclosure expected when companies calculate and disclose avoided emissions in accordance with the concept of avoided emissions and related guidelines set forth in the Basic Guidelines. Accordingly, please refer to the Basic Guidelines for the definition and concept of avoided emissions, and basic disclosure guidelines. Please note that the examples provided in this document are hypothetical cases only to explain key points of reporting avoided emissions, based on the disclosure of the companies in The Working Group on Disclosure and Evaluation of Climate-related opportunities. Additionally, since they were made as disclosure examples consistent with the Basic Guidelines, they do not uniformly prescribe best practices and ideal disclosure. Please also note that some explanations of transition strategies, products, services, etc., have been simplified to provide information about the critical points in a way that is easy to understand.

This document has been created to be used as reference information by companies disclosing avoided emissions. Actual disclosure will vary depending on the company's industry, as well as the characteristics of the products and services that create the avoided emissions.

Points to be considered on this document

- 1 **Note that this is an example of how to disclose avoided emissions, and thus the description is simplified**
- 2 **It is not intended to prescribe best practices for disclosure. When disclosing avoided emissions, companies should refer to other guidance and guidelines as well as this document.**
- 3 **Examples do not determine eligible products or services, and are not intended to exclude examples that are not provided**
- 4 **Note that the eligibility of the calculation method is outside the scope of this document, and that information provided in this document is hypothetical cases based on various examples**
- 5 **This document is a living document that will be continually updated to reflect the most recent discussions and guidelines.**

Contents

Structure of this document and how to read 02

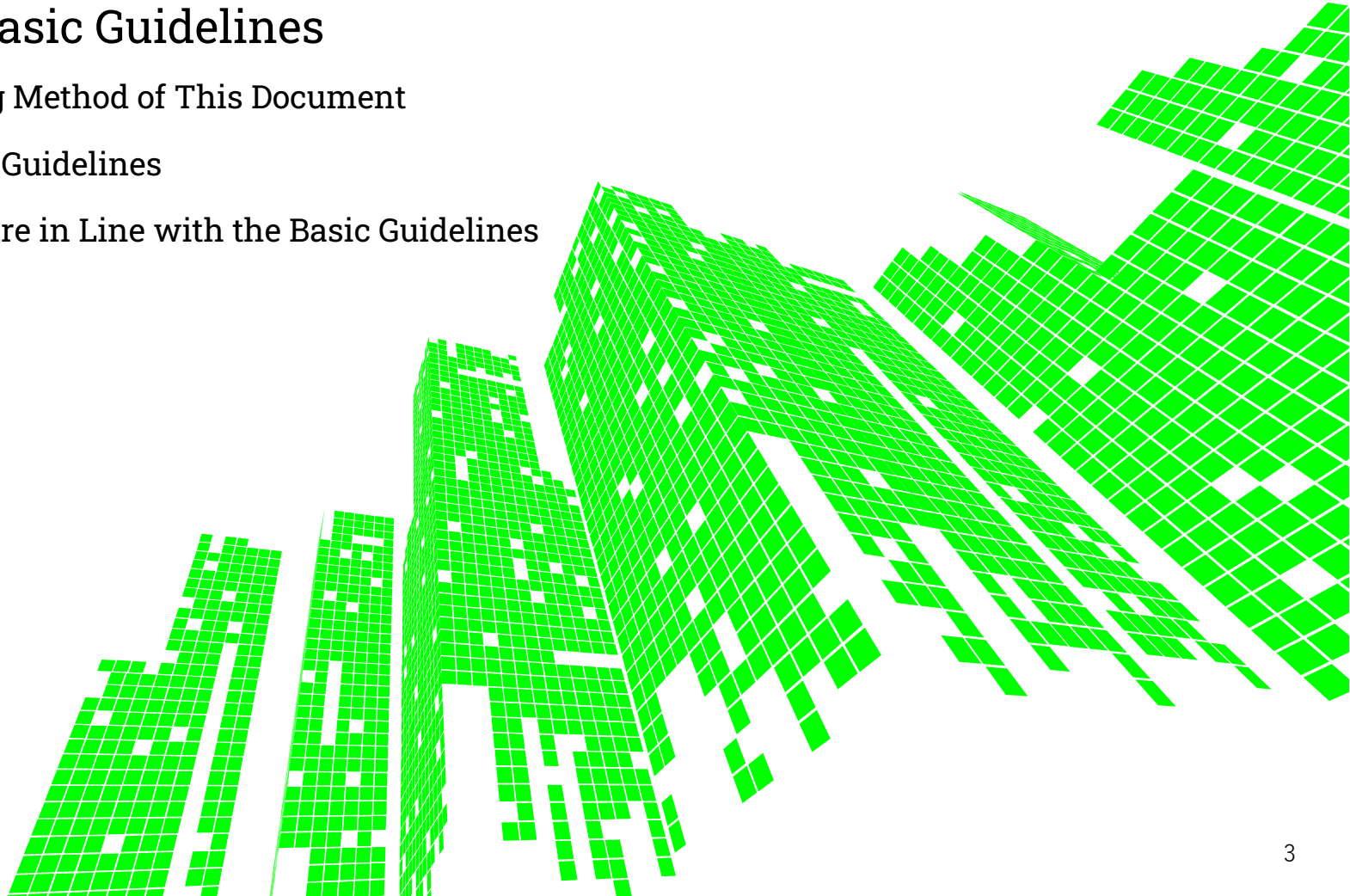
01 Key points for disclosure based on the Basic Guidelines 03

02 Example of disclosure of avoided emissions 12

01

Key points of disclosing Avoided Emissions in line with the Basic Guidelines

- Structure and Reading Method of This Document
- Overview of the Basic Guidelines
- Key Points of Disclosure in Line with the Basic Guidelines



Structure and Reading Method of This Document

The purpose of this document is to supplement the Basic Guideline by presenting specific examples of disclosure in response to the basic guideline's approach to disclosure and is divided into two chapters. Chapter 1 organized the disclosure approach suggested in the Basic Guidelines, giving detailed context through various examples to the points that may be difficult to understand from the description of the Basic Guidelines alone. Chapter 1 explains the points difficult to understand. Chapter 2 presents hypothetical disclosure examples based on real-life products and services that may be eligible for avoided emissions.

Companies that are disclosing or considering to disclose avoided emissions in the future are recommended to examine both the Basic Guidelines and the points of disclosure organized in Chapter 1. It is also advisable to refer to the potential disclosure examples as set forth in Chapter 2.

Each case in Chapter 2 consists of two elements: The first is disclosure examples on corporate emissions reduction plans and eligibility and methodology of avoided emissions. The Basic Guidelines stipulate that companies disclose their own emission reduction plans to address climate-related risks as a prerequisite for disclosing climate-related opportunities (e.g., avoided emissions). This is because transitioning to a decarbonized society necessitates reducing GHG emissions across both the company and wider society. The second is the hypothetical disclosure cases demonstrating how companies might clarify the eligibility of products and services and disclose their methodology for avoided emissions. Companies should be transparent about these contents, and the hypothetical cases are developed in line with the recommendations of the Basic Guidelines.

This document targets not only companies whose individual products and services are subject to calculation as shown in the disclosure examples, but also pertains to a wide range of subjects to be considered for calculation of avoided emissions. For those who wish to understand the key points of disclosure may refer to Chapter 1, and those interested in examining various disclosure to meet the Basic Guidelines may first refer to each case of Chapter 2.

CHAPTER 01 Points of Disclosure in accordance with the Basic Guidelines

Premises for disclosing climate-related opportunities (Chapter 1 of the Basic Guidelines)

- Setting a scientific-based targets
- Scope 3 disclosure
- Monitoring the progress of transition strategy

Concept and guidelines on avoided emissions (Chapter 2 of the Basic Guidelines)

- Setting an attribution factor
- Assessment of negative impacts on the environment and society

CHAPTER 02 Hypothetical cases of Avoided Emissions Disclosure

hypothetical cases using potentially credible products and services of avoided emissions

- | | |
|---|---|
| 1. Decarbonization of energy such as electricity and heat | 7. Manufacturing and supply of products using low-carbon and decarbonized raw materials |
| 2. Electrification | 8. Extension of product life |
| 3. Electrification of transportation | 9. Supply of products contributing to decarbonization of buildings |
| 4. Emission reduction during product use phase | 10. Emissions reduction from livestock |
| 5. Energy efficiency through lightweight material | 11. Emissions reduction in waste management |
| 6. Energy efficiency during product use phase | |

01 Own emission reduction

- ✔ hypothetical cases on how company may disclose their transition strategy (net-zero targets and specific actions).

02 Avoided emissions eligibility and methodology

- ✔ A hypothetical cases that are aligned with the concept, guidelines, and recommended disclosure outlined in the Basic Guidelines.

Overview of the Basic Guidelines

Avoided emissions

Avoided emissions refer to the difference between the greenhouse gas (GHG) emissions of existing products and services (baseline) and new products and services, and they quantify the contribution to the mitigation of climate change across society as a whole through products and services. By utilizing avoided emissions, companies can disclose and promote their impact on society, which was previously difficult to assess with GHG inventories. There is a movement to evaluate such corporate efforts, and discussions are progressing internationally concerning the concept, calculation, and disclosure of avoided emissions.

Avoided emissions, which indicate the positive impact of a company on society, show the difference with the GHG emissions (baseline) that would otherwise have been emitted, and a high level of transparency is required in their calculation and disclosure. Rules related to calculation methods and disclosure are not stipulated in the Basic Guidelines or this document since they are under discussion, mainly through the "Guidance on Avoided Emissions" by the World Business Council for Sustainable Development (WBCSD) and industry associations.

Assumptions when disclosing climate-related opportunities

Disclosure of targets, strategies, and initiatives related to companies' own reductions, which are prerequisite when disclosing climate-related opportunities (avoided emissions)

- Setting science-based emissions reduction targets
- Developing a transition strategy to achieve targets and ensuring its viability
- Disclosure of targets/strategies and their results

Concept of avoided emissions

Concept and guidelines for target products and services

- Contributing to the decarbonization of society
- Products and services play a role in contributing to the reduction

Concept and guidelines for disclosure (basic principles and recommendations)

- Clear distinction from GHG inventories
- Meeting eligibility
- Consideration of negative impacts other than climate change due to the supply of such products and services
- Transparent disclosure



Overview of the Basic Guidelines

| Basic Guidelines

In order to spread the concept of avoided emissions and increase transparency in the market, the Basic Guidelines provide three guidelines based on the characteristics of avoided emissions. Specifically, it refers to the following three matters.

- Disclosure of targets, strategies, and initiatives related to companies' own reductions, which are prerequisite when disclosing climate-related opportunities (avoided emissions)
- Concept and guidelines for target products and services
- Concept and guidelines for disclosure (basic principles and recommendations)

As a corporate initiative related to climate change, avoided emissions are a means of calculating and disclosing the contribution to the decarbonization of society as a whole. In order to achieve global decarbonization, it is important that companies promote initiatives related to risk to reduce their own emissions as well as such impacts on society. Accordingly, the Basic Guidelines summarize matters to be disclosed in relation to companies' initiatives to reduce their own emissions, as a precondition for disclosing items for evaluating climate-related opportunities, such as avoided emissions.

When calculating and disclosing actual avoided emissions, a high level of transparency is important to ensure reliability.

In addition to demonstrating that the products and services subject to calculation are consistent with the achievement of a decarbonized society, it is recommended that the establishment of baselines and calculation methods be as clear as possible. Details of these concepts and guidelines are summarized in Chapter 2 of the Basic Guidelines.

Key Points of Disclosure in Line with the Basic Guidelines

Premise for Disclosing Climate-Related Opportunities

| Setting Science Based Targets

As a prerequisite for calculating and disclosing avoided emissions, companies are required to set science based GHG reduction targets. Science based targets are those consistent with the achievement of the Paris Agreement, aiming to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels”.

One of the most widely recognized frameworks for setting science-based targets is the Science Based Targets Initiative (SBTi) certification. By obtaining SBTi certification, companies can objectively demonstrate that their targets are based on scientific evidence. Indeed, in the research conducted for hypothetical cases in Chapter 2, several companies have obtained SBTi certificate for their GHG reduction targets.

However, it's important to acknowledge that while SBTi offers valuable guidance, it has its limitations. Some industries are still awaiting the development of sector-specific guidance, making it challenging for all companies to tailor targets that fully consider their unique industry and regional characteristics. To address this, companies can draw upon internationally recognized scenarios, such as those provided by the International Energy Agency (IEA), or align their targets with the GHG reduction targets outlined in each country's Nationally Determined Contributions (NDCs) under the Paris

Agreement. Furthermore, in Japan, sector-specific technology roadmaps have been established by the Ministry of Economy, Trade, and Industry (METI) to assist hard-to-abate sectors. These roadmaps, when combined with NDCs, enable companies to provide a scientifically grounded rationale for their targets, incorporating both international and domestic considerations.

For example, in Case 3 of Chapter 2 (page.26-32), companies in the chemical industry exemplify obtaining SBTi certification to ensure the scientific basis of their emission reduction targets. Conversely, in Case 8 (page.61-68), companies in the petroleum industry focusing on extending product lifecycles, and Case 10 (page. 79-85), companies in the chemical industry aiming to reduce emissions from livestock, set Scope 1+2 reduction targets aligned with Japan's NDC levels. Moreover, they explain that their efforts towards reduction are in line with sector-specific roadmaps established by the Ministry of Economy, Trade, and Industry, thus providing a scientifically grounded rationale for their target setting.

Key Points of Disclosure in Line with the Basic Guidelines

Premise for Disclosing Climate-Related Opportunities

| Scope 3 Disclosure and Target Setting

In the Basic Guidelines, companies are generally required to grasp and set reduction targets based on emissions from Scope 1 to 3. By understanding supply chain emissions, including Scope 3, companies can efficiently work towards achieving carbon neutrality by identifying activities with higher emissions.

There is a growing demand for disclosure and goal setting regarding Scope 3 emissions. The “IFRS S2 Climate-related Disclosures,” established in June 2023 by International Sustainability Standards Board (ISSB), mandates disclosure of Scope 3 emissions. In terms of target setting of scope 3, “SBTi Corporate Near-Term Criteria” by Science Based Targets initiative (SBTi) states that if a company’s relevant scope 3 Emissions are 40% or more of total scope 1, 2, and 3 emissions, they shall be included in near-term science based-targets. Furthermore, in the “Basic Guidelines on Climate Transition Finance” by Japanese Government (Financial Service Agency, Ministry of Economy, Trade and Industry, and Ministry of the Environment), it is recommended that targets covering Scope 3 to be set when scope 3 could be the significant reduction.

However, it is recognized that there are challenges in calculating Scope 3 emissions. The Task Force on Climate-related Financial Disclosures (TCFD) points out that collecting the necessary data for calculating Scope 3 emissions and ensuring data quality is a significant challenge for some companies.

IFRS S2 also acknowledges the potential difficulties in disclosing Scope 3 emissions, requiring companies to provide reasons if disclosure is challenging. Thus, while disclosure and goal setting for Scope 3 emissions are currently not universally mandated for all companies, it is desirable for companies to explain if they find such requirements challenging.

CDP, an NGO that evaluates and facilitates the disclosure of climate change initiatives by companies and municipalities, advocates for a gradual approach to calculating Scope 3 emissions. Rather than demanding immediate precision, it suggests to first gain a broad understanding and progressively refining the data to align with actual circumstances. In practice, some companies face challenges in calculating emissions for all categories within Scope 3. Consequently, they opt to disclose only the emissions from categories where calculations are feasible. For instance, Mock -Case 8, which focuses on extending product lifecycles, illustrates this approach by disclosing numerical values for categories where data is currently available, given the diverse nature of related industries. Moreover, it restricts target setting to emissions per unit of energy provided by the company. Similarly, Case 10, which addresses emissions reduction from livestock sources, outlines collaboration with suppliers in target setting and provides a detailed timeline leading up to goal establishment.

Key Points of Disclosure in Line with the Basic Guidelines

Premise for Disclosing Climate-Related Opportunities

| Progress Report

In accordance with the fundamental guidelines, companies are required to disclose not only the establishment of emission reduction targets and the development of strategies to achieve these objectives but also the progress and achievements made thus far. In addition to a quantitative assessment of progress, progress updates also include, for example, supplemental explanations regarding the status of projects related to emission reduction. By disclosing such progress, companies can demonstrate externally that they are actively adhering to their emission reduction strategies and plans.

In accordance with the Basic Guidelines, companies are required to set and disclose not only their emission reduction targets and transition strategies to achieve these targets, but also the progress and achievements made thus far. Progress updates encompass a variety of aspects and are not limited solely to quantitative measures; they may also include explanations regarding the status of projects related to emission reduction. By disclosing such progress, companies can externally demonstrate that they are actively adhering to their emission reduction targets and strategies.

Strategies and plans related to emission reduction are formulated with certain assumptions on uncertain future developments, such as technology advancements. Therefore, it is anticipated that progress may not always align precisely with the initial plans.

Additionally, external factors such as policies in other countries or fluctuations in raw material and energy prices can also influence progress. Hence, it is advisable to provide explanations for any deviations from the planned progress in emission reduction initiatives, including the underlying reasons and factors contributing to such deviations. In Case 2: Promotion of Electrification (page. 19-25), the increase in emissions is attributed to a rise in production volume. Furthermore, it is indicated that efforts to achieve the targets will continue, taking into account these changes in production volume. Moreover, it is useful to disclose events that may affect the achievement of targets in advance. In Case 3: Electrification of Transportation, the conditions assumed during the formulation of the transition plan are disclosed alongside the plan itself.

Concept and Guidelines on Avoided Emissions

| Attribution Factor

The attribution factor refers to the allocation ratio used to assign avoided emissions based on the degree of contribution of companies or industries involved in the manufacturing and supply of the eligible products or services. As avoided emissions occur due to the involvement of various companies of the supply chain, it is a method for company to allocate a portion of the avoided emissions according to the contribution of their company or their position in the value chain.

However, the setting of attribution factor currently lacks established principles or calculation methods, making it difficult to determine. On the other hand, it is advisable to conservatively calculate avoided emissions in response to criticisms of greenwashing, and some companies use self-defined attribution factor instead of allocating 100% of the avoided emissions generated through the eligible products or services. As discussions on attribution factor are still evolving, the Basic Guidelines, including this document, do not define the concept of attribution factor. However, it is recommended to disclose the approach to attribution factor to ensure the reliability and transparency of the methodology. In this document, examples of attribution factor are provided based on actual methods used by companies as hypothetical scenarios:

- Calculation based on self-defined attribution factor
- Calculation without considering attribution factor

The first scenario involves companies establishing their own rules for attribution factor and disclosing those values. For example, in Case 9: Supply of Products Contributing to Decarbonization of Buildings (page69-78), attribution factor are temporarily set based on the degree of contribution, where they distribute the contribution between manufacturing, raw materials, and other factors. In this case, 50% is allocated to manufacturing, and companies calculate the final value by multiplying the calculated emission reduction per product by 0.5. Companies may also decide to temporally attribute 100% of the avoided emissions to their products and services where majority of avoided emissions were caused due to their business.

The second scenario is where attribution factor are temporarily not considered. Due to the lack of clear guidance or rules at present, it is challenging to set values independently, and some companies choose not to consider attribution factor. However, ensuring transparency by disclosing the non-consideration of attribution factor is essential.

In either methods, it is desirable to clearly define the concept of attribution factor as part of the calculation method and reconsider the approach to attribution factor based on future discussions.

Key Points of Disclosure in Line with the Basic Guidelines

Concept and Guidelines on Avoided Emissions

| Evaluating Broader Environmental and Societal Impact

The concept of avoided emissions serves as a quantitative measure of a company's commitment to combatting climate change. However, beyond addressing climate issues, companies are also tasked with evaluating their broader impact on the environment and society. This entails scrutinizing whether their products or services inadvertently contribute to adverse environmental or societal consequences. Such considerations may encompass phenomena like the rebound effect such as increase in emissions resulting from an increase in the time of new product and service usages as they become more widely available, ecological degradation, and human rights violations. To uphold transparency and accountability, companies must internally assess these potential impacts and disclose their findings. For instance, in Example 6: Energy Efficiency during Product Use (page.46-52), it is elucidated that the manufacturing process of inverter air conditioners bears no significant divergence from conventional methods, indicating negligible adverse effects. Similarly, in Case 7: Manufacturing and Supply of Products Utilizing Low-Carbon or Decarbonized Raw Materials (page53-60), emphasis is placed on the conscientious procurement of eco-friendly materials, coupled with an ongoing commitment to refine assessments of environmental ramifications, including biodiversity and water usage.

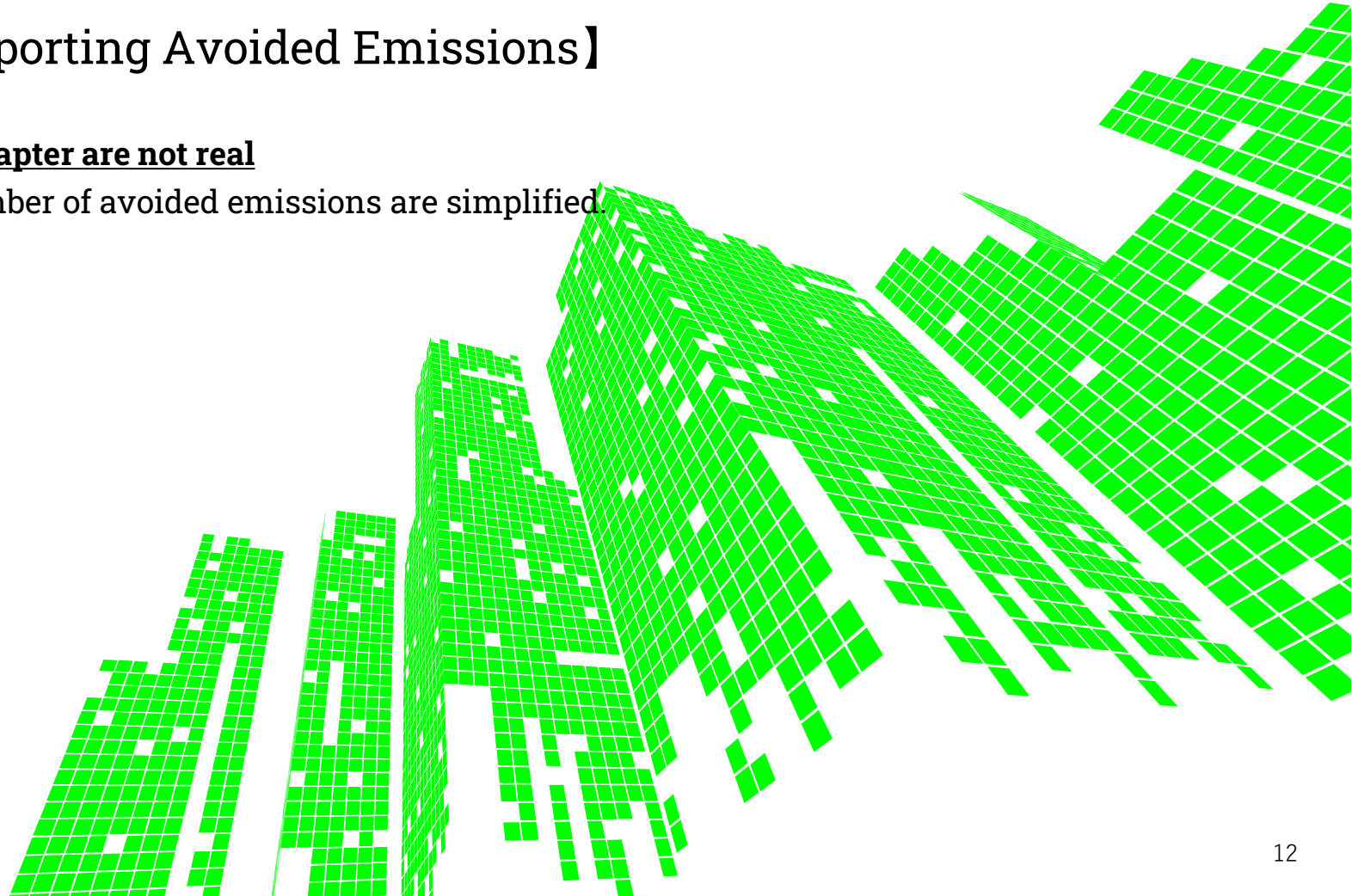


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【Examples of Reporting Avoided Emissions】

The examples in this chapter are not real

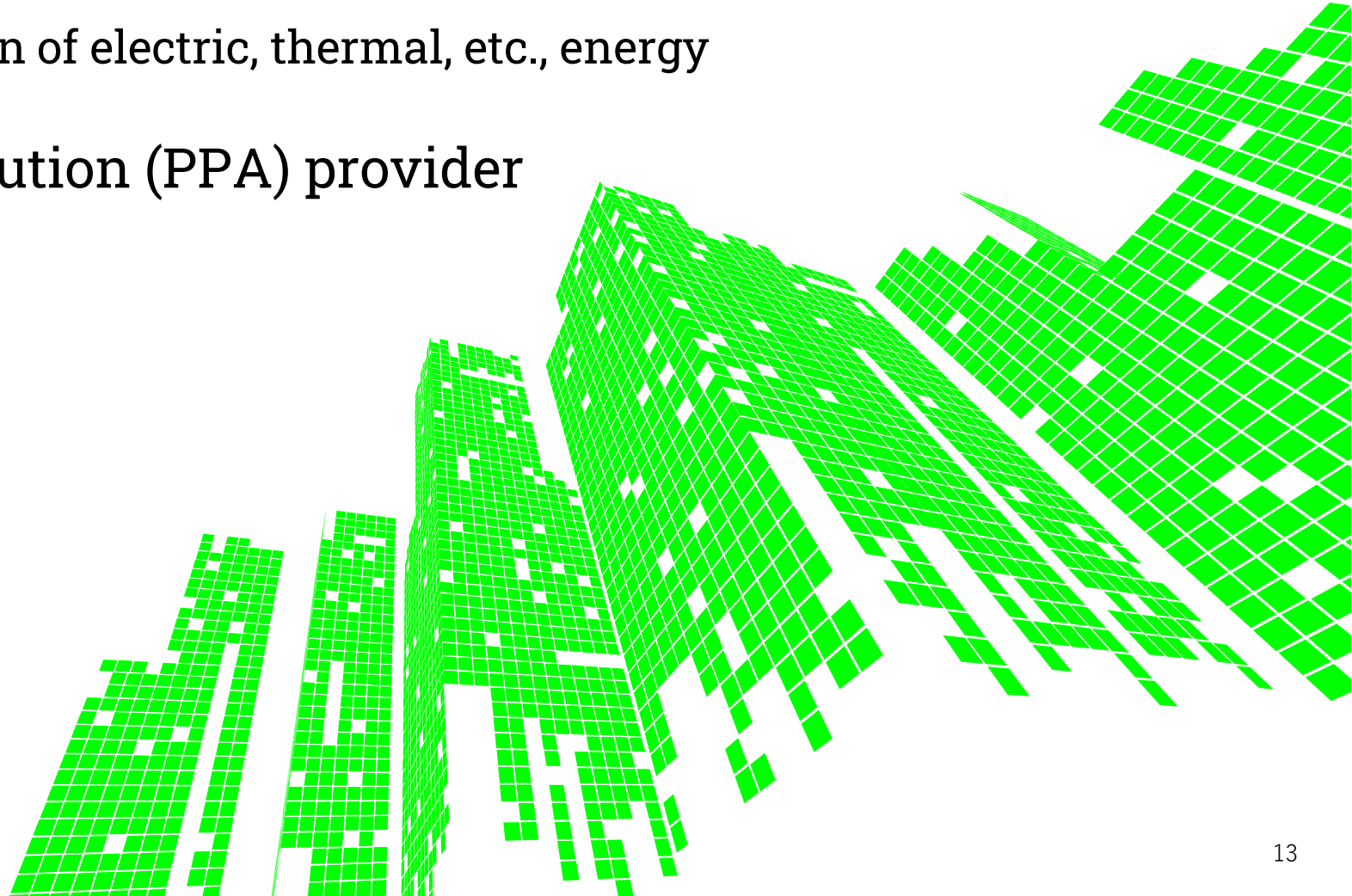
Please note that the number of avoided emissions are simplified.



02

(1) Decarbonization of electric, thermal, etc., energy

Example of solution (PPA) provider



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Industrial equipment and information and communications
 Location: Germany, Japan
 Business: Manufacture and sales of electrical equipment, as well as a wide range of IT and solution systems

Points

Target setting and progress rate by Scope

We have set time-bound emission reduction targets for our own Scope 1+2 emissions, as well as for the supply chain as a whole, including Scope 3 emissions, and have published progress rates against interim targets. In addition, we have ensured that these targets are scientifically based by obtaining SBT Net-Zero certification.

Initiatives as an enabler

In the example on the right, the role of an enabler to promote the decarbonization of society as a solution provider is emphasized, and avoided emissions are positioned separately from the amount of GHG emissions as an indicator for promoting those initiatives and measuring progress.

Sustainable growth and climate change

We consider sustainability an essential element of our business. As the COVID-19 pandemic has driven digitalization and new business models have emerged, it is important to solve various sustainability issues so that we can promote partnerships across society. Based on the GRI Standard by Global Reporting Initiative, we identified 15 issues that are particularly important to our business, both in terms of the impact of the company on society and the impact of society on the company. In this context, we have positioned responding to climate change and sustainable product design and management as the most important items. Regarding responding to climate change, which we have identified as a key issue, we conducted a scenario analysis on the future to develop an understanding of trends in social change, and identify impacts, risks, and future opportunities (see TCFD disclosure for details). We set a target of net-zero emissions for our businesses (Scope 1-2) by 2030 to respond to the risks posed by climate change and become a leader in achieving a climate change decarbonized society. We also announced a target of achieving net-zero emissions, including the supply chain as a whole, by 2050. We have obtained SBT Net-Zero certification for all of these targets. In addition, we will act as an enabler to support the decarbonization of our customers, taking the promotion of energy transition by responding to climate change as an opportunity.

GHG emission reduction targets and progress

01 Reduction in own emissions: net-zero in-house emissions (Scope 1+2) by 2030

Baseline	FY2023 progress rate	Interim target
FY2019 500 ktCO ₂ e	90% progress rate	● -50 % by FY2025 ● -90% by FY2030*

02 Reduction in supply chain emissions: net-zero Scope 1-3 emissions by 2050

Baseline	FY2023 progress rate	Interim target
FY2019 7,000 ktCO ₂ e	10% progress rate	● -50% by FY2030

*Temporary utilization of carbon credits for residual emissions

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Industrial equipment and information and communications

Location: Germany, Japan

Business: Manufacture and sales of electrical equipment, as well as a wide range of IT and solution systems

Points

Net-zero roadmap and KPI setting

Concrete initiatives to achieve emission reduction targets have been established at each stage of the supply chain. Additionally, monitor initiatives' progress, the related KPIs and the progress rate at the time of publication are published.

| Net-zero roadmap

To achieve our net-zero target, we have formulated a net-zero roadmap. In order to reduce our own emissions, we will conserve energy during operations while also promoting the procurement of renewable energy. In the supply chain, we will improve transportation efficiency, reuse resources, and replace SF6 gas, which has high GHG emissions. Based on the roadmap, we also set KPIs related to these initiatives. In addition, as an enabler, we set targets for avoided emissions to contribute to the decarbonization of society as a whole through such measures as the expansion of renewable energy. In order to promote these initiatives, 5% of revenues were allocated to related capital investment and research and development as of FY2023. For example, this investment includes 100 million yen in expenses for research and development aimed at replacing SF6 gas, which is one of our initiatives.

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Industrial equipment and information and communications
 Location: Germany, Japan
 Business: Manufacture and sales of electrical equipment, as well as a wide range of IT and solution systems

Points

Net-zero roadmap and KPI setting

Concrete initiatives to achieve emission reduction targets have been established at each stage of the supply chain. Additionally, monitor initiatives' progress, the related KPIs and the progress rate at the time of publication are published.

Net-zero roadmap 2030

Process	Initiatives	FY2023 progress rate
Supply chain Scope 3 upstream	<ul style="list-style-type: none"> Request for compliance with the Supplier Code of Conduct 100% abolition of single-use plastics 	<ul style="list-style-type: none"> Achieved Achieved
Own businesses Scope 1+2	<ul style="list-style-type: none"> RE100: Use of 90% renewable energy EV100: 100% use of EVs in-house EP100: 50% improvement in energy efficiency 	<ul style="list-style-type: none"> 85% renewable energy Achieved 30% Improved 39%
Supply chain Scope 3 downstream	<ul style="list-style-type: none"> 100% replacement of SF6 gas 	<ul style="list-style-type: none"> 45% replaced
Decarbonization of society	<ul style="list-style-type: none"> Avoided emissions by customers of 80 million tons through the expansion of renewable energy, etc. 70% of sales from environmentally friendly products 	<ul style="list-style-type: none"> 40 million tons Ratio 65%

We view these efforts as integrated with corporate growth and we have established a dedicated department for climate change-related strategies. This department is responsible for scenario analysis, and its role is to report the results of scenario analysis, roadmaps, and overall strategy reviews to the Sustainability Promotion Council, which is chaired by the President.

2. Avoided emissions

Target products and services:
PPA business

Points

Disclosure of avoided emissions throughout the business and the disclosure of calculation methods for each product and service

In the example on the right, the numerical data for avoided emissions are not disclosed for each product and service. However, the total avoided emissions generated throughout the business are disclosed. Since the total value alone, however, does not provide reliable calculation results, the list of products and services subject to calculation (*1; however, the example disclosure in Appendix 1 has been excluded from the example on the right), and the calculation methods established for each product and service have been disclosed to enhance the transparency of the calculation process. In addition, products and services are excluded from the scope of calculation, and the concept of the contribution ratio (contribution rate) is shown as a basic principle of the calculation.

Contribution toward decarbonization – avoided emissions

It is impossible to measure the contributions to the decarbonization of customers and stakeholders with a company's Scope 1-3 emissions alone. Therefore, we use avoided emissions to show the overall image of our decarbonization initiatives. Calculation methods, however, for avoided emissions are still being developed, so we use our original calculation method, which is consistent with the GHG Protocol.¹

We emphasize our role as an enabler and consider our contribution to the decarbonization of society as an important strategic initiative. The calculation of avoided emissions covers all products, services, and systems of the Company that do not violate the principles set forth below. (Refer to Appendix 1*1 for a list of specific products. The calculation method for each product, service, and system is also provided from Appendix 2 onward.)

Calculation of avoided emissions – basic principles

The following basic principles were applied when calculating avoided emissions.

- Excluded from the scope of calculation
 - Military-related technology
 - If the use of products is found to have adverse effects on the environment
- Contribution ratio concept
 - If all of the relevant products are manufactured and sold: 100%
 - If all of the main components of the relevant products are provided: 100%
 - If some of the main components of the relevant products are provided: Prorated based on the price of the main components provided as a percentage of the overall price of the products or services

Avoided emissions

We achieved avoided emissions of 19 million tons in FY2023. PPA systems and frequency converters played a significant role in generating avoided emissions.

Avoided emissions (mtCO ₂ e)	FY2022	FY2023
Avoided emissions	1,500	1,900

2. Avoided emissions

Target products and services:
PPA business

Points

Disclosure of data sources and update frequency

In addition to specifying the disclosable values and other sources of data used in the calculation, the update frequency is set, thus enhancing the transparency of the calculation.

* Although it has been excluded from this example, companies that actually disclose their avoided emissions are assumed that calculation methods like the above have been established for each product and service subject to calculation of avoided emissions. In the above, PPAs are given as one example.

Appendix 1: List of products and services for calculation

Appendix 2: Calculation method for each product, service, and system*

A power purchase agreement (PPA) is a purchase agreement between a producer and a purchaser of electric power. We are contributing to the spread of renewable energy by providing long-term PPA solutions. As described below, we use our original calculation method to calculate the amount of avoided emissions from PPAs. For the baseline, we have set the amount of electric power in the average contract in the region when there is no PPA by lumping lifetime reductions into the year of sale (flow-based calculation) For the calculation range, we have only included the difference in emission intensity when using electric power. Since 90% of our company's PPA services are provided in Germany, the United States, and Japan, we have referred to the values provided by each government, based on the sales ratio, for energy consumption rates.

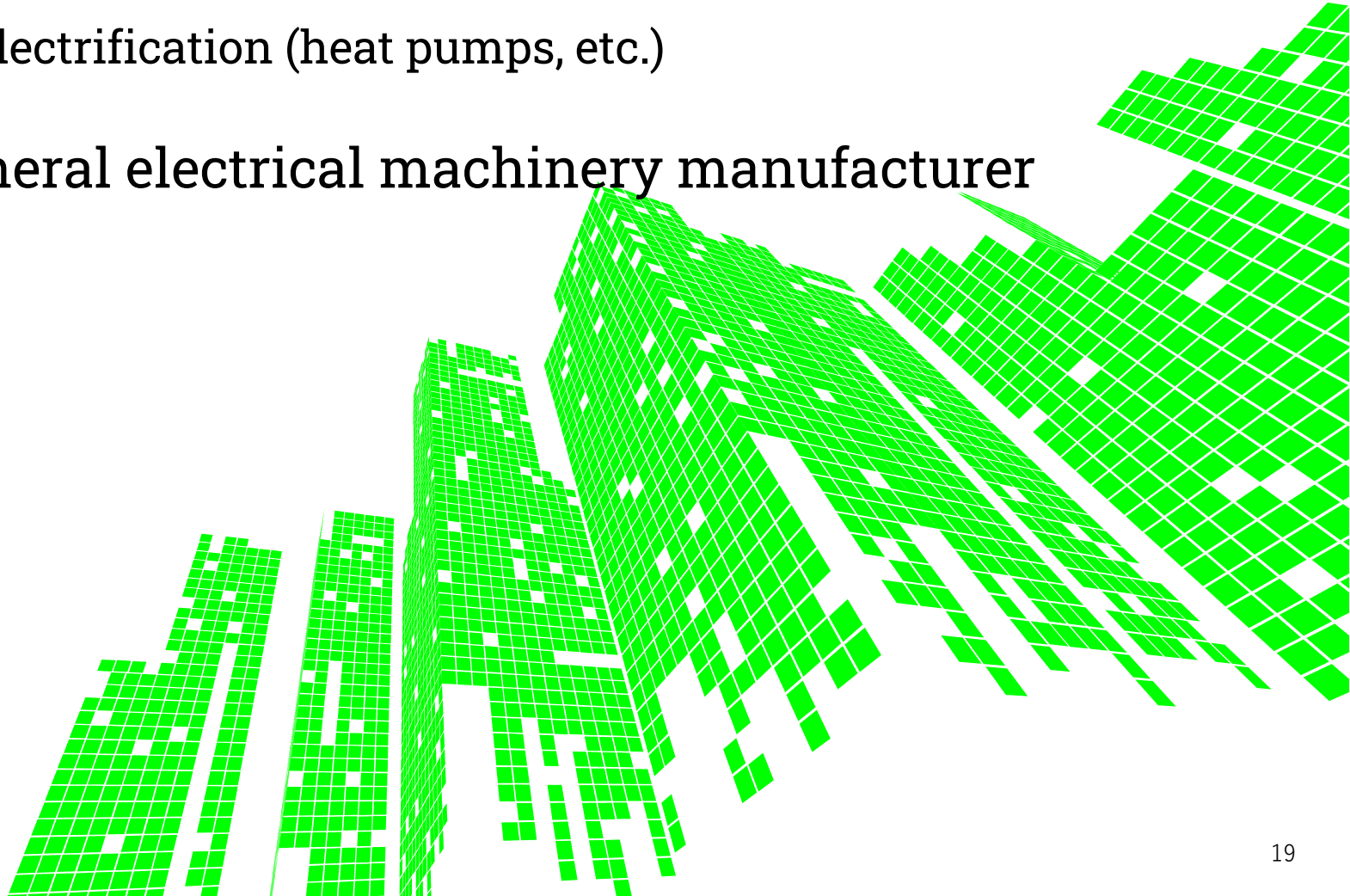
$$\begin{aligned}
 \text{Avoided emissions of each country through PPAs} &= \text{Number of contracts (/year)} \times \text{Contract period (year)} \\
 &\times \left\{ \left(\text{Baseline electric power supply* (kWh/year/contract)} \times \text{Grid electricity Energy intensity (kgCO2e/kWh)} \right) \right. \\
 &\quad \left. - \left(\text{Contracted electric power Supply (kWh/year/contract)} \times \text{Renewable energy intensity (kgCO2e/kWh)} \right) \right\}
 \end{aligned}$$

Data	Source	Update	Value
Utilization rate (Used to calculate electricity supply)	Our original estimates (Based on historical data)	Every year	<ul style="list-style-type: none"> Solar power: 15% (Japan),20% (US) Wind power: 20% (Japan),30% (US) Operating: 365 days × 24 hours
Number of contracts/ period	The Company's data is used for the number of contracts, duration, and amount of electric power sold	Every year	<ul style="list-style-type: none"> Not disclosed
Grid electricity Energy intensity and renewable energy intensity	Data from respective national governments	Every three years	<ul style="list-style-type: none"> Using average values for each country

02

(2) Promotion of electrification (heat pumps, etc.)

Example of general electrical machinery manufacturer



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: General electric machinery

Location: Japan

Business: Manufacture and sales of industrial equipment and general home appliances based on four core businesses: social infrastructure business, energy business, health tech business, and IT service business

Points

Setting targets based on materiality

Given that the majority of emissions are in Scope 3 Category 11, the subject aims to achieve carbon neutrality by setting Scope 3 targets, in addition to efforts to reduce Scope 1+2 emissions.

Climate change response

Our emissions – "responsibility" and "contribution"

In our business (manufacturing and sales of electrical and electronic equipment), there are some activities that emit GHGs from the use of resources (raw materials, energy, water, etc.). Specifically, there are Scope 1 emissions from industrial processes during manufacturing, Scope 2 emissions from the use of purchased energy, and Scope 3 emissions, mainly from the use of purchased products and services (Category 1) and sold products (Category 11). In addition to targeting carbon neutrality by 2050 as our "responsibility" to address climate change, it is important that we promote our "contribution" to society as a whole by reducing emissions in Scope 3 Category 11, which accounts for most of the total. As a company engaged in business activities that use using resources, we have identified climate change response as our highest-priority materiality. In FY2021, we formulated the Environmental Vision 2050 as a common strategy for the entire Group and set forth our commitment to promote both our "responsibility" and our "contribution."

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: General electric machinery
Location: Japan
Business: Manufacture and sales of industrial equipment and general home appliances based on four core businesses: social infrastructure business, energy business, health tech business, and IT service business

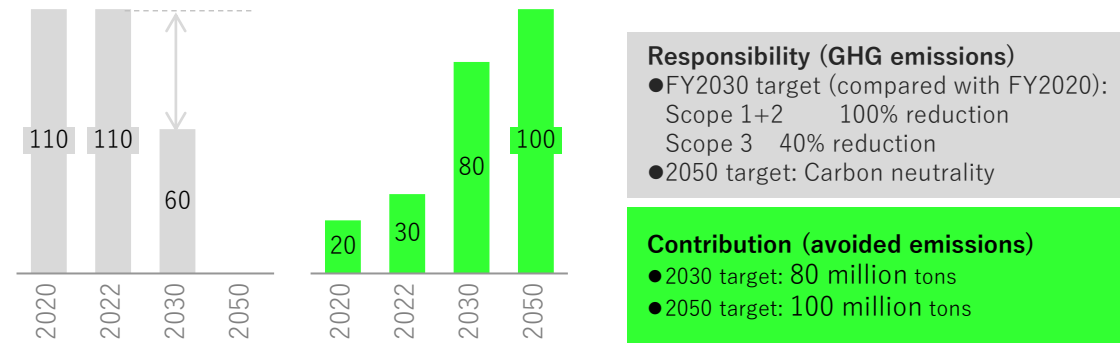
Points

Setting targets based on materiality

Given that the majority of emissions are in Scope 3 Category 11, the subject aims to achieve carbon neutrality by setting Scope 3 targets, in addition to efforts to reduce Scope 1+2 emissions.

Climate change response

As our “responsibility,” we have set targets consistent with the Paris Agreement to reduce Scope 1+2 emissions from our own businesses by 40% as of 2025 and to achieve carbon neutrality (net-zero emissions from our own offices and plants) by FY2030. In addition, we have set a target of reducing Scope 3 emissions, which account for 90% or more of the total, by 40% by FY2030 (compared with FY2020), and we have obtained SBT certification for each target. As our “contribution,” we aim to contribute at least 80 million tons in avoided emissions compared to baseline to society by 2030 through such measures as manufacturing and selling products with low emissions. In addition, we aim to contribute at least 100 million tons to avoided emissions by 2050 by expanding our business domains, etc.



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: General electric machinery
Location: Japan
Business: Manufacture and sales of industrial equipment and general home appliances based on four core businesses: social infrastructure business, energy business, health tech business, and IT service business

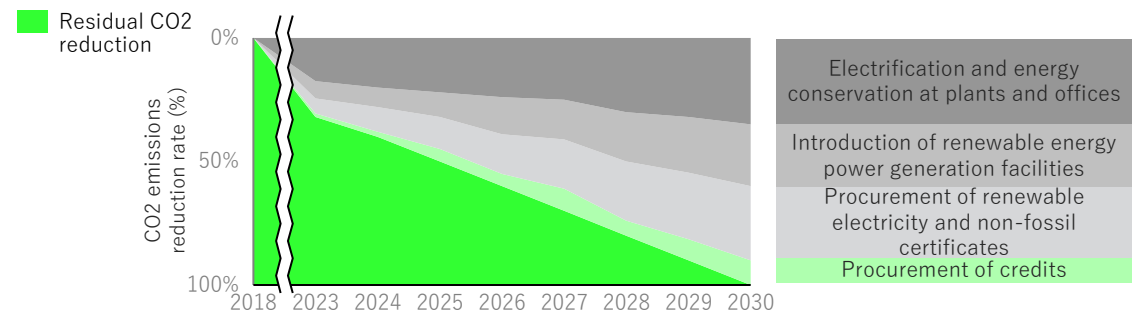
Points

Report on progress toward achieving targets

Concrete initiatives to achieve emission reduction targets have been established at each stage of the supply chain. Additionally, monitor initiatives' progress, the related KPIs and the progress rate at the time of publication are published.

Creation of net-zero emissions from our own offices and plants and generation of avoided emissions

We will take steps toward energy conservation and electrification as we aim to achieve net-zero emissions at our own plants and offices by FY2030, while also promoting renewable energy procurement as well as credits procurement. When “electrifying and conserving energy at our plants and offices” and “introducing renewable energy power generation facilities,” the cost per unit of CO2 reduced will be high, but this initiative will contribute to mitigating the risk of cost increases due to carbon taxes, etc., in the long term.



As we work to contribute to a social transition, we have classified products and services that add to our “contribution” into three categories: “those that contribute to the conversion to non-fossil energy,” “those that contribute to energy conservation,” and “those that contribute to electrification.”

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: General electric machinery

Location: Japan

Business: Manufacture and sales of industrial equipment and general home appliances based on four core businesses: social infrastructure business, energy business, health tech business, and IT service business

Points

Report on progress toward achieving targets

Concrete initiatives to achieve emission reduction targets have been established at each stage of the supply chain. Additionally, monitor initiatives' progress, the related KPIs and the progress rate at the time of publication are published.

Actual emissions

We endeavor to reduce emissions yearly as part of our response to climate change. In FY2022, emissions increased owing to an increase in resources used caused by an increase in production. We will continue to promote initiatives to achieve our target of carbon neutrality, while taking into consideration changes in production volume.

Greenhouse gases (ktCO ₂ e)* ¹		FY2021	FY2022
Scope 1		300	400
Scope 2		2,000	1,800
Scope 3	1: Purchased products and services	10,000	11,000
	2: Capital goods	550	700
	11: Use of products sold	90,000	93,500
	Other* ¹	105,550	110,800

*1 Refer to the Company's website (www.chem.esgdata) for the amount of emissions in each category included in Other.

*2 Scope 1+2 and Scope 3 Categories 1 and 11 have received external verification from AB Corporation.

2. Avoided emissions

Target products and services:
Heat pump water heaters

Points

Explanation of consistency with net-zero pathways using the IEA Roadmap

It is explained that heat pump water heaters are a product consistent with net-zero emissions, according to the "Net Zero by 2050 Roadmap for the Global Energy Sector" presented by the IEA.

Statement of sales ratio

In line with the guidance provided by the WBCSD, the Basic Guidelines, etc., the subject has disclosed at the beginning the percentage of its product sales made up of heat pump water heaters, which are a target product.

Example disclosure:

Heat pump water heaters are an important product as one of "those that contribute to electrification," and they account for 15% of our sales.

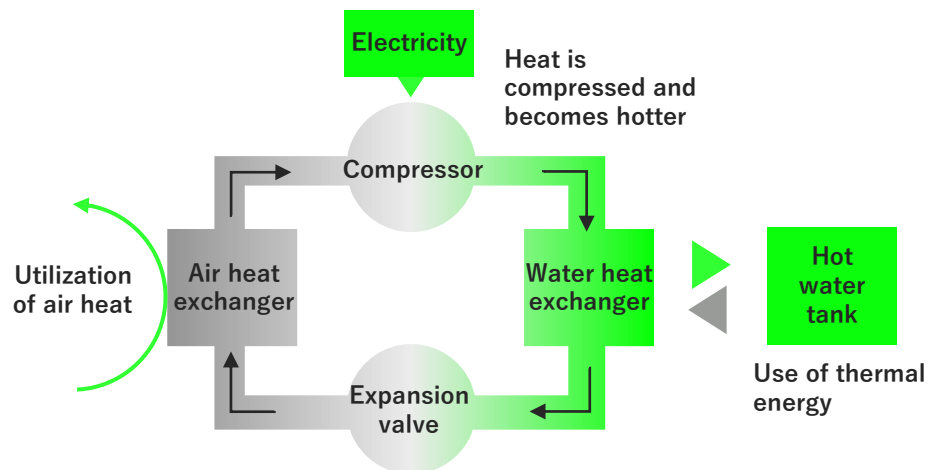
Generation of avoided emissions through heat pump water heaters

As our "contribution" to addressing climate change, we engage in the manufacture and sale of products that contribute to reducing emissions across society as a whole. Heat pump water heaters are an important product as one of "those that contribute to electrification," accounting for 15% of our sales.

Mechanism for generation of thermal energy by a heat pump water heater

The heat pump technology used in heat pump water heaters is based on a system that collects and transfers heat from the air. This system takes advantage of the fact that the temperature rises when gas is compressed and falls when it expands. This technology generates thermal energy from air heat. Therefore, compared with conventional boilers, etc., it achieves better emission factors and higher energy efficiency through electrification and the utilization of air heat.

Heat pump water heaters are an important product listed as a leading choice for heating equipment to achieve net-zero emissions in the building sector in the IEA's "Net Zero by 2050 Roadmap for the Global Energy Sector", and they are consistent with the path toward carbon neutrality.



2. Avoided emissions

Target products and services:
Heat pump water heaters

Points

Explanation of consistency with net-zero pathways using the IEA Roadmap

It is explained that heat pump water heaters are a product consistent with net-zero emissions, according to the "Net Zero by 2050 Roadmap for the Global Energy Sector" presented by the IEA.

Statement of sales ratio

In line with the guidance provided by the WBCSD, the Basic Guidelines, etc., the subject has disclosed at the beginning the percentage of its product sales made up of heat pump water heaters, which are a target product.

Example disclosure:

Heat pump water heaters are an important product as one of "those that contribute to electrification," and they account for 15% of our sales.

Avoided emissions

The Company's products are mainly sold in Europe. In Europe, boilers are currently the mainstream, but replacement with our products will promote the electrification of hot water systems. Accordingly, we set boilers, which are commonly used in Europe, as the baseline for the calculation of avoided emissions, and our calculation covers sales of heat pump water heaters sold to Europe. We referred to the "The Pillar B Guide" of the Net Zero Initiative when considering calculation methods for avoided emissions. For the calculation, we used a flow-based approach, and the emission factor for electric power was based on the factor for the European region, which is the main sales target region. We also took into consideration future decarbonization based on IEA's scenario for achieving global net-zero emissions in 2050 (NZE scenario).

Calculation method

STEP 01 Emissions from target product (heat pump water heaters)

$$\begin{array}{l} \text{Power consumption per year} \\ \text{(The Company's data)} \end{array} \times \begin{array}{l} \text{Electric power emission factor} \\ \text{(Average published by the} \\ \text{European Commission)} \end{array} \times \begin{array}{l} \text{Useful life} \\ \text{(10 years)} \end{array} + \begin{array}{l} \text{Emissions other than} \\ \text{during use} \\ \text{(The Company's data)} \end{array}$$

STEP 02 Baseline (boiler) emissions

$$\begin{array}{l} \text{Gas consumption per year} \\ \text{(European Commission} \\ \text{materials)} \end{array} \times \begin{array}{l} \text{Gas emission factor} \\ \text{(European Commission materials)} \end{array} \times \begin{array}{l} \text{Useful life} \\ \text{(10 years)} \end{array} + \begin{array}{l} \text{Emissions other than} \\ \text{during use} \\ \text{(External research} \\ \text{references)} \end{array}$$

STEP 03 Calculation of avoided emissions

$$\left(\begin{array}{l} \text{STEP 02} \\ \text{(258kgCO2e)} \end{array} - \begin{array}{l} \text{STEP 01} \\ \text{(Not disclosed)} \end{array} \right) \times \begin{array}{l} \text{Sales volume} \\ \text{(The Company's data)} \end{array}$$

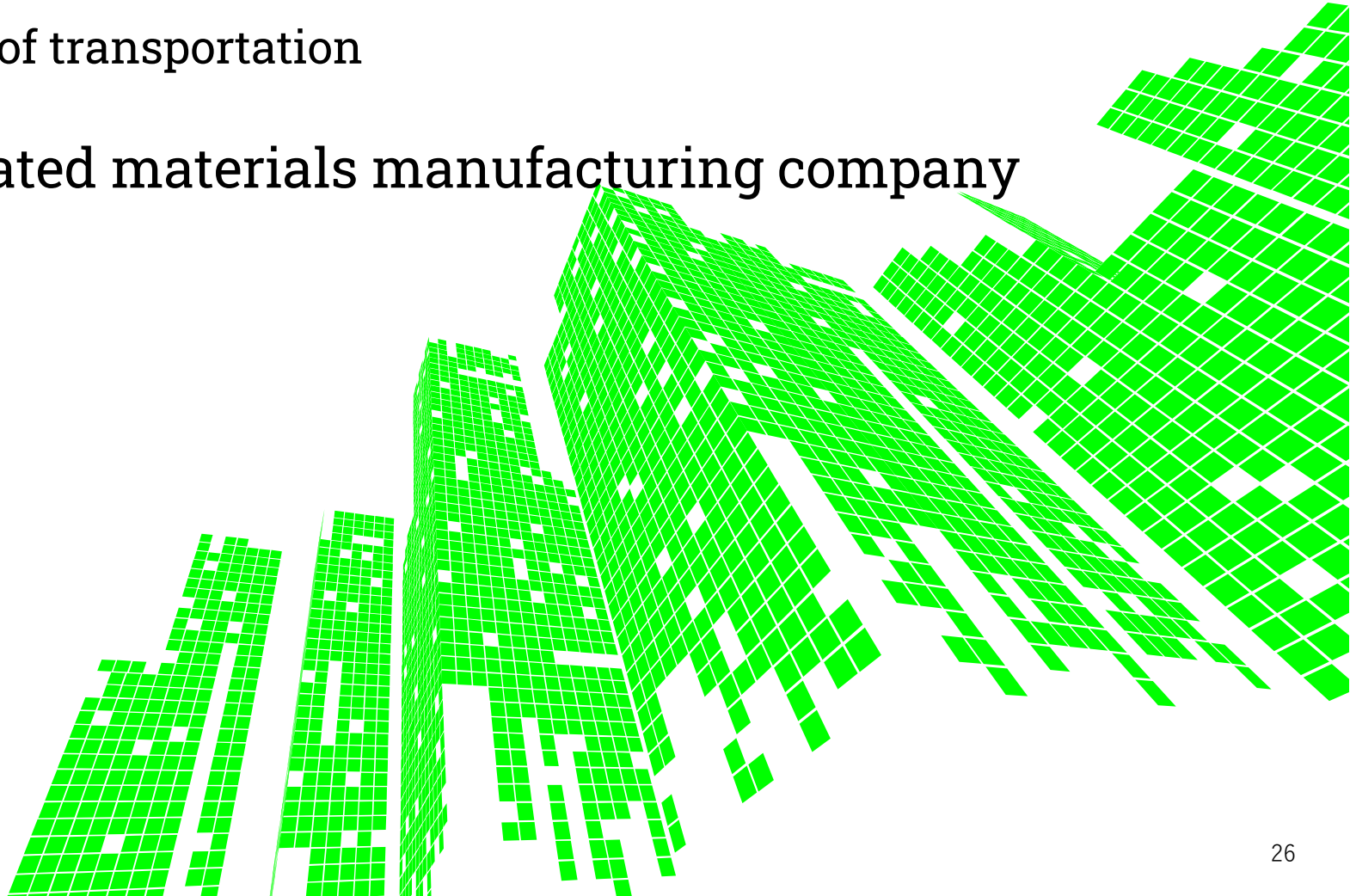
2023 avoided emissions

As a result of estimation based on the above, we found that avoided emissions from our heat pump water heaters was 600,000 tCO₂e in FY2023.

02

(3) Electrification of transportation

Example of related materials manufacturing company



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Chemicals
 Location: Japan
 Business: An integrated chemical manufacturer that engages in a broad range of businesses, from the manufacture of basic chemicals and functional chemicals, to the manufacture and sale of functional products and pharmaceuticals

Points

Setting interim targets and disclosing results

In "actual emissions and targets," in addition to a 2050 carbon neutrality target, a target for 2030 has also been set as an intermediate target. In addition, the subject has disclosed actual GHG emissions and obtained third-party assurance for this data.

Science-based targets

The example on the right shows that the targets are science-based (= consistent with the achievement of the Paris Agreement) through the acquisition of SBT WB2.0 °C certification from the SBTi. In addition, these targets have been set such that they cover all of Scope 1-3.

Climate change initiatives

In light of our medium- to long-term direction, we have identified climate change initiatives as one of our key issues. In particular, based on the concept of scenario analysis, we are aware of transition risks, such as regulations on chemical products and increases in carbon prices. In order to achieve carbon neutrality by 2050, we will reduce emissions from our own businesses, while also working to reduce emissions across society as a whole, including the carbon cycle, through our businesses.

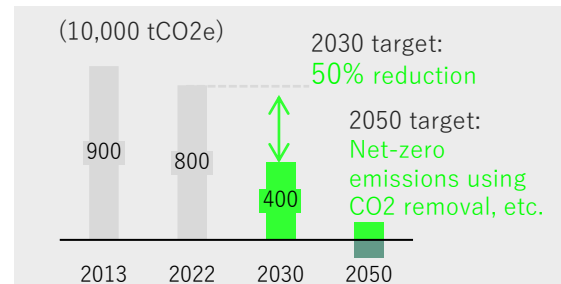
Actual emissions and targets

In order to achieve carbon neutrality by 2050, we have set a target of reducing Scope 1+2 emissions, referring to emissions from our own businesses, by 50% by 2030. In addition, for Scope 3 emissions, which account for approximately 40% of the total, we will work to reduce GHG emissions through engagement with suppliers. We have acquired SBT WB2.0 °C certification for Scope 1+2.

* The Company's figures have received assurance from Company A. Please refer to the separate [URL](#) for the assurance report.

Greenhouse gases (ktCO2e)	FY 2021	FY 2022
Greenhouse gas emissions	8,500	8,000
Scope 1+2	5,200	4,800
Scope 3	3,300	3,200

Scope 1+2 SBTi WB2.0 acquired (2021)



Scope 3

Scope 3 accounts for a major share of total emissions. Targets have been set in accordance with guidelines complied with SBT WB2.0. Specifically, we are engaging with domestic suppliers to reduce emissions, etc.
 2030 target: 14% reduction

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Chemicals

Location: Japan

Business: An integrated chemical manufacturer that engages in a broad range of businesses, from the manufacture of basic chemicals and functional chemicals, to the manufacture and sale of functional products and pharmaceuticals

Points

The setting of specific actions

In order to achieve the targets, a time-phased plan has been developed by referring to the report of the International Energy Agency (IEA), an international organization, as well as the sector-specific roadmap established by the Ministry of Economy, Trade and Industry. In addition, the external environment, which is an assumption behind the promotion of initiatives, is described.

Actions to achieve targets (transition plan)

In order to achieve our interim target for 2030, as well as our net-zero target for 2050, we aim to improve process efficiency through the utilization of the Best Available Technology (BAT), while also working to reduce emissions through the utilization of LNG in the medium term. Over the long term, we will convert to CO2-free fuels and raw materials, and conduct research and development to achieve this goal.

We also contribute to resource recycling through the development, sale, and recycling of products and services that contribute not only to the reduction of our own emissions but also to the reduction of emissions across society as a whole through their use. We have set KPIs to measure progress in these initiatives and disclosed them in our integrated report.

When formulating these plans, we have referred to technology roadmap for the chemical industry presented by the IEA and the Ministry of Economy, Trade and Industry's roadmap for the chemical sector and have ensured that our initiatives are consistent with these.

Reduction of in-house emissions

- More efficient manufacturing processes
- Fuel conversion (use of LNG and biofuels)
- Utilization of electric power from renewable energy
- Research and development of CCUS, etc.

Reduction of emissions across society as a whole

- Chemical and material recycling initiatives
- R&D and sales of environmentally friendly products

- Conversion to CO2-free fuels
- Conversion to CO2-free raw materials
- Achievement of resource recycling

Assumptions

Development of various infrastructure (supply of renewable energy, hydrogen, etc.), Lower fuel prices

In order to steadily implement the transition plan, we will invest 100 billion yen toward achieving carbon neutrality by 2030. This includes capital investment to improve the efficiency of manufacturing processes, as well as R&D expenses for technologies such as CCUS and environmentally friendly products aimed at implementing innovative technologies in the future.

Investment to achieve carbon neutrality (by 2030)

100 billion yen ● Facility renovation expenses to reduce emissions
● Research and development expenses, etc.

2. Avoided emissions

Target products and services:
Electrolyte solutions

Points

Calculation with materials related to EV lithium-ion batteries

In most cases, avoided emissions are calculated with batteries. However, electrolyte solutions, key components of electrical vehicles (EV), can also be used for calculation. Based on the fact that the concept of the contribution rate has not been clearly established at present, avoided emissions when comparing internal combustion engine vehicles (ICE vehicles) with EVs have been disclosed as the avoided emissions from electrolyte solutions, and this point is clearly stated.

Example disclosure: At present, there is no established method for calculating the contribution rate to allocate avoided emissions from final products to companies in the supply chain. Therefore, the contribution rate has not been taken into consideration in the calculation for this fiscal year.

Generation of avoided emissions through electrolyte solutions

We manufacture and sell electrolyte solutions for lithium-ion batteries for electric vehicles (EVs), which are essential for EVs, and we calculate avoided emissions from these products. EVs are an important technology that has been adopted as an initiative by the transportation sector to achieve net-zero emissions under the IEA NZE scenario. Electrolyte solutions play a major role in the performance of lithium-ion batteries because they are one of the main components of lithium-ion batteries and are responsible for the transport of lithium ions. Accordingly, they are a core product in our efforts to contribute to reducing of emissions across society as a whole through the spread of EVs.

2. Avoided emissions

Target products and services:
Electrolyte solutions

Points

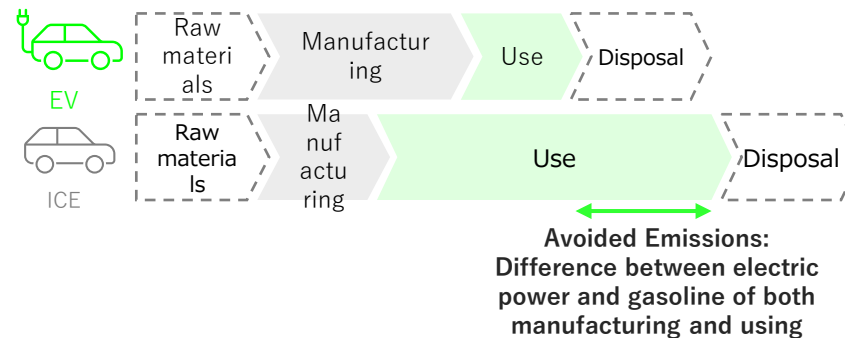
Calculation with materials related to EV lithium-ion batteries

In most cases, avoided emissions are calculated with batteries. However, electrolyte solutions, key components of electrical vehicles (EV), can also be used for calculation. Based on the fact that the concept of the contribution rate has not been clearly established at present, avoided emissions when comparing internal combustion engine vehicles (ICE vehicles) with EVs have been disclosed as the avoided emissions from electrolyte solutions, and this point is clearly stated.

Example disclosure: At present, there is no established method for calculating the contribution rate to allocate avoided emissions from final products to companies in the supply chain. Therefore, the contribution rate has not been taken into consideration in the calculation for this fiscal year.

Generation of avoided emissions through electrolyte solutions

As EVs use electricity with lower carbon intensity than ICEs and do not emit CO₂ when driving, GHG emissions when driving EVs is lower than ICEs. On the other hand, EVs emit more CO₂ than ICEs during manufacturing. Therefore, we calculated the difference between the total emissions during manufacturing and driving as avoided emissions. When calculating avoided emissions, we referred to the Life Cycle Assessment figures provided by the Japan Automobile Manufacturers Association (JAMA), which cover the period from manufacturing to use. We will elaborate this by including raw materials and disposal figures for more accurate calculations. Furthermore, at present, there is no established method for calculating the contribution rate to allocate avoided emissions from final products to companies in the supply chain. Therefore, the contribution rate has not been taken into consideration in the calculation for this fiscal year. Accordingly, we have defined the reduction in emissions resulting from the spread of EVs using our electrolyte solutions as the avoided emissions resulting from the manufacture and sale of our electrolyte solutions



We produce electrolyte solutions, which are a key material for EV lithium-ion batteries, which are needed to power vehicles with electric power.

2. Avoided emissions

Target products and services:
Electrolyte solutions

Points

The basis for setting baseline and assumptions

As a background to the use of emissions during driving by ICE vehicles as the basis for setting the baseline, it is clearly stated that it is because electrolyte solutions are sold in the manufacture of EVs to replace ICE vehicles. In addition, the WBCSD and the Ministry of Economy, Trade and Industry's guidelines are specified as the guidelines that have been referenced.

Calculation of avoided emissions

Our products are mainly supplied to domestic EV manufacturers and EV lithium-ion battery manufacturers. Therefore, we have set ICE vehicles, which are the mainstream for domestic automobiles, as the baseline.

The conditions and scope of avoided emissions calculation, are in accordance with the WBCSD guidance and the Ministry of Economy, Trade and Industry's guidance for the quantification of GHG avoided emissions.

Scope and prerequisites

Country of sale: Japan

- Baseline: Average emissions of ICE vehicles sold in Japan
- Calculation scope: Manufacturing and driving (difference between manufacturing and driving)
- Period and scope: Electrolyte solution sold per year converted to EV units
- Contribution rate : not taken into consideration as there is no standardized way of calculation

2. Avoided emissions

Target products and services:
Electrolyte solutions

Points

The basis for setting baseline and assumptions

As a background to the use of emissions during driving by ICE vehicles as the basis for setting the baseline, it is clearly stated that it is because electrolyte solutions are sold in the manufacture of EVs to replace ICE vehicles. In addition, the WBCSD and the Ministry of Economy, Trade and Industry's guidelines are specified as the guidelines that have been referenced.

Calculation of avoided emissions

Calculation formula

Avoided emissions

= (CO2 emissions from manufacturing per ICE: JAMA estimate (kgCO₂e/unit)

- CO2 emissions from manufacturing per EV: JAMA estimate (kgCO₂e/unit)

= (ICE CO2 emissions per km : Domestic industry average (kgCO₂e/km/unit)

- EV CO2 emissions per km) : The Company's data (kgCO₂e /km/unit)

× **Lifetime mileage** : Average length of driving per year × average vehicle lifetime of 10 years (km)

× **Conversion of electrolyte solution sales volume to EV units**

: Actual data from the Company and industry figures for conversion (units)

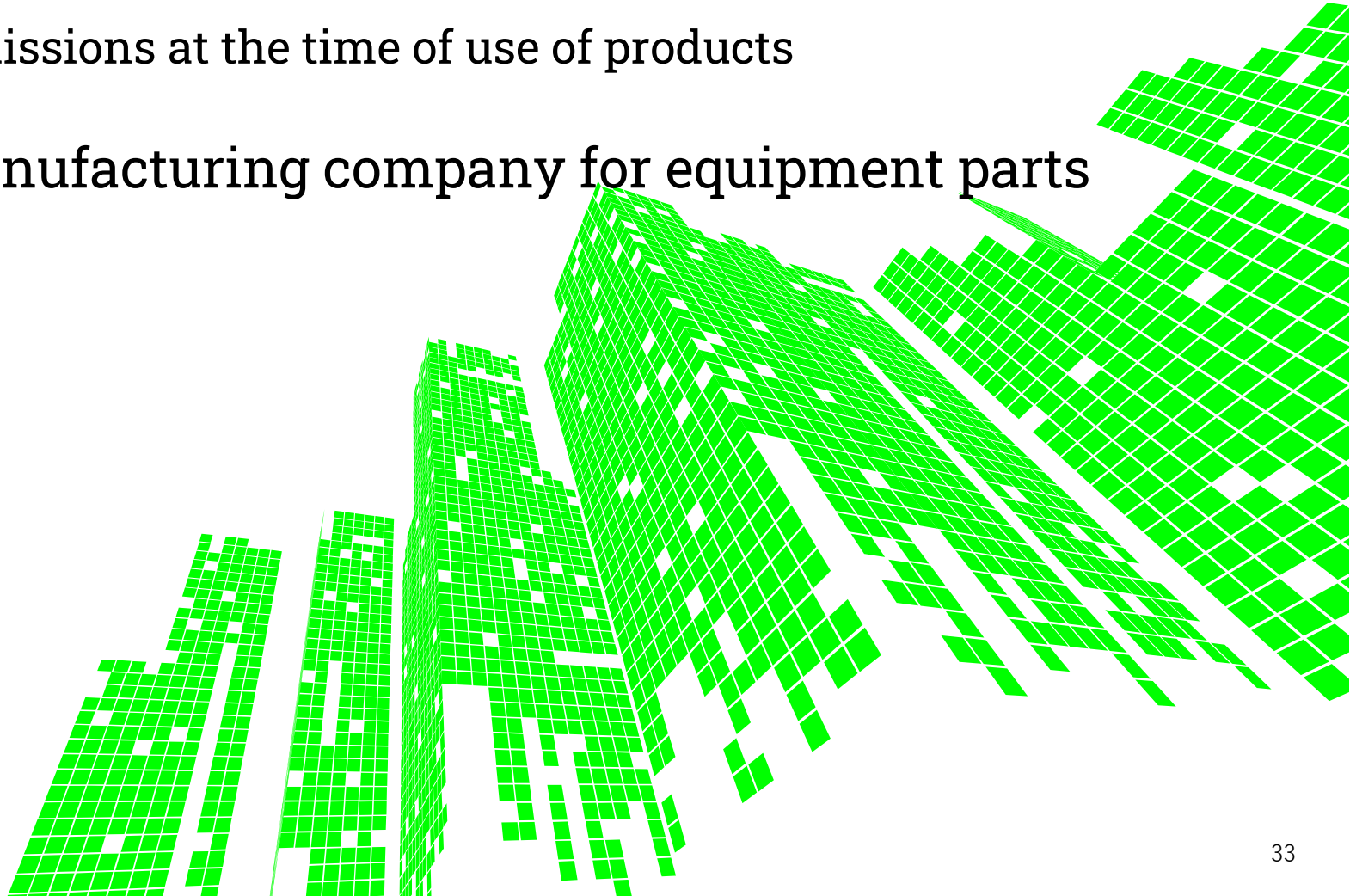
Avoided emissions in 2022

As a result of estimation based on the above, we found that avoided emissions from EVs produced through the sale of our electrolyte solutions were "10 million tCO₂e" in FY2022.

02

(4) Controlling emissions at the time of use of products

Example of manufacturing company for equipment parts



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Industrial equipment and home appliances
 Location: Japan
 Business: Manufacture and sales of general home appliances, as well as industrial mechatronics, electronic devices, and energy infrastructure-related equipment

Points




Formulation of environmental vision, including the achievement of a decarbonized society

Based on materiality analysis, the subject has formulated an environmental vision that includes climate change, resource recycling, the conservation of natural capital, etc. In addition, the subject has already set targets for each item or is committed to setting targets for the future.

Environmental vision

As environmental problems such as climate change, loss of biodiversity, and the degradation of natural capital have become more serious in recent years, companies must also recognize the importance of the environment and take countermeasures from a long-term perspective. As a company, we believe it is important to contribute to achieving a sustainable society to achieve sustainable development. We aim to work together as a group to identify important issues that affect us from a long-term perspective and contribute to the development of society. Accordingly, we have positioned the achievement of a decarbonized society, a circular economy, and the conservation of natural capital as important environmental issues.

In particular, achieving a decarbonized society is a top management priority. Based on our “Basic Environmental Policy,” we have set medium- to long-term targets for GHG emissions consistent with the Paris Agreement, and we have also set targets for avoided emissions to reduce emissions from customers' use of our products and services as a contribution to carbon neutrality. We obtained SBT Net-Zero certification for our GHG emissions reduction targets in December 2022. Going forward, we will further accelerate our initiatives to respond to the circular economy and conserve natural capital.

	Long-term target	Interim target
 Achievement of decarbonized society	<ul style="list-style-type: none"> ● Achievement of 2050 carbon neutrality across the entire supply chain (Scope 1-3) 	<ul style="list-style-type: none"> ● 50% reduction in Scope 1+2 and Scope 1-3 GHG emissions by FY2030 (compared with FY2019) ● Avoided emissions in FY2030 40 million tons
 Response to the circular economy	<ul style="list-style-type: none"> ● Promotion of the 3Rs ● Building of a supply chain with zero environmental impact 	<ul style="list-style-type: none"> ● 20,000 tons or less in waste from business activities in FY2023 ● FY2023 resource conservation: 350,000 tons
 Conservation of natural capital	<ul style="list-style-type: none"> ● Reduction of impact on ecosystems ● Nature positive initiatives 	<ul style="list-style-type: none"> ● — (Set targets in the future for wastewater and chemical substances during production)

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Industrial equipment and home appliances
 Location: Japan
 Business: Manufacture and sales of general home appliances, as well as industrial mechatronics, electronic devices, and energy infrastructure-related equipment

Points

Implementation of measures for major sources of emissions

The subject has identified that 90% of Scope 3 emission sources are in Category 11 (emissions from the use of products) and has set forth research and development on low-carbon designs for products as a measure to address this source of emissions.

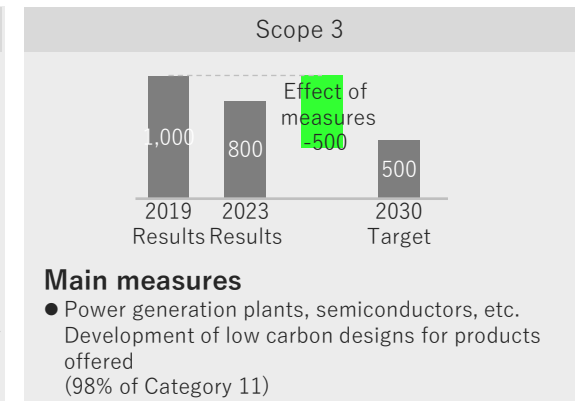
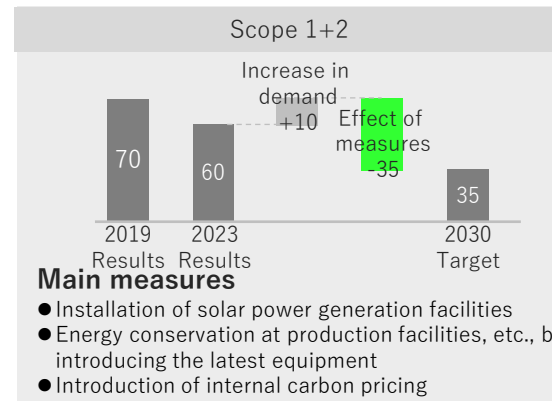
* An example of risks and opportunities by business is provided for one business for convenience, but in practice, it is assumed that this information will be disclosed for each business

Information disclosure in line with TCFD recommendations (strategy)

In order to achieve a decarbonized society, based on the TCFD recommendations, we consider an increase in the cost of responding to frequent extreme weather events as the most significant risk, and an increase in demand for renewable energy is also expected. Therefore, we have identified an increase in demand for our energy and infrastructure business (40% of sales in FY2023) as an opportunity.

Business*	Main risks	Main opportunities
Energy and infrastructure	<ul style="list-style-type: none"> Loss of sales opportunities owing to regulations on gases with a high greenhouse effect (including SF6 gas used in our mainstay products) Increase in procurement and manufacturing costs owing to the use of low-carbon materials 	<ul style="list-style-type: none"> Demand for renewable energy-related technologies Expansion Increasing demand for batteries, etc.

Taking into consideration the risks and opportunities identified based on the 4° C and 1.5° C scenarios established with reference to the IEA and Intergovernmental Panel on Climate Change (IPCC), we will implement the following measures to reduce emissions during production and in the supply chain. We have also announced that we will invest 10 billion yen by 2030 in the development of low-carbon products in the energy and infrastructure business as a growth area.



2. Avoided emissions

Target products and services:
Special high voltage transformers

Points

Avoided emissions other than CO2 (SF6 gas)

Avoided emissions are an indicator for quantifying initiatives that contribute to the decarbonization of society, and the scope of their calculation is not limited to CO2. In the example on the right, avoided emissions have been calculated for SF6 gas, which has a high greenhouse effect. Carbon dioxide equivalent values (CO2e) have been used for the actual calculation results.

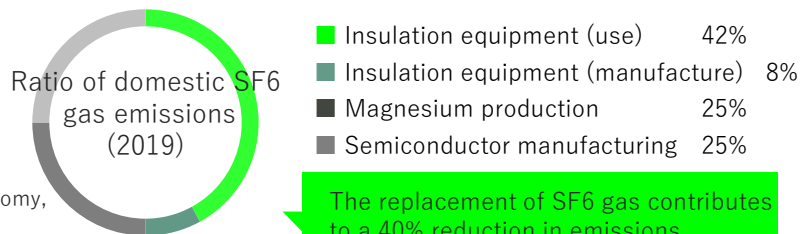
Environmentally conscious products – special high voltage transformers

As awareness of the environment has increased in society in recent years, the acceleration of electrification and other factors has led to increased demand for our products in our mainstay energy and infrastructure business. Additionally, in light of environmental regulations in various countries and the increasing environmental awareness of our customers, there is also a growing need for a reduction in the environmental impact of our products and services. In response to these demands, we have calculated avoided emissions from special high-voltage transformers, one of our mainstay products in our energy and infrastructure business.

The greenhouse effect of SF6 gas

Special high voltage transformers are a type of equipment that is necessary when using special high voltages in large buildings, plants, etc., and some such transformers use SF6 gas, a gas with high insulation and cooling performance. SF6 gas has a high greenhouse effect equivalent to 25.2 tons of CO2 per kilogram and was designated as a gas subject to measures to reduce GHG emissions at COP 3. Although the amount of SF6 gas used has decreased somewhat as a result of initiatives to date, it is still commonly used in special high voltage transformers (insulation equipment), and insulation equipment-related emissions account for about 50% of total SF6 gas emissions in Japan.

Therefore, we have developed special high-voltage transformers (insulation equipment) that do not use SF6 gas. By selling these products, we can contribute to the reduction of emissions during the use and disposal of equipment by our customers.



Source: Ministry of Economy, Trade and Industry

2. Avoided emissions

Target products and services:
Special high voltage transformers

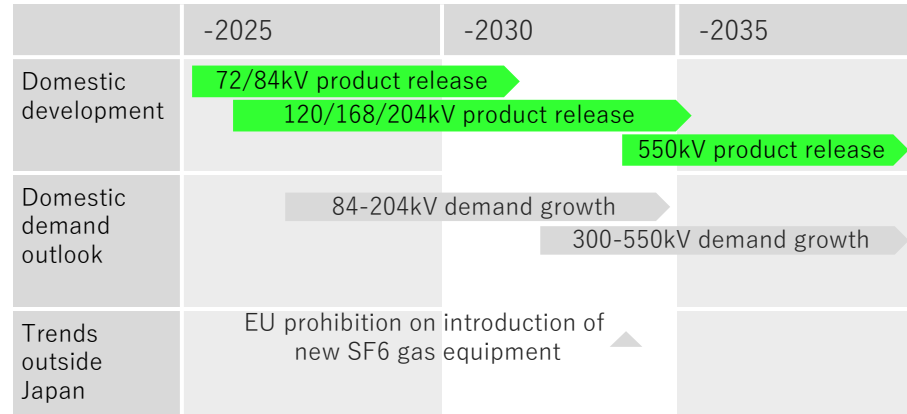
Points

Disclosure of eligibility using industry roadmap

The example on the right refers to roadmaps presented by an industry association called Japan Electrical Manufacturers' Association (JEMA) as the basis for claims that products and services are consistent with a decarbonized society. By referring to these roadmaps, it is possible to show that the products and services for which avoided emissions are calculated are consistent with the path to achieving a decarbonized society.

Roadmap of Transition toward SF6 Alternative Technologies

JEMA has formulated the "Roadmap of Transition toward SF6 Alternative Technologies," with the aim of reducing the environmental impact of equipment for the transmission and transformation of electric power. The reduction of SF6 gas consumption is also consistent with decarbonization policies in the industry. We also considered the sustainability of raw materials in the development of SF6 gas-free equipment.



Source: JEMA

2. Avoided emissions

Target products and services:
Special high voltage transformers

Points

Consideration for sustainability of raw materials

It is clearly stated that the subject has confirmed that the procurement of alternative raw materials is sustainable, not just the greenhouse effect, when developing alternative gases for SF6 gas and using products. Accordingly, effects other than climate change have also been taken into consideration.

Calculation formula

Our SF6 gas-free special high-voltage transformers do not use SF6 gas, and thus contribute to the reduction of emissions during product use and disposal. In the calculation of avoided emissions, it is recommended internationally to calculate the value conservatively. Accordingly, we have calculated avoided emissions only when the use is particularly highly effective in reducing the environmental impact.

Since using special high voltage transformers using SF6 gas is still common today, we set the baseline as emissions from products using SF6 gas and referred to industry average (undisclosed) for this data. Since our products are sold mainly in Japan and the United States, we have used the industry average for each country as the baseline in the calculation and have aggregated the calculation results for each country. Our calculation methods are accompanied with WBCSD guidelines. However, it has not been subjected to third-party verification because there are no clear guidelines for individual products. As a result of the calculation, avoided emissions from these products in FY2023 were found to be 30,000 tCO2e.

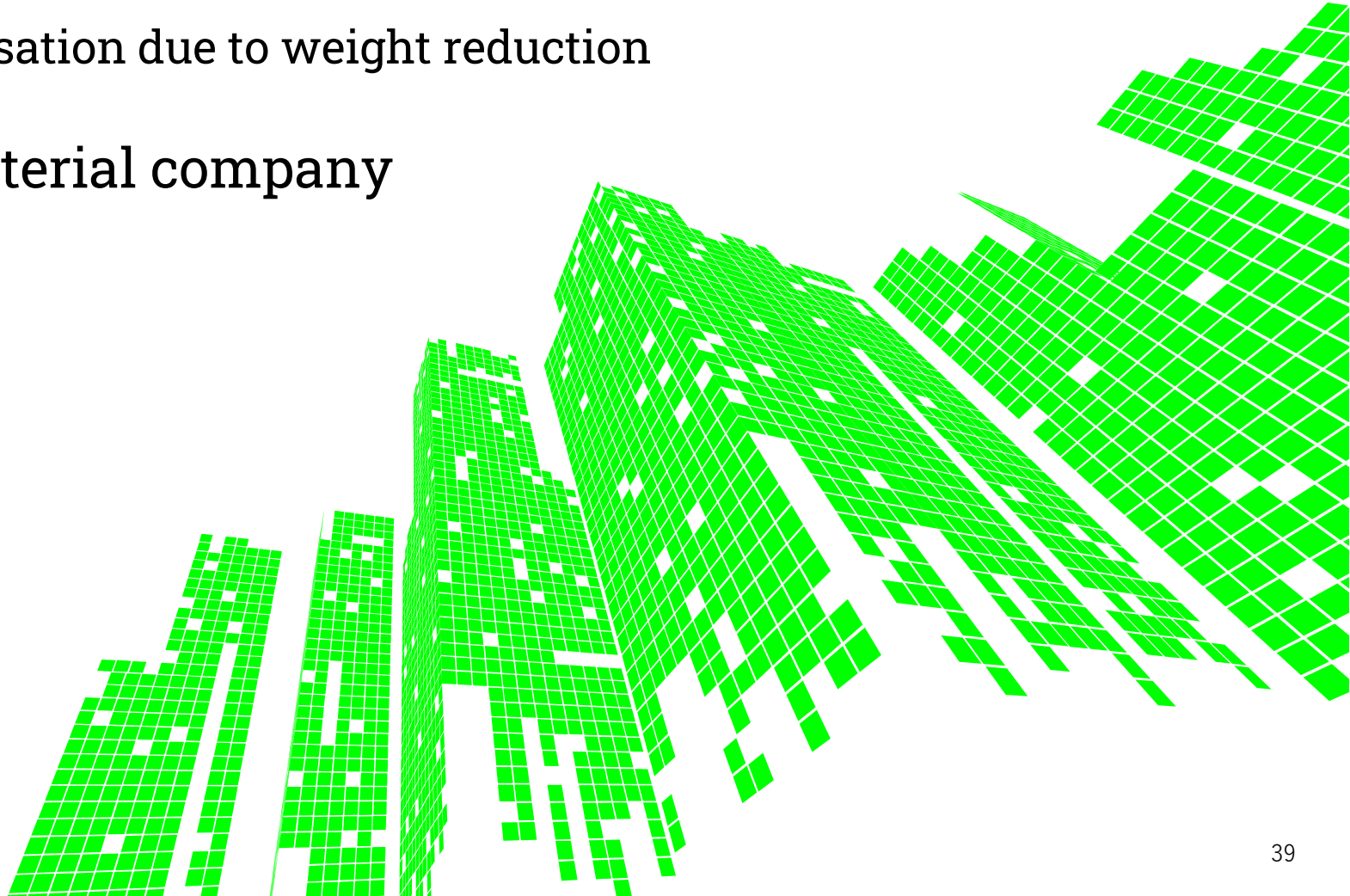
SF6 gas-free special high-voltage transformers
(gas-insulated switchgear)

$$= \left(\begin{array}{c} \text{Emissions from gas-insulated} \\ \text{switchgear that uses SF6 gas} \\ \text{(Baseline)} \end{array} - \begin{array}{c} \text{SF6 gas-free} \\ \text{Emissions from gas-insulated} \\ \text{switchgear} \\ \text{(The Company's products)} \end{array} \right) \times \begin{array}{c} \text{Shipments} \\ \text{(Japan and the} \\ \text{United States)} \end{array}$$

02

(5) Energy conservation due to weight reduction

Example of material company



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Textile

Location: Japan

Business: Primarily operates a textile business, as well as a functional chemicals business and healthcare business

Points

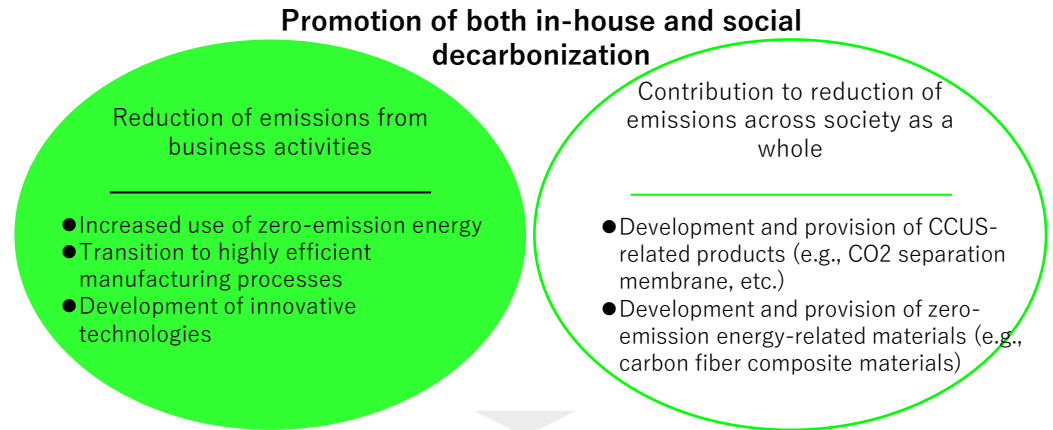
Promotion of both business and social decarbonization

Based on the subject's own business areas, the subject has identified areas such as the development and provision of materials related to zero-emission energy, etc., as growth areas and has announced proactive expansion as a group strategy. In addition, the subject has clearly stated that it will use technology from growth areas to reduce emissions from its business activities (Scope 1+2) and has formulated a carbon-neutral strategy that is integrated with its business strategy.

| Strategies for achieving carbon neutrality by 2050

The Group has contributed to developing a sustainable society based on our philosophy of contributing to society through business. As a company that uses large amounts of resources and energy when operating our businesses, we place great importance on environmental initiatives. Climate change, in particular, has a major impact on the economy and us, raising various risks, so we have positioned it as an important issue for the Group.

We will also promote the transition of society as a whole by promoting renewable energy, hydrogen, and electrification materials, and other elements necessary for achieving a carbon-neutral society, . This is in anticipation of an increase in demand for environmentally friendly products due to stricter regulations related to climate change and increased environmental awareness. At the same time, we will also reduce the Group's GHG emissions (Scope 1+2") by utilizing products from these businesses in-house.



As growth areas, the Company aims to expand the scale of these businesses to 200 billion yen by FY2025. 600 billion yen investment over three years to achieve this. (Including 100 billion yen for research and development)

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Textile
Location: Japan
Business: Primarily operates a textile business, as well as a functional chemicals business and healthcare business

Points

Strong governance system integrated with management

In order to steadily implement its carbon-neutral strategy, the subject has established a governance system, including the establishment of a specialized organization and the establishment of system for reporting to the Sustainability Committee, which is chaired by the President and Representative Director.

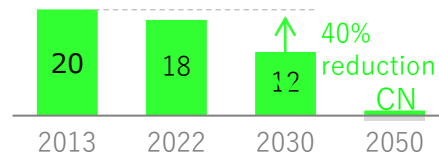
Consideration of various environmental impacts

A system has been established for organizations that manage carbon-neutral strategies to check environmental impacts outside of the climate.

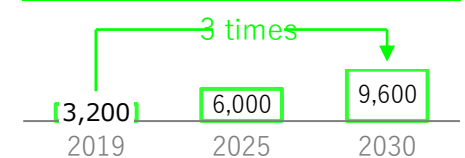
Indicators and targets

In order to achieve carbon neutrality, we have set targets both for reducing emissions from our own business activities and for contributing to emissions across society as a whole. With regard to the reduction of emissions from our business activities, a target of a 40% reduction from the level in FY2013, which is higher than the reduction rate for the industrial sector (total of -38%) has set through Japanese government's "Global Warming prevention Plan" in October 2021, and we will achieve carbon neutrality by 2050. We have also obtained SBT WB2.0°C certification for our short-term targets for 2030. In addition, as our contribution to reducing emissions across society as a whole, we will increase the supply of related products and services by 2.2 times and will also aim to increase avoided emissions by three times (both compared with FY2019). The scope of calculation of avoided emissions includes products from the zero-emission energy business, services from the recycling business, film and the functional materials business (see the ESG Data Book for details of the product list).

Scope 1+2 emissions reduction



Avoided emissions



Governance

The GX Promotion Office oversees climate change initiatives and submits reports to the Sustainability Committee, chaired by the President and Representative Director. In addition to supervision and guidance at meetings of the Sustainability Committee, the Board of Directors will also receive regular reports and ensure that initiatives are integrated with corporate growth strategies. In addition, the Environmental Measures Office will promote measures against climate change, while also examining the environmental impact outside of the climate from growth areas, and implementing any necessary measures.

2. Avoided emissions

Target products and services:
Carbon fiber composite materials for aircraft

Points

Reference to roadmaps and industry association studies in explanations of eligibility

The fact that the utilization of carbon fiber composite material reduces the weight of the airframe and contributes to the reduction of emissions caused by jet fuel consumption during flight is explained with reference to the publications of International Civil Aviation Organization (ICAO) and Japan Chemical Industry Association (JCIA), a general Incorporated Association. Specific assumed figures are also cited for the proportion of weight reduction.

| Contribution to reduction from carbon fiber composite materials in the functional materials business

In our energy conservation business, we provide carbon fiber composite materials in areas requiring weight reduction, such as automobiles, aircraft, and wind power generators. Using carbon fiber composite materials reduces the weight of products and improves energy efficiency during use, thereby contributing to a reduction in CO2 emissions. For this reason, we have included these materials in the scope of our calculation of avoided emissions as materials that contribute to reducing emissions across society as a whole. Since the carbon fiber composite materials that we provide are mainly used in automobiles and aircraft supplied both in Japan and overseas, as well as propellers for wind power generation in Japan, we included these three applications in the scope calculation for carbon fiber composite materials.

2. Avoided emissions

Target products and services:
Carbon fiber composite materials for aircraft

Points

Setting of boundaries that take life cycles into consideration

Carbon fiber composite materials contribute to reducing emissions from aircraft operation (in use). On the other hand, in the raw material-material procurement stage, emissions are higher than those of conventional airframes (baseline), so the boundary for avoided emissions includes the raw material-material procurement stage.

Calculation of avoided emissions from materials

The company in the example on the right is a manufacturer and seller of materials that contribute to decarbonization when used in final products. In order to claim avoided emissions, the company, which is located upstream in the supply chain, has confirmed that the parts and materials it provides are indispensable for final products, in accordance with the guidelines of JCIA.

Contribution to reduction from carbon fiber composite materials for aircraft

By using carbon fiber composite materials as aircraft materials, we can reduce the weight of aircraft while maintaining the strength and safety required for aircraft, thereby improving fuel efficiency and reducing jet fuel emissions. This is also consistent with the technology for reducing emissions from aircraft presented by the International Civil Aviation Organization (ICAO).

With regard to efforts to make airframes lighter, the Japan Chemical Industry Association (JCIA) has confirmed that the total weight of aircraft is reduced by approximately 20% when comparing aircraft model that are currently popular (model plane: α β Company, airframe AAA) with aircraft model that use carbon fiber composite materials for 50% of the total structural weight of the airframe (model plane: α β Company, airframe BBB). The calculation method for avoided emissions was based on the concepts and principles in the WBCSD guidance and Basic Guidelines. We also referred to the "Life Cycle Assessment of Chemical Products in Japan and Worldwide (4th Edition) Case Study 14 Aircraft Materials (Carbon Fiber Composite Materials)" developed by JCIA.

* It has been excluded from this example, but it is assumed that calculation methods like the above have been established for each product and service subject to the calculation of companies disclosing avoided emissions. In the above, carbon fiber composite materials used in aircraft are given as one example.

2. Avoided emissions

Target products and services:
Carbon fiber composite materials for aircraft

Points

Calculation of avoided emissions from materials

The company in the example on the right is a manufacturer and seller of materials that contribute to decarbonization when used in final products. In order to claim avoided emissions, the company, which is located upstream in the supply chain, has confirmed that the parts and materials it provides are indispensable for final products, in accordance with the guidelines of JCIA.

Assessment conditions

Carbon fiber composite materials for aircraft are a material that constitutes part of the final product subject to calculation of avoided emissions. However, they are an indispensable part for achieving weight reduction that contributes to reducing emissions. Accordingly, as a material manufacturer, we have used the avoided emissions from energy conservation due to weight reduction as our value. (We are reviewing this based on the "Basic Role of the Chemical Industry in Reducing Greenhouse Gases" by JCIA) Other conditions have been summarized as follows.

- Boundary: Raw material procurement, manufacturing, assembly, flight (during use) * Excluding disposal
- Baseline: α β Company, popular aircraft AAA
- Product life: 10 years
- Fuel consumption rate: 2.5 kgCO₂e/l

* It has been excluded from this example, but it is assumed that calculation methods like the above have been established for each product and service subject to the calculation of companies disclosing avoided emissions. In the above, carbon fiber composite materials used in aircraft are given as one example.

2. Avoided emissions

Target products and services:
Carbon fiber composite materials for aircraft

Points

Calculation of avoided emissions from materials

The company in the example on the right is a manufacturer and seller of materials that contribute to decarbonization when used in final products. In order to claim avoided emissions, the company, which is located upstream in the supply chain, has confirmed that the parts and materials it provides are indispensable for final products, in accordance with the guidelines of JCIA.

Results of calculation of avoided emissions per aircraft

Avoided emissions per aircraft calculated based on various conditions are as follows. Furthermore, we referred to the official airframe information of $\alpha \beta$ Company for data, and other conditions (lifetime flight distance, etc.), we referred to settings from JCIA. Avoided emissions per aircraft are 26.6 ktCO₂e. When reporting our avoided emissions, we have converted the amount of carbon fiber composite material sold to the number of aircraft (not disclosed) and multiplied it by of emissions. This data is aggregated with figures for other products and the amount services subject to the calculation of avoided emissions and provided in the integrated report.

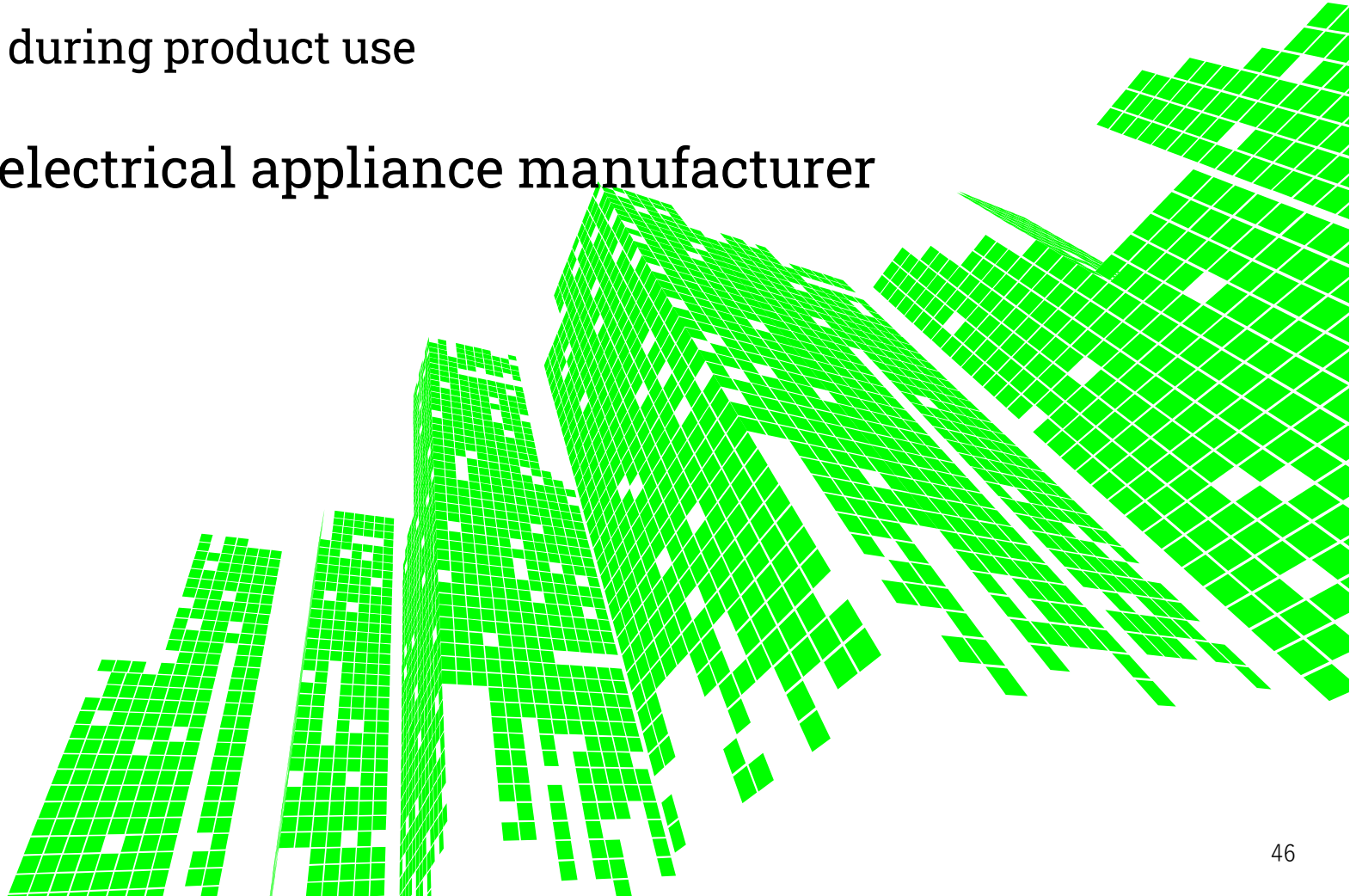
Item	Baseline	Aircraft subject to calculation
CO2 emissions at the raw material to material procurement stages (ktCO ₂ e)	0.7	0.9
CO2 emissions at the assembly stage (ktCO ₂ e)	3.8	3.0
CO2 emissions at 10 years of usage (ktCO ₂ e × 10 years)	390	364
CO2 emissions at the disposal stage (ktCO ₂ e)	– (not subject to calculation)	– (not subject to calculation)
Life cycle CO2 emissions (ktCO ₂ e × 10 years)	394.5	367.9
Avoided emissions per aircraft (ktCO ₂ e × 10 years)	-26.6	

* It has been excluded from this example, but it is assumed that calculation methods like the above have been established for each product and service subject to the calculation of companies disclosing avoided emissions. In the above, carbon fiber composite materials used in aircraft are given as one example.

02

(6) Energy-saving during product use

Example of an electrical appliance manufacturer



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: General home appliance manufacturing
Location: Japan
Business: Development of health business and systems business, centered on the manufacturing and sale of home appliances

Points

Identification of the environmental burden

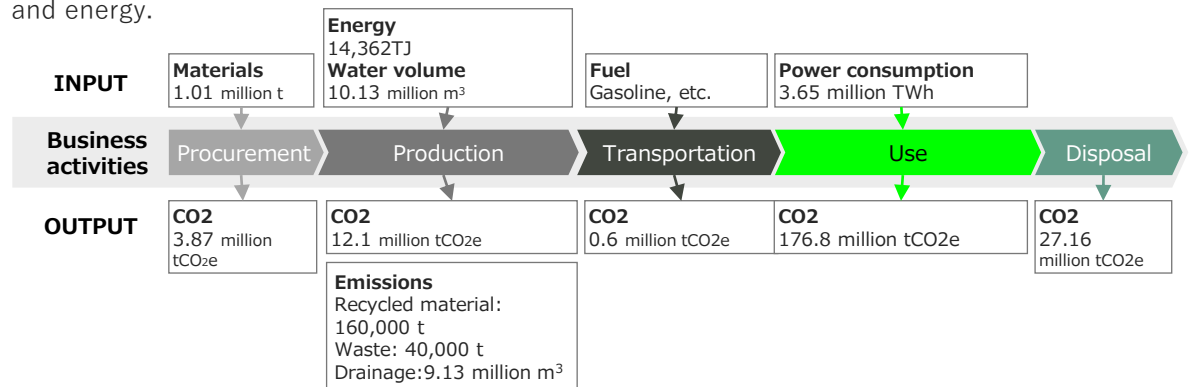
Identifying the inputs and outputs associated with its own business is important for the efficient reduction of the company's environmental burden, including CO₂ emissions. In the example on the right, apart from CO₂ emissions, which is the output, the company has grasped the amounts of inputs, including materials, water, and energy. In addition, reduction of emissions during product use, which accounts for the majority of emissions and improvement of the recycling efficiency of specific resources are also identified as key measures for reducing environmental impact.

Environmental vision and environmental targets for 2050

Based on the recognition that global population growth and economic growth in emerging countries could exacerbate climate change and other global issues, the company established an environmental vision, which raises a decarbonized society and a resource-recycling society as the two social images that we will aim for and formulated environmental targets for 2050 to realize the vision.

The overall image of the environmental burden

We identified and grasped the environmental burden associated with business activities throughout its overall value chain, from raw material procurement to production, transportation, use and disposal, to establish our environmental targets for 2050. Most of the emissions associated with the company's business activities (manufacturing and sale of home appliances) are CO₂ from energy sources, and other emissions are extremely small. The company works on improving energy efficiency during use, which is the largest source of emissions, and energy saving during procurement and production for the efficient reduction of emissions. In addition, since the company procures energy and materials during procurement and production, we strive to reduce our environmental burden by increasing the recycling efficiency of materials, water, and energy.



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: General home appliance manufacturing
 Location: Japan
 Business: Development of health business and systems business, centered on the manufacturing and sale of home appliances

Points

Identification of the environmental burden

Identifying the inputs and outputs associated with its own business is important for the efficient reduction of the company’s environmental burden, including CO2 emissions. In the example on the right, apart from CO2 emissions, which is the output, the company has grasped the amounts of inputs, including materials, water, and energy. In addition, reduction of emissions during product use, which accounts for the majority of emissions and improvement of the recycling efficiency of specific resources are also identified as key measures for reducing environmental impact.

Environmental targets for 2050

The company is promoting initiatives for the decarbonization of society as a whole through its products and services, known as “avoided emissions,” in combination with achieving carbon neutrality by 2050 through its value chain for the realization of a “decarbonized society.” We will work on improving the efficiency of using materials and water towards the realization of a resource-recycling society. The company has also obtained SBT 1.5 °C certification for their short-term targets.

Targeted social image	KPI	FY2022 results	FY2030 targets	FY2050 targets
Decarbonized society * The base year is FY2018	Scope 1 + 2 emissions	-30% 1.31 million tCO2e	60% reduction	Achievement of CN
	Scope 3 emissions	-14% 20.9 million tCO2e	30% reduction	
Resource-recycling society * The base year is FY2015	Resource use efficiency	11% improvement	-	50% improvement
	Water use efficiency	22% reduction	-	50% improvement

1. Strategies for achieving carbon neutrality

Corporate profile

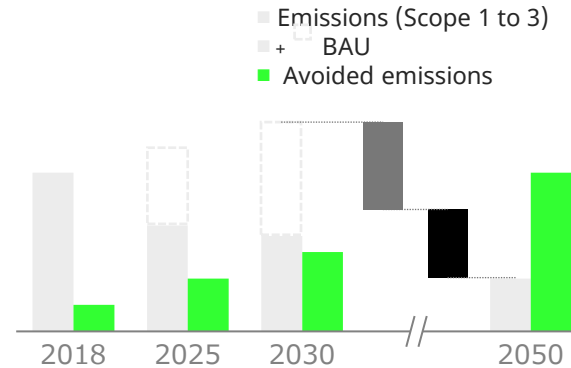
Industry: General home appliance manufacturing
Location: Japan
Business: Development of health business and systems business, centered on the manufacturing and sale of home appliances

Points

Identification of the environmental burden

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Initiatives towards the achievement of emissions reduction targets



- | Scope 1 + 2 reductions |
|---|
| ● Efficient use of energy saving and renewable energy through energy management |
| ● Introduction of renewable energy to internal factories and buildings |
- | Scope 3 reductions |
|--|
| ● R&D on environmentally friendly refrigerants |
| ● Heat pump supply |
| ● Supplier engagement |

The company set reduction targets based on the increase in emissions associated with the spread of environmentally-friendly products (BAU), and will implement various initiatives in line with the goals of the electrical and electronics industries in the "Carbon Neutral Action Plan" by Japan Business Federation to achieve its environmental targets for 2050. In particular, we will invest 100 billion yen in R&D aimed at the reduction of Scope 3 emissions.

2. Avoided emissions

Target products and services:
Energy-saving home appliances (inverter air conditioners)

Points

Evaluation by life-cycle emissions (product eligibility)

The company has explained that the reduction of emissions during use by reducing power consumption through optimization of inverters creates avoided emissions. In the calculation of those avoided emissions, the company evaluates over the product's life-cycle emissions, which is recommended in various guidance.

Confirmation of negative impacts on the environment

The company has disclosed that their products which create avoided emissions may have a negative impact on biodiversity and resources in the manufacturing process, etc. However, the example on the right shows no such negative impacts on environment from inverter development.

| Contributions to reductions through energy saving (inverter air conditioners)

The inverter air conditioners the company manufactures and sells have better energy-saving performance than the average air conditioner on the market, so these are products that can contribute to the reduction of emissions during use and play a major role in the reduction of its environmental burden.

Inverters (frequency converters) are technologies that control voltage, current and frequency, enabling detailed control of the speed of the motor that drives an air conditioner's compressor and fan. Air conditioners equipped with inverters can operate at high power until they reach the set temperature and then switch to low-speed operation after that, reducing power consumption significantly compared to non-inverter air conditioners that can only be turned on and off.

Furthermore, according to the "The Future of Cooling" by the IEA, global demand for cooling is expected to surge through 2050, with electricity demand associated with this expected to triple. We believe that the spread of use of energy-saving inverter air conditioners will be an important initiative in the reduction of global emissions.

2. Avoided emissions

Target products and services:
Energy-saving home appliances (inverter air conditioners)

Points

Evaluation by life-cycle emissions (product eligibility)

The company has explained that the reduction of emissions during use by reducing power consumption through optimization of inverters creates avoided emissions. In the calculation of those avoided emissions, the company evaluates over the product's life-cycle emissions, which is recommended in various guidance.

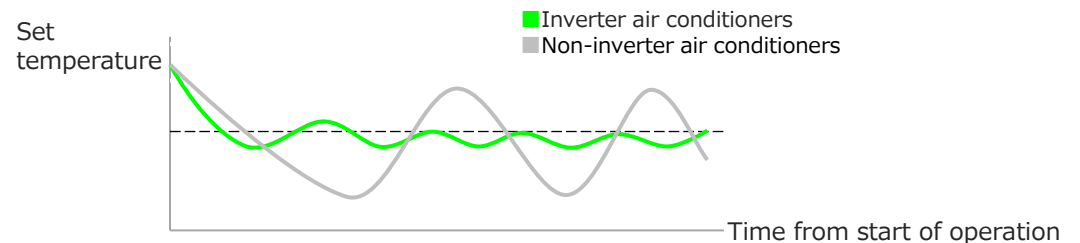
Confirmation of negative impacts on the environment

The company has disclosed that their products which create avoided emissions may have a negative impact on biodiversity and resources in the manufacturing process, etc. However, the example on the right shows no such negative impacts on environment from inverter development.

Contributions to reductions through energy saving (inverter air conditioners)

In addition to the installation of inverters, the company has improved the performance of heat pumps and refrigerants. The company also sell products that achieve greater energy savings in many countries, including those with high penetration rates of inverter air conditioners. Since the average emissions intensity of products varies depending on the climate and electricity mix in each region, company has compared the average emissions for each sales region with their own products. Further, they have also confirmed that these products will create avoided emissions by replacing existing products in the market, and that they will have no significant negative impact on the environment through material procurement, etc., as they are no different to normal products apart from the inverter technology.

Comparison of temperature control between inverter and non-inverter air conditioners (image)



2. Avoided emissions

Target products and services:
Energy-saving home appliances (inverter air conditioners)

Points


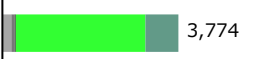




Setting of baselines based on regional differences in each country

Since the average CO2 emissions intensity of electricity used by energy-saving products differs depending on the market in each country, the company compared the emissions of their inverter machines to the average emissions of air conditioners in each sales region. In addition, the calculation is also performed separately for commercial and residential use, which have different life-cycle emissions compositions.

Calculation of avoided emissions

The company's products are sold worldwide for residential and commercial use. Since the penetration rate and energy-saving performance of inverter air conditioners vary greatly depending on the country or region, the baseline is set by sales region based on the reports by industry association. The conditions and scope of calculation of avoided emissions are in line with the calculation method of the Ministry of Economy, Trade and Industry and WBCSD guidance.

Lifecycle CO₂ emissions by country or region of sale

Country / region	Residential use (kgCO ₂ e)		Commercial use
Japan	Market average	 4,051	See attachment
	Company	 3,774	
Europe * Within the EU	Market average	 5,302	See attachment
	Company	 3,958	
:			
India	Market average	 8,019	See attachment
	Company	 4,182	

Lifecycle CO₂ emissions by country or region of sale

The results were calculated based on the following formula using the figure above.

$$\sum \{ \text{sales by country / region, residential / commercial} \times (\text{average market emissions} - \text{company emissions}) \}$$
 As a result of calculations, avoided emissions created through sales of the company's inverter air conditioners in 2022 were 1.5 million tCO₂e.

02

(7) Manufacturing and supply of products using

Example of Packaging material manufacturing company



I. Strategies for achieving carbon neutrality

Corporate profile

Industry: Printing and manufacturing
 (consumer goods)
 Location: Japan
 Business: Lifestyle infrastructure-related business
 manufacturing and supplying consumer
 goods, and IT / information-related business

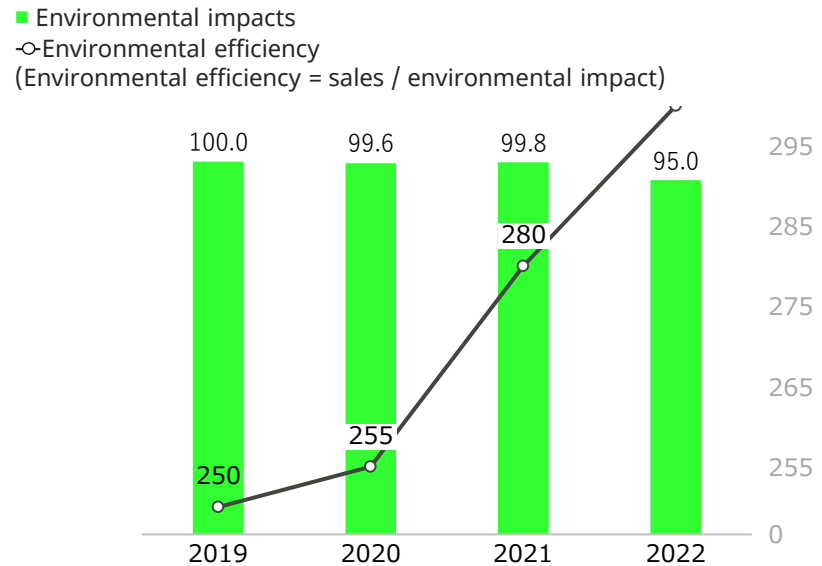
Points

Evaluation of environmental burden

The company uses the LIME, a life-cycle environmental impact evaluation method to evaluate quantitatively the impacts of the company's business on the environment. In addition to climate change, the subjects of evaluation include mineral, fossil and forest resources, enabling the evaluation of a wide range of impacts concerning the environment not limited to climate change.

Initiatives for the environment

As a responsible company, we aim for the realization of a sustainable society for the future of the earth. In recent years, while required to reduce the environmental burden of its business activities, we have been implementing scenario analysis based on the TCFD recommendations of the magnitude of the impact of climate change on business and using the LIME method to grasp quantitatively the impacts on the company's business. We have evaluated the environmental impacts by business area, and the impacts on a wide range of subjects, including mineral resources, fossil resources, forest resources, climate change, and photochemical oxidants.



Analysis on major businesses*1

*1 Major businesses include lifestyle infrastructure-related businesses and IT and information-related businesses

I. Strategies for achieving carbon neutrality

Corporate profile

Industry: Printing and manufacturing
(consumer goods)

Location: Japan

Business: Lifestyle infrastructure-related business
manufacturing and supplying consumer
goods, and IT / information-related business

Points

Disclosure of emission reduction pathways

The company has illustrated its initiatives for the reduction of emissions and the extent to which each initiative will contribute to reductions, and discloses the emission reduction pathways for the realization of targets consistent with the achievement of the Paris Agreement for all Scopes. The company is also applying for SBT Net-Zero certification.

Climate Change

The company positions climate change as its most important issue in sustainability management. In light of the scenario analysis implemented based on the TCFD recommendations {IEA NZE Scenario and Stated Policies Scenario (STEPS) }, the company has identified that climate change poses financial risks in the medium-term due to soaring raw material and energy prices, and the introduction of carbon taxes. On the other hand, as the market changes in association with climate change, the company thinks that resource recycling needs and the expansion of demand for low-carbon and decarbonized products will be opportunities for it.

Climate-related risks

- Increased costs related to carbon taxes and emissions trading
- Soaring prices of raw materials and low-carbon and decarbonized energy

Climate-related opportunities

- Increase in resource recycling needs in association with the strengthening of regulations
- Expansion of demand for low-carbon and decarbonized products

- Scope 1+2 emissions reduction target FY2030 50% reduction (compared to FY2019)
- Scope 3 emissions reduction target FY2030 50% reduction (compared to FY2019)

- Sales of products that contribute to the decarbonization of society FY2030 15% increase (compared to FY2019)

Therefore, as part of its risk management process, the company has set reduction targets for Scope 1 to 3 emissions and is committed to achieving carbon neutrality throughout its value chain overall by 2050. These targets are above the national levels set for achieving the Paris Agreement and were revised upward according to the 1.5 °C target level. They are currently applying their mid-term targets for SBTi certification. In addition, the company has also set sales targets for products that contribute to the decarbonization of society, anticipating needs for resource recycling and the expansion of demand for low-carbon and decarbonized products, which are opportunities for the company.

I. Strategies for achieving carbon neutrality

Corporate profile

Industry: Printing and manufacturing
 (consumer goods)
 Location: Japan
 Business: Lifestyle infrastructure-related business
 manufacturing and supplying consumer
 goods, and IT / information-related business

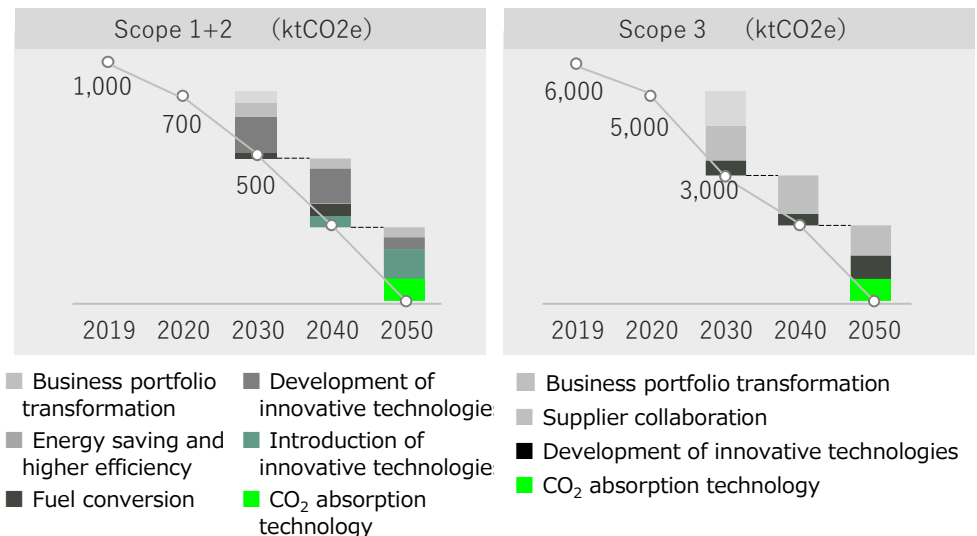
Points

Disclosure of emission reduction pathways

The company has illustrated its initiatives for the reduction of emissions and the extent to which each initiative will contribute to reductions, and discloses the emission reduction pathways for the realization of targets consistent with the achievement of the Paris Agreement for all Scopes. The company is also applying for SBT Net-Zero certification.

Initiatives towards the achievement of emissions reduction targets

Energy-derived emissions account for more than 90% of the company's Scope 1 + 2 emissions. Accordingly, the company will promote further energy saving through the introduction of energy management systems, etc., and will also convert to decarbonized energy and improve energy efficiency in manufacturing processes aimed at the reduction of Scope 1 + 2 emissions. In addition, we will expand our investments in the low-carbon materials area and transform our business portfolio to focus on future growth areas. Products and services purchased (Category 1) and the disposal of products sold (Category 12) accounted for more than 80% of Scope 3 emissions. Therefore, apart from striving for the procurement of low emission factor materials through cooperation with suppliers, the company will also maximize the use of these materials and advance initiatives related to the improvement of recycling rates, aiming ultimately for carbon neutrality by 2050. These initiatives are consistent with the decarbonization action plan established by the printing industry.



2. Avoided emissions

Target products and services:
Plant-derived packaging materials

Points

Consideration of impacts on the environment

If disclosing positive impacts through avoided emissions, other than climate, it is recommended to consider whether the manufacturing and supply of products and services have impacted the environment adversely and to state the results. In the case on the right, while there are no adverse impacts at present, the company is committed to continuous evaluations.

Sustainable packaging materials

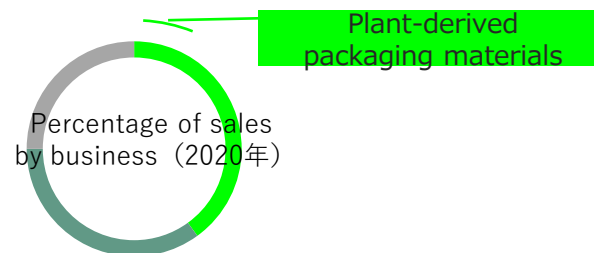
Many of the packaging materials used currently are oil-derived plastics. Since fossil fuels are used as raw materials, there is sustainability risk in the procurement of raw materials, and large quantities of CO2 are emitted when the raw materials of packaging are procured, manufactured, and disposed of. In addition to the handling of climate change, the company, which a sustainable society, is working on the issue of packaging materials, while the resolution of marine plastic waste pollution and the realization of a circular economy have also become issues.

Lifestyle infrastructure-related business | Plant-derived packaging materials

One solution that can be raised is environmentally friendly packaging materials made from plant-derived materials. The company manufactures packaging materials with a unique manufacturing method using its printing technology for many years, and by doing so, has realized the manufacturing and supply of packaging materials with the same functions as conventional plastics using plant-derived materials.

Plant-derived packaging materials are the main product of the company's lifestyle infrastructure-related business, accounting for 10% of sales. Based on the TCFD recommendations, the company apprehends the expansion of demand for low-carbon and decarbonized products as a climate-related opportunity and has positioned plant-derived packaging materials as one of the company's important products into the future.

■ Lifestyle infrastructure-related businesses	35%
■ IT and information-related business	40%
■ Other	25%



2. Avoided emissions

Target products and services:
Plant-derived packaging materials

Points

Consideration of impacts on the environment

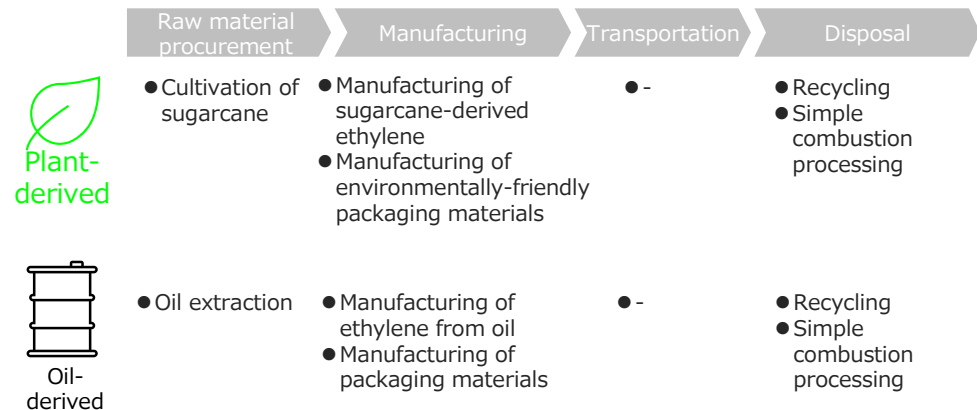
If disclosing positive impacts through avoided emissions, other than climate, it is recommended to consider whether the manufacturing and supply of products and services have impacted the environment adversely and to state the results. In the case on the right, while there are no adverse impacts at present, the company is committed to continuous evaluations.

Evaluation of environmental impacts

The company is committed to sustainable procurement with a low environmental burden in the cultivation and procurement of sugarcane, which it uses as a raw material for packaging materials. We have evaluated both quantitatively and qualitatively that there are currently no significant adverse effects, but we will evaluate more precisely in future the amount of water used and the impact on biodiversity.

Avoided emissions and baseline

The plant-derived packaging materials (for detergents) used to calculate avoided emissions will contribute to CO2 emissions reductions during manufacturing and combustion by replacing oil-derived plastics, which are generally used as the raw material for packaging materials. The company discloses these reductions as avoided emissions. To be specific emissions during manufacturing can be reduced along with CO2 emissions during disposal through the use of bio-derived raw materials, since no petroleum-derived raw materials are used. Avoided emissions are created during manufacturing and disposal, and the lifecycle overall is calculated including these based on the WBCSD guidance. The range of emissions calculation ranges from raw material procurement to disposal per ton of packaging material.



2. Avoided emissions

Target products and services:
Plant-derived packaging materials

Points

Disclosure of data reference list

Many estimates and assumptions are required for calculating of avoided emissions. Because of that, it is recommended to clarify the data reference sources for transparent disclosure. Even if actual data, such as sales volumes, are not disclosed, it is recommended to disclose data references and figures as far as possible.

The presence or absence of third-party verification

Third-party verification of avoided emissions calculation methods is not mandatory at the present time. On the other hand, the Basic Guidelines and other guidance recommend including the presence or absence of verification for disclosure that is easy-to-understand, and in the case on the right, it is stated that no third-party verification has been received.

Scope and prerequisites

Country of sale: Japan

- Baseline: From the procurement of raw materials for oil-derived packaging materials (for detergents) to the manufacturing and disposal of the packaging materials
- Scope of calculation: From raw material procurement to disposal
- Period and range: Amount of packaging material sold in 1 year (t)

Data and calculation results

In calculating avoided emissions, reference was made to the values in reports by industry associations, interviews with experts, government publications, and other sources. Company data was used for the plant-derived packaging materials they produce.

Process	Oil-derived	Plant-derived
Raw material procurement	<ul style="list-style-type: none">• Emissions related to oil extraction, refining and transportation required for 1t of packaging material (Oil industry reports)	<ul style="list-style-type: none">• Emissions related to the production and transportation of sugarcane required for 1t of packaging material (Interviews with sugarcane producers and industry experts)
Manufacturing	<ul style="list-style-type: none">• Emissions related to the manufacturing of basic chemicals such as ethylene required for 1t of oil-derived packaging materials• Emissions related to processing into oil-derived packaging materials (Chemical industry reports)	<ul style="list-style-type: none">• Emissions related to the manufacturing of basic chemicals such as bioethylene required for 1t of plant-derived packaging materials (Ministry of the Environment data)• Emissions related to processing into plant-derived packaging materials (Company data)
Disposal	<ul style="list-style-type: none">• Emissions related to simple combustion processing of 1t of oil-derived packaging materials (Chemical industry reports)	<ul style="list-style-type: none">• Emissions related to simple fuel processing of 1t of plant-derived packaging materials (Ministry of the Environment data)

2. Avoided emissions

Target products and services:
Plant-derived packaging materials

Points

Disclosure of data reference list

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Third-party verification of avoided emissions calculation methods is not mandatory at the present time. On the other hand, the Basic Guidelines and other guidance recommend including the presence or absence of verification for disclosure that is easy-to-understand, and in the case on the right, it is stated that no third-party verification has been received.

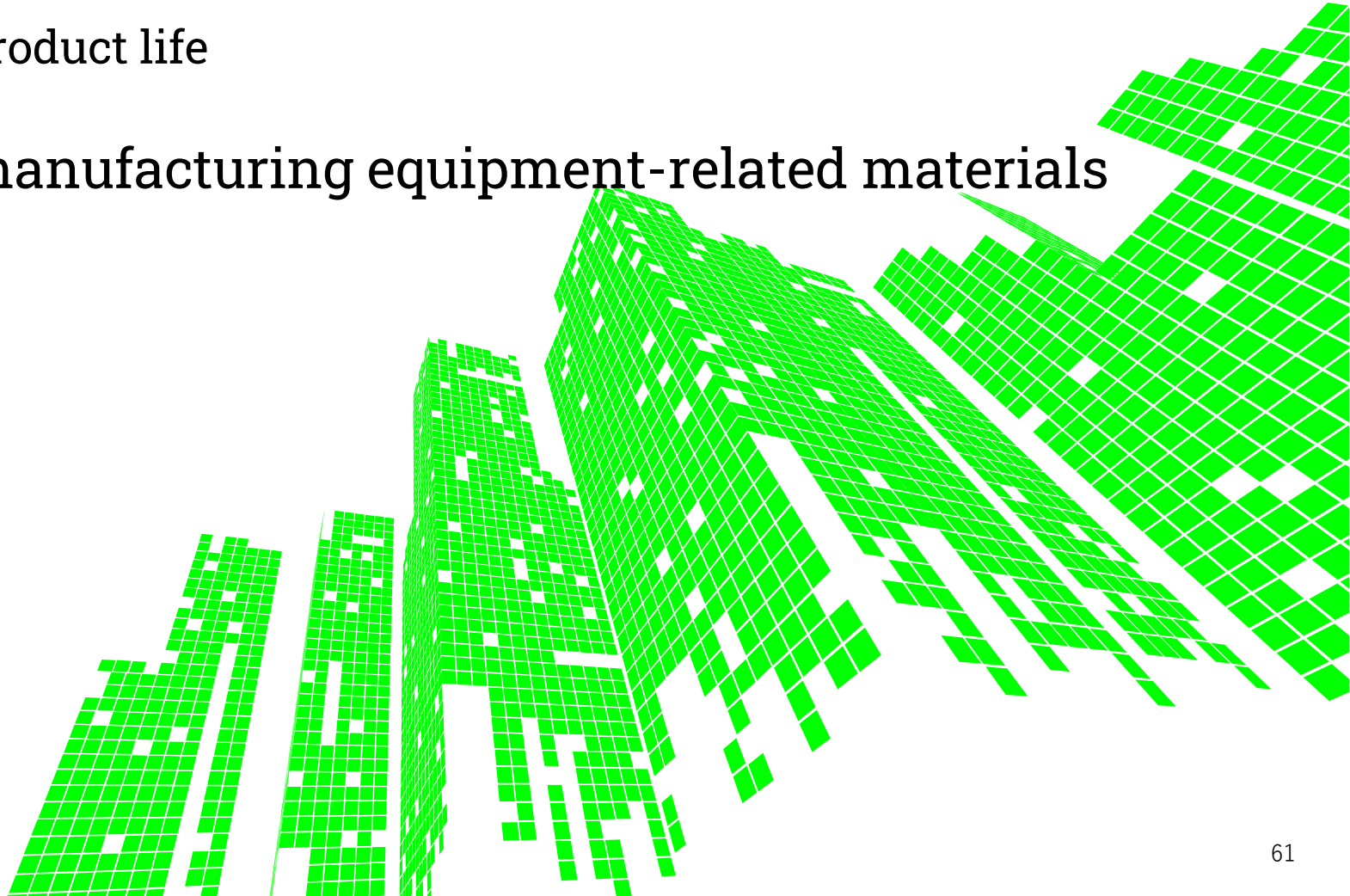
After calculating based on the data, the result for avoided emissions per ton of packaging materials was 407 kgCO₂e. Avoided emissions were calculated by multiplying this by the company's sales of plant-derived packaging materials in fiscal year 2022. As a result, avoided emissions related to packaging materials for detergents were calculated at 4,000 tCO₂e. Because the company manufactures its final products from the processing of sugarcane, which is an important factor in avoided emissions, 100% of avoided emissions are attributed to the company. However, we will strive to refine the calculation method while also taking into account future discussions on the contribution ratio.

* Avoided emissions figures are not subject to third-party verification at present.

02

(8) Extension of product life

Example of a manufacturing equipment-related materials manufacturer



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Oil

Location: Japan

Business: Energy business, high-performance materials business (lubricants, electronic materials, agribio, etc.), resource business

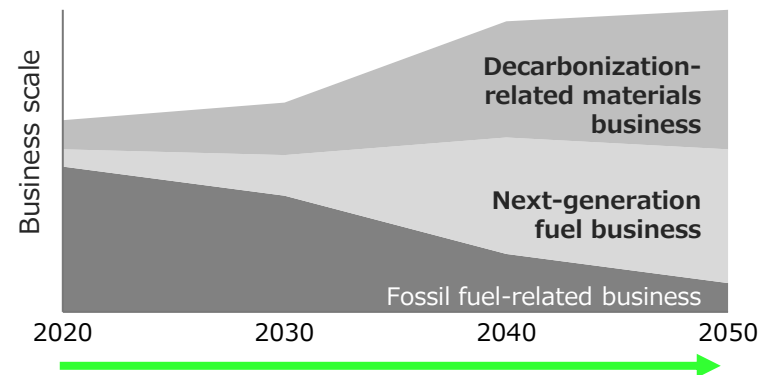
Points

Initiatives consistent with the Ministry of Economy, Trade and Industry's technology roadmap

The company has planned concrete short and medium to long-term initiatives to achieve carbon neutrality targets regarding the technology roadmaps for related fields formulated by the Ministry of Economy, Trade and Industry. In addition, it is also disclosing the guidance it referred to.

Business transformation in line with the realization of a sustainable society

The company organized the issues from both social impact and business impact and identified five areas in fiscal year 2023 towards the identification of its priority ESG issues. In particular, climate change is the most important issue for the group, which deals with energy and materials, and with the mission of supplying energy while contributing to the development of a sustainable society, we will promote initiatives to realize a decarbonized society. To that end, we will transform our business portfolio and work on the expansion of growth areas with an eye toward carbon neutrality.



Recently, the company has been investing earnings from its profit-making business (fossil fuel-related business) in growth business to transform its medium to long-term business portfolio.

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Oil

Location: Japan

Business: Energy business, high-performance materials business (lubricants, electronic materials, agribio, etc.), resource business

Points

Disclosure of Scope 3 emissions and issues

Various issues in making calculations have been pointed out regarding to the disclosure of Scope 3 emissions, but in the case shown on the right, the company has disclosed emissions while noting that these are the figures that can be calculated at the present time. In addition, the company has stated the reasons for the difficulty in setting targets and clarified the time limit for target setting.

Transition strategy for the realization of carbon neutrality

The company group will work on both the contribution and mitigation perspectives while using existing resources to the full for the realization of carbon neutrality. To transform our business portfolio and realize a carbon-neutral circular economy, we have set GHG emissions reduction targets and formulated a transition roadmap for initiatives to be promoted in each business. In formulating the roadmap, the company referred to roadmaps for related fields centered on the “Roadmap for “Transition Finance” in the Oil Sector,” published by the Ministry of Economy, Trade and Industry, for initiatives that contribute to decarbonization based on domestic policies. In addition, the company has raised a GHG emissions reduction target of -46% for Scope 1 + 2, which is consistent with the targets for achievement of the Paris Agreement raised by the state. The company group has disclosed figures for its Scope 3 emissions that it is able to calculate at the present time because they are so wide-ranging.

1. Strategies for achieving carbon neutrality

Corporate profile




Industry: Oil
 Location: Japan
 Business: Energy business, high-performance materials business (lubricants, electronic materials, agribio, etc.), resource business

Points

Science-based targets consistent with state targets

The company has set GHG emissions reduction targets at the same level as the state targets consistent with the Paris Agreement and has set targets that are science-based. In addition, it has also disclosed that it has obtained a third-party evaluation (SPO) of its targets and initiatives.

With regard to Scope 3 target setting, the company has not yet set a clear target because the Scope 3 emissions of the group are affected by many industries, but it is planning to set a target by around 2027. Further, at the present time, we are aiming to reduce the emissions intensity of the energy the group supplies by 30% by 2050 while continuing to grasp Scope 3 results. When formulating the transition finance framework, a third-party evaluation institution confirmed the group's strategy to be consistent with the International Capital Market Association's Climate Transition Finance Handbook as an SPO. (Actual emissions are published on the company's website.)

	~2030	~2040	~2050
 Decarbonization-related materials	<ul style="list-style-type: none"> ● Oil-conversion technology for waste plastics ● Establishment of exhaust gas conversion technology 		<ul style="list-style-type: none"> ● Heat resource recovery ● Waste material conversion
 Next-generation fuel	<ul style="list-style-type: none"> ● Development of SAF ● Building of a hydrogen and ammonia supplychain 		<ul style="list-style-type: none"> ● Expansion of SAF business ● Hydrogen and ammonia power generation business
 Fossil fuel	<ul style="list-style-type: none"> ● Improvement of the operation of refineries, etc. (energy saving, etc.) ● Fuel conversion of coal boilers, etc. 		

Investment in growth areas (2023 to 2025)

800 billion yen

- New capital investment
- Research and development expenses, etc.
- 60% on decarbonization-related materials business
- 40% on next-generation fuel business

2. Avoided emissions

Target products and services:

Durable needle coke

Points

Explanation of consistency with net zero

(product eligibility)

The company explains and discloses that electric furnaces in which durable needle coke is used are consistent with the realization of a decarbonized society based on the technology roadmap for the steel sector formulated by the Ministry of Economy, Trade and Industry.

| Products that contribute to the decarbonization of the steel industry

The company's high-performance materials business manufactures and sells materials and products that are essential for industrial infrastructure. In addition to the improvement of performance, having seen increased needs for environmental consideration, the group's high-performance materials business is making efforts in R&D for products with low emissions across their lifecycle that will contribute to the decarbonization of customers.

In high-performance materials business, the durable needle coke that the company manufactures and sells has a longer product life than ordinary needle coke, so it is possible to extend the life of products that use durable needle coke (graphite electrodes). This enables the company to contribute to the reduction of emissions related to the procurement of needle coke raw materials. The reduction of CO₂ emissions by society through the use of durable needle coke with a long product life is calculated as avoided emissions of the group, which visualizes our positive impact on society through business.

2. Avoided emissions

Target products and services:
Durable needle coke

Points

Consideration of LCA and clarification of the calculation method

Because the needle coke required for the production of 1 ton of iron decreases as durable needle coke extends the product lifecycle, emissions during use (steel production by electric furnace) and the disposal stage have the main reductions in emissions. In the case on the right, the company states that it considers whether or not there are any differences from the raw material to the manufacturing stage and excludes them to calculate conservatively based on the fact that consideration of the lifecycle is required in the calculation of avoided emissions.

Use of durable needle coke

The durable needle coke manufactured and sold by the company group is used as graphite electrode material for high-efficiency electric furnaces in the steel industry. It is a necessary material for the operation of electric furnaces. Electric furnaces are based on technology that manufactures steel from scrap steel by arc discharge and are attracting attention in Japan and overseas as decarbonization technology for the steel industry, which emits a large amount of CO₂ during manufacturing. The use of electric furnaces is consistent with the steel sector roadmaps formulated by the IEA and the Ministry of Economy, Trade and Industry, and the group's durable needle coke, which is used in electric furnaces, is also thought to be a material that was manufactured for the realization of a decarbonized society.

	~2030	~2040	~2050
Electric furnace	Energy saving, more efficient technology		
		Impurity removal and enlargement technology in electric furnaces	
Blast furnace	Energy saving, more efficient technology		
	Ferrocake	Hydrogen reduction steelmaking (on-site hydrogen; external hydrogen from 2040 on)	
		CO ₂ separation, recovery and use	

Source) Partial excerpt from the Ministry of Economy, Trade and Industry's sector-specific technology roadmap

2. Avoided emissions

Target products and services:
Durable needle coke

Points

Explanation of consistency with net zero (product eligibility)

The company explains and discloses that electric furnaces in which durable needle coke is used are consistent with the realization of a decarbonized society based on the technology roadmap for the steel sector formulated by the Ministry of Economy, Trade and Industry.

Calculation of avoided emissions

In establishing the calculation method for avoided emissions, the company did not receive third-party verification but received an external review and advice on its consideration of the calculation method and the figures.

The needle coke used on average was the subject of comparison in calculations (baseline) because the buyers are mainly steel-related companies in Japan, the reference figures are of those domestic companies.

Comparison of lifecycle CO2 emissions per ton of steel manufactured using electric furnaces

The figures used in the calculation have been organized in the following table. The figures shown in parentheses in the table are the group's estimates and are based on the figures of trading companies that handle these materials and research materials. A difference is generated in the amount of emissions related to processes from the procurement of needle coke raw materials to manufacturing because of the decrease in manufacturing volume, but it is not included in the calculation of avoided emissions because it is the same as the baseline, assuming that the manufacturing method will not change and that it will be calculated more conservatively.

2. Avoided emissions

Target products and services:

Durable needle coke

Points

Consideration of LCA and clarification of the calculation method

Because the needle coke required for the production of 1 ton of iron decreases as durable needle coke extends the product lifecycle, emissions during use (steel production by electric furnace) and the disposal stage have the main reductions in emissions. In the case on the right, the company states that it considers whether or not there are any differences from the raw material to the manufacturing stage and excludes them to calculate conservatively based on the fact that consideration of the lifecycle is required in the calculation of avoided emissions.

[Legend] ●: Excluded from subjects of calculation

Item	Baseline	Subject to calculation
Emissions at the raw material to material procurement stages (ktCO ₂ e/ton-steel)	●	●
Emissions at the manufacturing stage (ktCO ₂ e/ton-steel)	●	●
During use (electrode basic unit) * Amount of electrode consumed to manufacture 1t of iron (ktCO ₂ e/ton-steel)	(30)	20
CO ₂ emissions at the disposal stage (ktCO ₂ e/ton-steel)	(20)	10
Avoided emissions per ton of steel (kg/ton-steel)		-20

*1 Calculated by multiplying by 44/12 (conversion factor) in the conversion of carbon to carbon dioxide

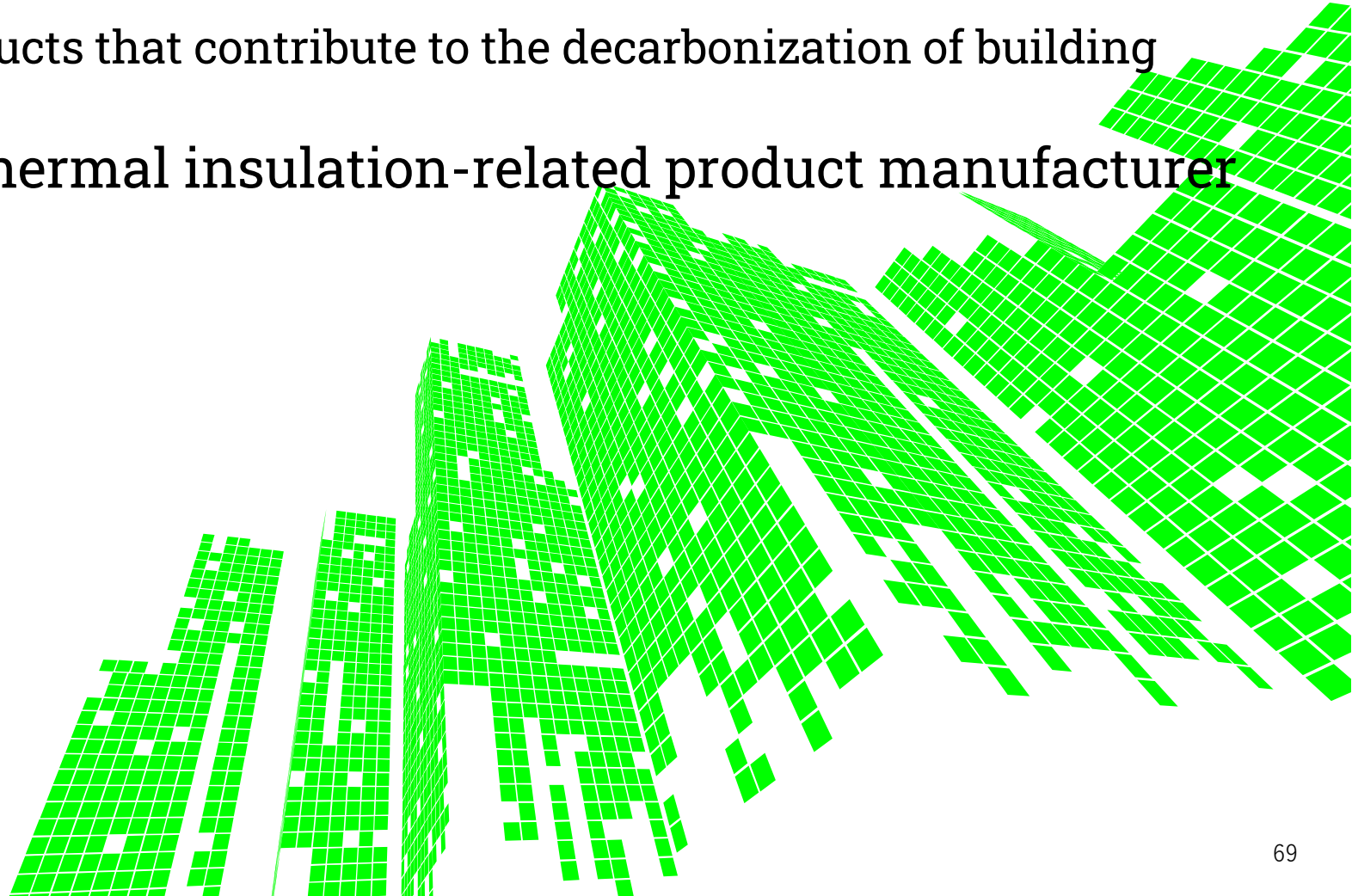
Results for calculation of avoided emissions in 2022

Avoided emissions are calculated by multiplying the production volume per ton of iron by “production volume of steel manufactured with the annual sales volume of the company’s needle coke” with the result that 100,000 tons of avoided emissions were created in fiscal year 2022.

02

(9) Supply of products that contribute to the decarbonization of building

Example of a thermal insulation-related product manufacturer



I. Strategies for achieving carbon neutrality

Corporate profile

Industry: Construction materials, materials, furniture (manufacturing)

Location: Japan

Business: Manufacturing of insulation materials, roofing materials, composite fibers, etc., used in construction

Points

Analysis of the impact on the value chain

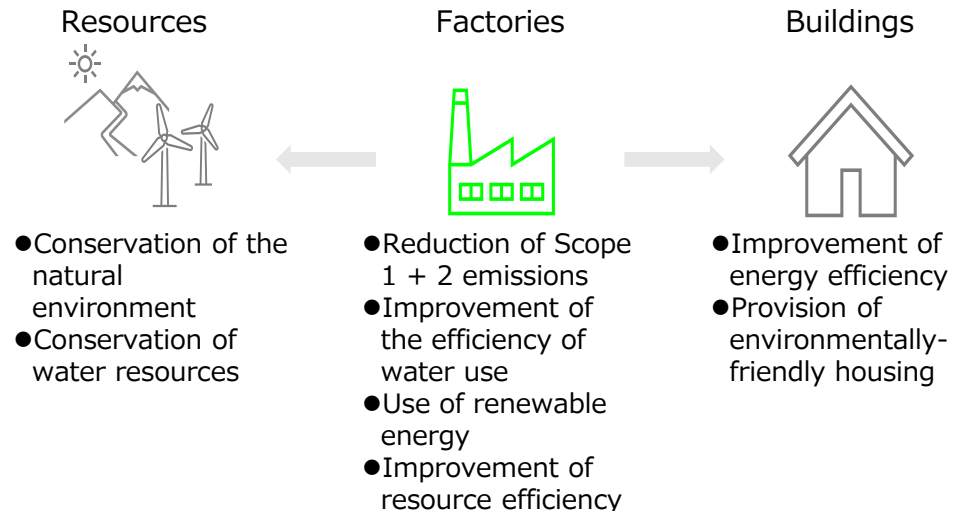
The company has considered the impact that its business exerts on the sustainability of society throughout the value chain overall, and, with the cooperation of university professor, an external experts, identified areas that are easily affected and where the impacts exerted by its business are particularly large (double materiality).

Sustainability and value chain impact

Sustainability is at the core of the company's business strategy. We apprehend issues to realize a sustainable society as business opportunity. Since 2016, we have been working to quantify the impacts of our initiatives, set targets, and confirm progress based on the Sustainable Development Goals (SDGs). In particular, we conducted double materiality analysis with external experts and have identified four areas that are most relevant to our business: countermeasures against climate change; water conservation; the spread of clean energy penetration; and responsible production and consumption.

Value chain impacts

We exert a variety of impacts on the value chain through our business activities. We identify these impacts and work on the improvement of sustainability through business.



I. Strategies for achieving carbon neutrality

Corporate profile

Industry: Construction materials, materials, furniture
(manufacturing)
Location: Japan
Business: Manufacturing of insulation materials,
roofing materials, composite fibers, etc., used
in construction

Points

Science-based targets

The example on the right shows that the targets are science-based (= consistent with the achievement of the Paris Agreement) through the acquisition of certification from the SBTi. In addition, these targets have been set such that they cover all of Scope 1 to 3.

Countermeasures against climate change

As a manufacturer and seller of building-related products, we place the highest importance on dealing with climate change and urbanization. CO2 emissions from residential and commercial buildings account for 10% of overall global emissions, so we think that our company, which handles high energy-saving performance insulation materials, has a large role to play in the reduction of emissions.

We are striving for the development of products that will contribute to the greater energy efficiency of new buildings for the realization of net zero in the global building construction sector. In addition, based on the importance of retrofitting existing buildings to achieve energy efficiency improvements, we are conducting advocacy activities aimed at various countries' governments for the setting of retrofitting targets and the expansion of subsidy programs.

I. Strategies for achieving carbon neutrality

Corporate profile

Industry: Construction materials, materials, furniture (manufacturing)
Location: Japan
Business: Manufacturing of insulation materials, roofing materials, composite fibers, etc., used in construction

Points

Science-based targets

The example on the right shows that the targets are science-based (= consistent with the achievement of the Paris Agreement) through the acquisition of certification from the SBTi. In addition, these targets have been set such that they cover all of Scope 1 to 3.

Reduction of GHG emissions

Scope 1 + 2 emissions account for more than 70% of our GHG emissions so the reduction of the company's emissions is important. Accordingly, we announced our commitment to the achievement of carbon neutrality by 2050. As our interim targets, we set the reduction of Scope 1 + 2 emissions by 35% compared to the base fiscal year (2019) and the reduction of Scope 3 emissions by 20% compared to the base year. The SBTi has confirmed that our interim target for Scope 1 + 2 emissions is consistent with the 1.5° C target and that our interim target for Scope 3 emissions is consistent with the WB2.0 target.

2030 target: -35%
Base year: 2019



2023 result:
2.6 million tCO₂e

2030 target: -20%
Base year: 2019



2023 result:
800,000 tCO₂e

I. Strategies for achieving carbon neutrality

Corporate profile

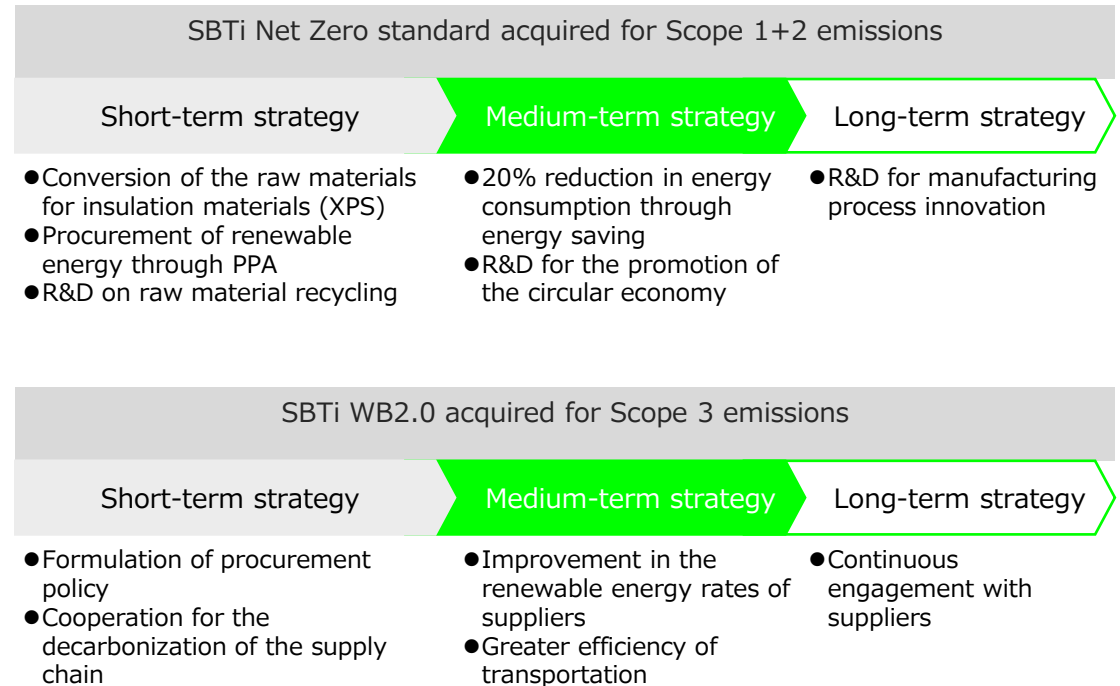
Industry: Construction materials, materials, furniture (manufacturing)
 Location: Japan
 Business: Manufacturing of insulation materials, roofing materials, composite fibers, etc., used in construction

Points

Science-based targets

The example on the right shows that the targets are science-based (= consistent with the achievement of the Paris Agreement) through the acquisition of certification from the SBTi. In addition, these targets have been set such that they cover all of Scope 1 to 3.

We will work on the electrification of fiber melting processes (Scope 1) and the greening of procured electricity (Scope 2) while taking the circumstances of each country into account for the reduction of emissions at our factories, which account for the majority of our emissions, and the achievement of our targets. Regarding Scope 3 emissions, apart from working on engagement with suppliers, we will strive to reduce upstream emissions by using recycled materials, etc.



2. Avoided emissions

Target products and services:
Insulation materials

Points

Establishment of a calculation method jointly with experts

Because the method for calculating avoided emissions requires the setting and investigating of estimates, in the case on the right, the company asked an environment-related research institution to set the calculation method and estimates and has strived to ensure transparency. The method of using external institutions as appropriate like this is expected.

Conservative calculation

Since various guidance (e.g., WBCSD) recommends that avoided emissions be calculated conservatively, the company has set conservative conditions for items of high uncertainty, such as product life and the scope of calculation.

| Creation of avoided emissions through insulation materials

Reduction effect of insulation materials

The insulation materials for residential and commercial buildings that we manufacture and sell are products that contribute to the reduction of emissions in the building sector because they increase the insulation efficiency of buildings. We have calculated the avoided emissions due to insulation materials sold to visualize this positive impact.

Insulation materials include glass wool and rock wool, both of which realize high insulation performance by storing air with low thermal conductivity within the material. Building-related CO₂ emissions account for 10% of total global emissions and if calculations are restricted to energy-related emissions, in particular, 26% of emissions are in the building sector. Therefore, improving the thermal insulation performance of the walls and roofs of buildings and saving heating and cooling energy is an important initiative for the reduction of emissions throughout society.

To ensure transparency and reliability in the calculation of avoided emissions, we requested calculations by Ω (an environment-related research organization), with reference to the WBCSD's Guidance on Avoided Emissions. The following are the calculation method formulated by Ω and the results.

2. Avoided emissions

Target products and services:
Insulation materials

Points

Establishment of a calculation method jointly with experts

Because the method for calculating avoided emissions requires the setting and investigating of estimates, in the case on the right, the company asked an environment-related research institution to set the calculation method and estimates and has strived to ensure transparency. The method of using external institutions as appropriate like this is expected.

Conservative calculation

Since various guidance (e.g., WBCSD) recommends that avoided emissions be calculated conservatively, the company has set conservative conditions for items of high uncertainty, such as product life and the scope of calculation.

| Creation of avoided emissions through insulation materials

Scope and prerequisites

The following conditions were set for calculations. Only the use of insulation materials is subject to calculation. If the upstream portion of the value chain is included, avoided emissions are expected to increase by approximately 10%.*1 However, due to the high uncertainty of the figures used in the calculation and the set assumptions, the upstream portion is excluded from the calculation based on the principle of calculating avoided emissions more conservatively.

- Subject of calculation: Reduction in CO₂ emissions associated with reductions in energy use
- Baseline: Amount of electricity used for air conditioning in average homes with insulation installed
- Countries of sale: Europe, USA, Japan
- Scope of calculation: During use
- Period and scope: Quantity of insulation materials sold annually (number of buildings delivered)

*1 Values are those estimated by Ω based on LCA evaluation

2. Avoided emissions

Target products and services:
Insulation materials

Points

Establishment of a calculation method jointly with experts

Because the method for calculating avoided emissions requires the setting and investigating of estimates, in the case on the right, the company asked an environment-related research institution to set the calculation method and estimates and has strived to ensure transparency. The method of using external institutions as appropriate like this is expected.

Conservative calculation

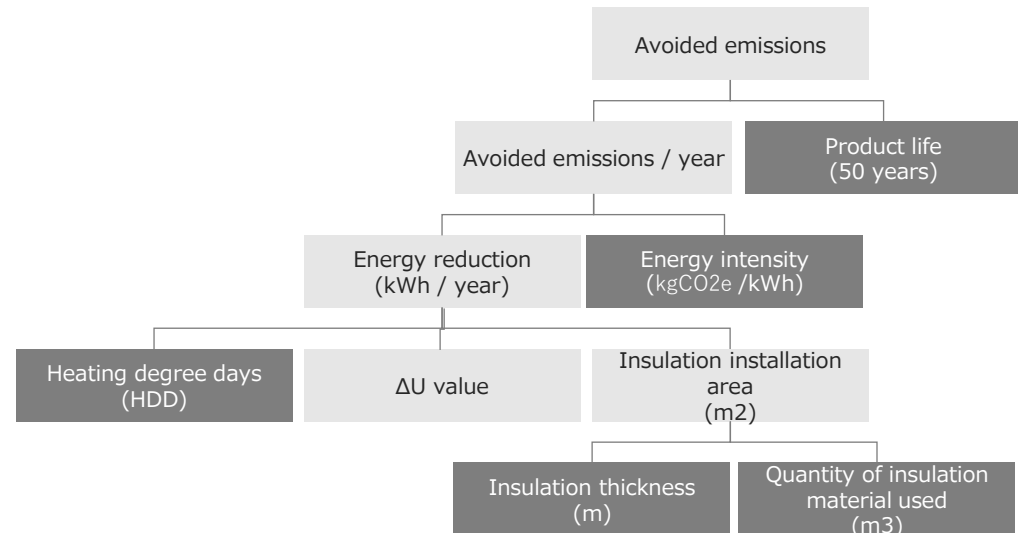
Since various guidance (e.g., WBCSD) recommends that avoided emissions be calculated conservatively, the company has set conservative conditions for items of high uncertainty, such as product life and the scope of calculation.

Methodology

The logic for calculation of avoided emissions is as shown below. The amount of energy saved per year is calculated based on the ΔU value (difference in heat transfer coefficient), and avoided emissions per year are calculated by multiplying further by energy intensity. Moreover, we calculate avoided emissions associated with the use of products by multiplying that value by product life. Calculations were performed on a flow basis. It is generally accepted that product life is about 60 years (●● et al., 2018), but because there is no clear standard, we have set 50 years as the product life to calculate conservatively.

[Legend]

- Estimates based on various documents and the company's results
- Values calculated based on estimated and actual values



2. Avoided emissions

Target products and services:
Insulation materials

Points

Disclosure of estimates

The company ensures transparency by disclosing emissions in a list of tables, including estimates, tentatively set values and references. The company specifies that sales volumes and other data that are difficult to disclose, are “Not disclosed” and clarifies that it uses the company’s unique data.

Contribution ratio

At present, no clear figure has been determined for the contribution ratio, but the company has tentatively set a value and disclosed its assumptions.

Data on use

The data used for calculation are as follows. Since intensity and fuel mix differ depending on the country of sale, we referred to the values given in the documents of the governments of Europe, the United States and Japan. Other values were set as estimates based on the results of investigations by the technical expert team at Ω.

Item		Subject products (insulation materials)	
		Exterior wall	Roof
Product life		50 years (industry average 60 years)	
Air-conditioning-related emissions	Intensity by country	Calculated based on the following	
	Thermal efficiency (%)	Coal (70%), biomass (80%), oil (90%) Gas (95%) electricity (100%)	
	Fuel mix	Reference to each national government’s materials	
	Energy intensity (kgCO ₂ e / kWh)	IEA data IPCC National Greenhouse Gas Inventories	
Quantity of insulation material used by product	Total sales volume (m ³)	Non-disclosed (company data)	
	Sales ratio (%)	Non-disclosed (company data)	
	Use (%)	98% (estimated by Ω)	
Insulation thickness	Λ value (thermal conductivity) (W/mK)	0.034	0.038
	U value before use of the company’s insulation material (heat transfer coefficient)	1.50	1.50
	U value after use of the company’s insulation material (W / m ² K)	0.15	0.10
ΔU value (W / m ² K)		1.35	1.40
Heating degree days (HDD)		460-5307	

2. Avoided emissions

Target products and services:
Insulation materials

Points

Disclosure of estimates

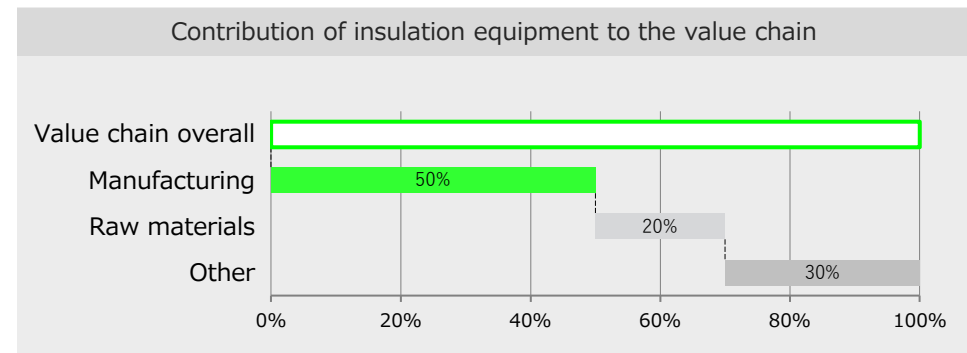
The company ensures transparency by disclosing emissions in a list of tables, including estimates, tentatively set values and references. The company specifies that sales volumes and other data that are difficult to disclose, are “Not disclosed” and clarifies that it uses the company’s unique data.

Contribution ratio

At present, no clear figure has been determined for the contribution ratio, but the company has tentatively set a value and disclosed its assumptions.

Data on use

Avoided emissions due to the use of insulation materials (external structure and roof) were 360 MtCO₂e. This value is multiplied by the set contribution ratio (50%) to disclose avoided emissions of 180 MtCO₂e for 2023. Because there are no clear guidelines on the contribution ratio, we set the following contribution ratio tentatively by dividing it into manufacturing, raw materials, and others based on exchanges of opinions with experts.

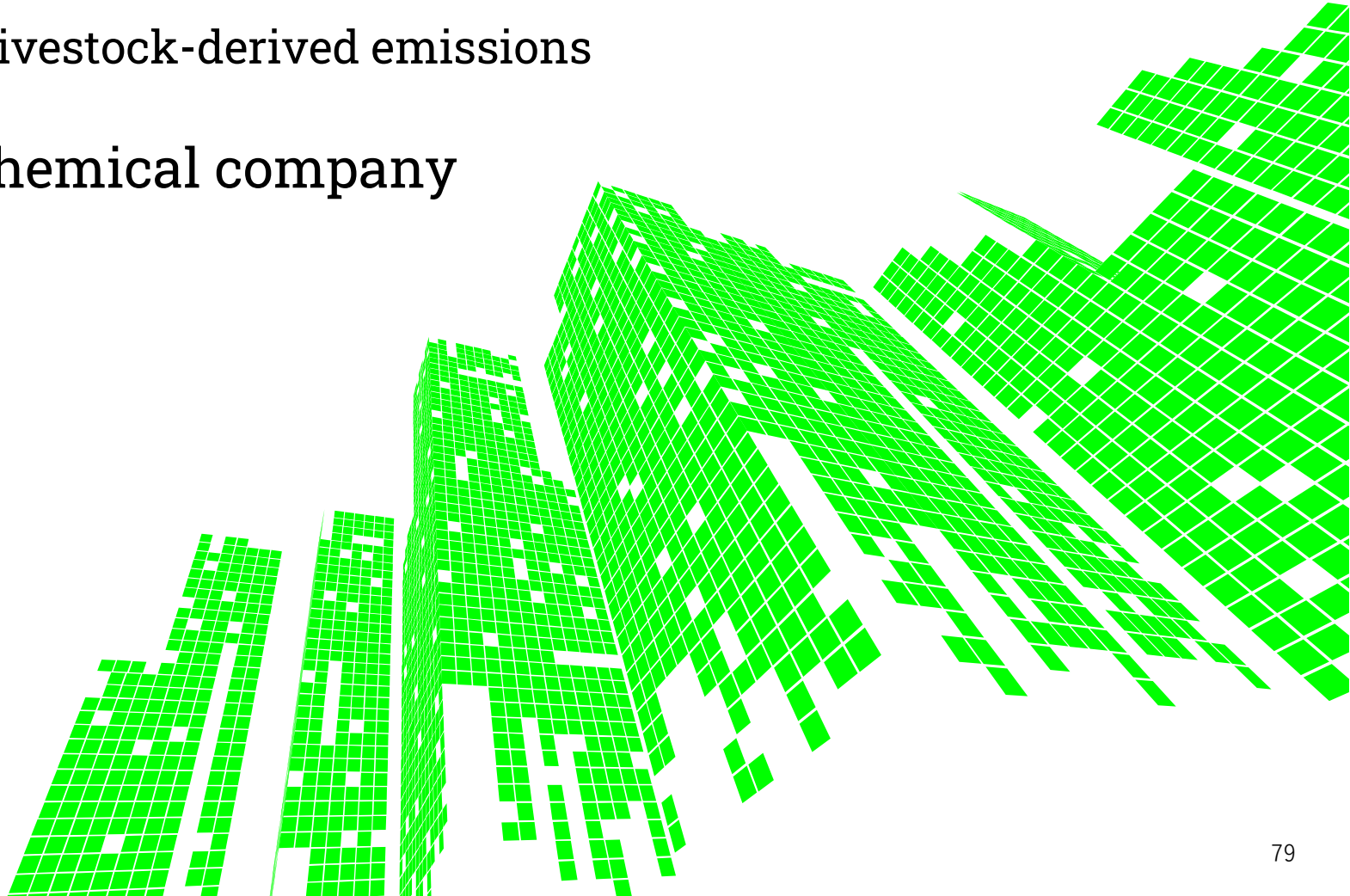


The calculation method for avoided emissions has not changed since 2018, but we will update the data and revise the calculation method in future as required.

02

(10) Reduction of livestock-derived emissions

Example of a chemical company



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Chemical

Location: Japan

Business: Information, electronics and chemicals business centered on manufacturing and sales of basic chemicals and functional chemicals, healthcare business and agriculture-related business

Points

Target setting based on national goals and policies

It may not necessarily be appropriate to apply a uniform level to emission reduction targets due to regional characteristics, etc. In the case study on the right, the company has set targets with reference to Japan's NDC and by the Ministry of Economy, Trade and Industry's technology roadmap, and these references are also disclosed as grounds for the targets.

| Strategies for achieving carbon neutrality by 2050

Climate change is a major issue common to humanity in the 21st century. It occupies an important position in both financial materiality and impact materiality and is an issue that should be addressed throughout the value chain. The chemical industry is currently using raw materials derived from fossil fuels and has the responsibility to promote initiatives for the achievement of the Paris Agreement. The company aims for the realization of carbon neutrality by 2050 through the power and innovation of chemistry.

We will work from two aspects: the reduction of emissions in the value chain and contributions to the decarbonization of society for the realization of carbon neutrality by 2050. To promote such initiatives, we have established a Management Strategy Subcommittee in the GX Promotion Department, chaired by the CEO, which analyzes scenarios, manages risks, and formulates strategies for the achievement of carbon neutrality as an organization under the direct control of the Board of Directors. In addition, we have introduced internal carbon pricing as a measure to accelerate our initiatives and revised the price last year from 3,000 yen / tCO₂e to 10,000 yen / tCO₂e.

- ✔ **Achievement of CN by 2050 across the entire value chain (Scope 1 to 3)**
- ✔ **Maximization of avoided emissions for the achievement of CN in society together with customers**

1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Chemical

Location: Japan

Business: Information, electronics and chemicals business centered on manufacturing and sales of basic chemicals and functional chemicals, healthcare business and agriculture-related business

Points

Disclosure of targetsetting forecast

Essentially, the Basic Guidelines call for the setting of targets for Scope 1 to 3, but there are cases where target setting is difficult at the present time because reductions require cooperation with the supply chain and initiatives that extend over a wide range. In light of this situation, the example on the right presents the reasons why target setting for Scope 3 is difficult and the plan for the timing of target setting.

Carbon neutral roadmap

As specific initiatives to achieve carbon neutrality, we formulated a carbon-neutral roadmap for the company based on the technology roadmap for the chemical sector formulated by the Ministry of Economy, Trade and Industry. As a company that handles a wide range of basic chemicals and functional chemicals, we have Scope 3 emissions as well as emissions derived from the use of heat and processes during manufacturing.

With regard to Scope 1 + 2 emissions, we aim for the achievement of carbon neutrality, focusing on three measures: fuel conversion; raw material conversion, and raw material recycling. For Scope 3 emissions, we will cooperate with suppliers to request the conversion of raw materials and the use of renewable energy, and establish a basic policy on procurement. Further, we will also reduce product disposal (category 12) by developing of recycling technologies.

With regard to specific emissions reduction targets, the company set targets and plans centered on the Management Strategy Subcommittee in the GX Promotion Department. In setting targets, we set a 25% reduction in fiscal year 2030 compared to fiscal year 2018 (Scope 1 + 2) based on Japan's reduction targets for achievement of the Paris Agreement, energy price and technology forecasts in scenario analysis based on Japan's NDC, the TCFD recommendations, and initiatives consistent with the roadmap formulated by the Ministry of Economy, Trade and Industry. In addition, we have currently disclosed figures for Scope 3 tentatively, ; we are cooperating with suppliers to set targets for high-impact categories and will establish a policy for handling by fiscal year 2024 and set targets by fiscal year 2025.

1. Strategies for achieving carbon neutrality

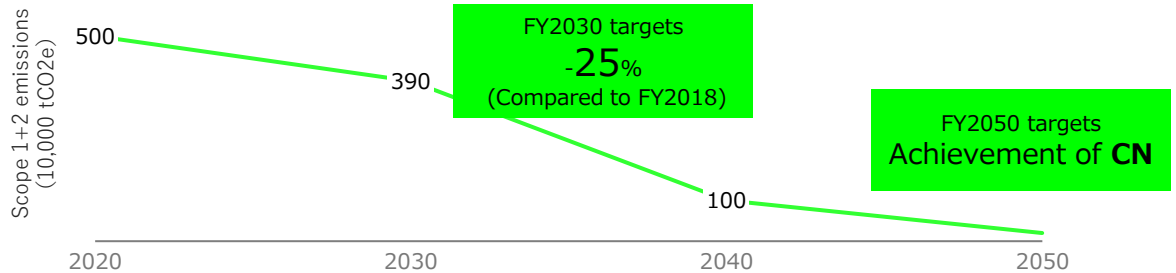
Corporate profile

Industry: Chemical
 Location: Japan
 Business: Information, electronics and chemicals business centered on manufacturing and sales of basic chemicals and functional chemicals, healthcare business and agriculture-related business

Points

Disclosure of targetsetting forecast

Essentially, the Basic Guidelines call for the setting of targets for Scope 1 to 3, but there are cases where target setting is difficult at the present time because reductions require cooperation with the supply chain and initiatives that extend over a wide range. In light of this situation, the example on the right presents the reasons why target setting for Scope 3 is difficult and the plan for the timing of target setting.



	Recent	Transition	Realization of decarbonization
Fuel conversion	<ul style="list-style-type: none"> ●Energy saving and higher efficiency ●Use of renewable energy ●Use of low-carbon fuels 	<ul style="list-style-type: none"> ●Hydrogen and ammonia co-firing 	<ul style="list-style-type: none"> ●Hydrogen and ammonia mono-firing
Raw material conversion	<ul style="list-style-type: none"> ●Artificial photosynthesis (RD&D) 	<ul style="list-style-type: none"> ●Expansion of bio-raw materials 	
Raw material circulation	<ul style="list-style-type: none"> ●Material recycling (RD&D) 	<ul style="list-style-type: none"> ●Chemical recycling (RD&D) 	<ul style="list-style-type: none"> ●Introduction of recycling technology

With regard to specific emissions reduction targets, the company set targets and plans centered on the Management Strategy Subcommittee in the GX Promotion Department. In setting targets, we set a 25% reduction in fiscal year 2030 compared to fiscal year 2018 (Scope 1 + 2) based on Japan's reduction targets for achievement of the Paris Agreement, energy price and technology forecasts in scenario analysis based on Japan's NDC, the TCFD recommendations, and initiatives consistent with the roadmap formulated by the Ministry of Economy, Trade and Industry. In addition, we have currently disclosed figures for Scope 3 tentatively, ; we are cooperating with suppliers to set targets for high-impact categories and will establish a policy for handling by fiscal year 2024 and set targets by fiscal year 2025.

2. Avoided emissions

Target products and services:
Feed Additives

Points

Reduction of N2O in the livestock industry

Feed additives contribute to reducing N2O, a GHG, and are products that contribute to the reduction of the GHG emissions of society as a whole. The example on the right explains how the company's products are consistent with climate change handling while providing a breakdown of livestock emissions. In addition, it also discloses that feed additives have been raised among the countermeasures of the Ministry of Agriculture, Forestry, and Fisheries. It explains that they are consistent with national policy.

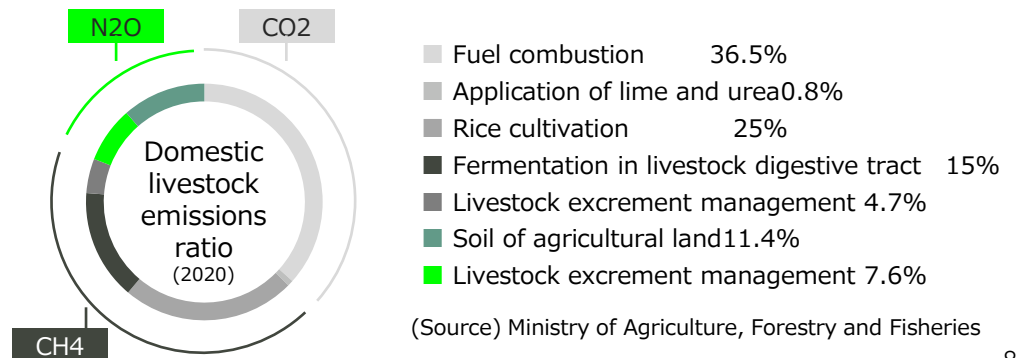
Disclosure of sales ratio

The Basic Guidelines and the WBCSD Guidance recommend or require that the sales ratios of products subject to avoided emissions are disclosed for the avoidance of greenwashing. In the example on the right, the sales ratio is also disclosed when explaining the eligibility for dealing with climate change of feed additives, the products subject to the avoided emissions.

Contribution to decarbonization of the livestock industry

In addition to reducing emissions throughout the value chain, we are aiming to work with customers to support the realization of carbon neutrality in society. We will contribute to the reduction of emissions in society by promoting the reduction of emissions by customers through the products that we manufacture. We have presented this initiative quantitatively using avoided emissions, which is an indicator that quantifies the positive impacts on climate.

Feed additives, which we manufacture and sell as part of our agriculture-related business, account for 0.5% of our sales and are important products that contribute to climate change mitigation by enabling the reduction of N2O in livestock excrement when mixed with livestock feed. The livestock industry accounts for 14% of the world's GHG emissions, and suppressing gastrointestinal tract-derived emissions, such as the methane contained in cattle burps, and management-derived emissions, such as the nitrogen oxide contained in swine and poultry excrement, is an important measure for the handling of climate change. By reducing the nitrogen content in pig excreta, the company's feed additives can reduce the N2O of excrement while maintaining productivity amount. The use of feed additives is also raised among the global warming countermeasures of the Ministry of Agriculture, Forestry and Fisheries.



(Source) Ministry of Agriculture, Forestry and Fisheries

2. Avoided emissions

Target products and services:
Feed Additives

Points

Reduction of N2O in the livestock industry

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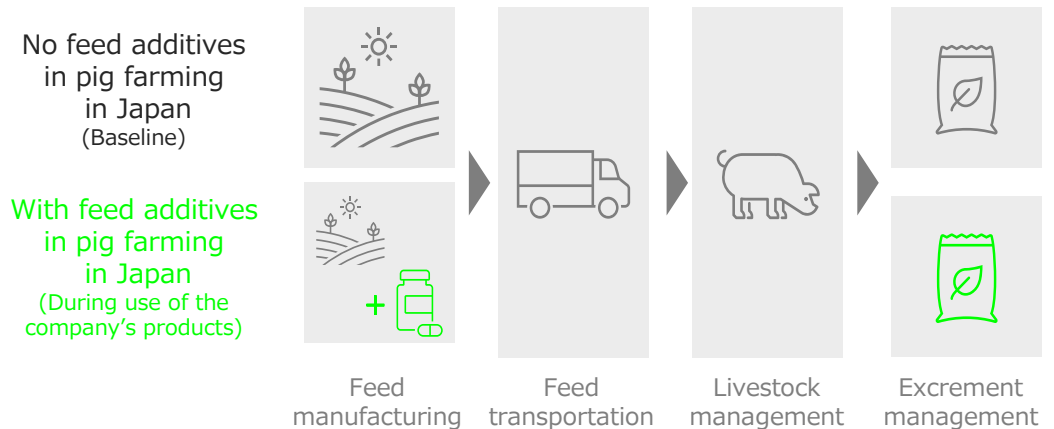
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Assumption for calculation

Feed additives are combined with feed for pigs and poultry. Intensity based on the management of excrement differs by the treatment method for each livestock, so we set different values for them in calculations. The avoided emissions of company products have been calculated only for pig feed additives and only for domestic sales, which account for 90% of sales overall.

Avoided emissions due to the use of the company's products are generated mainly at the disposal stage (excrement management), but calculations over the lifecycle are required, so all of the feed manufacturing, including the feed additive manufacturing stage, feed transportation, livestock management, and excrement management, have been included in the subjects of calculation. In addition, the subject of comparison (baseline) is the case where feed additives are not used in pig farming in Japan.



2. Avoided emissions

Target products and services:
Feed Additives

Points

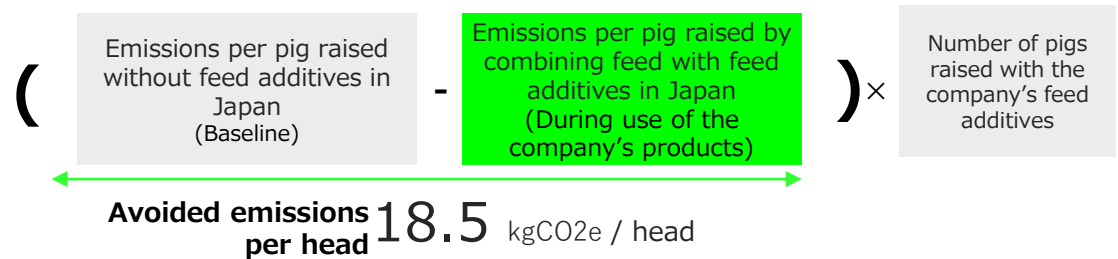
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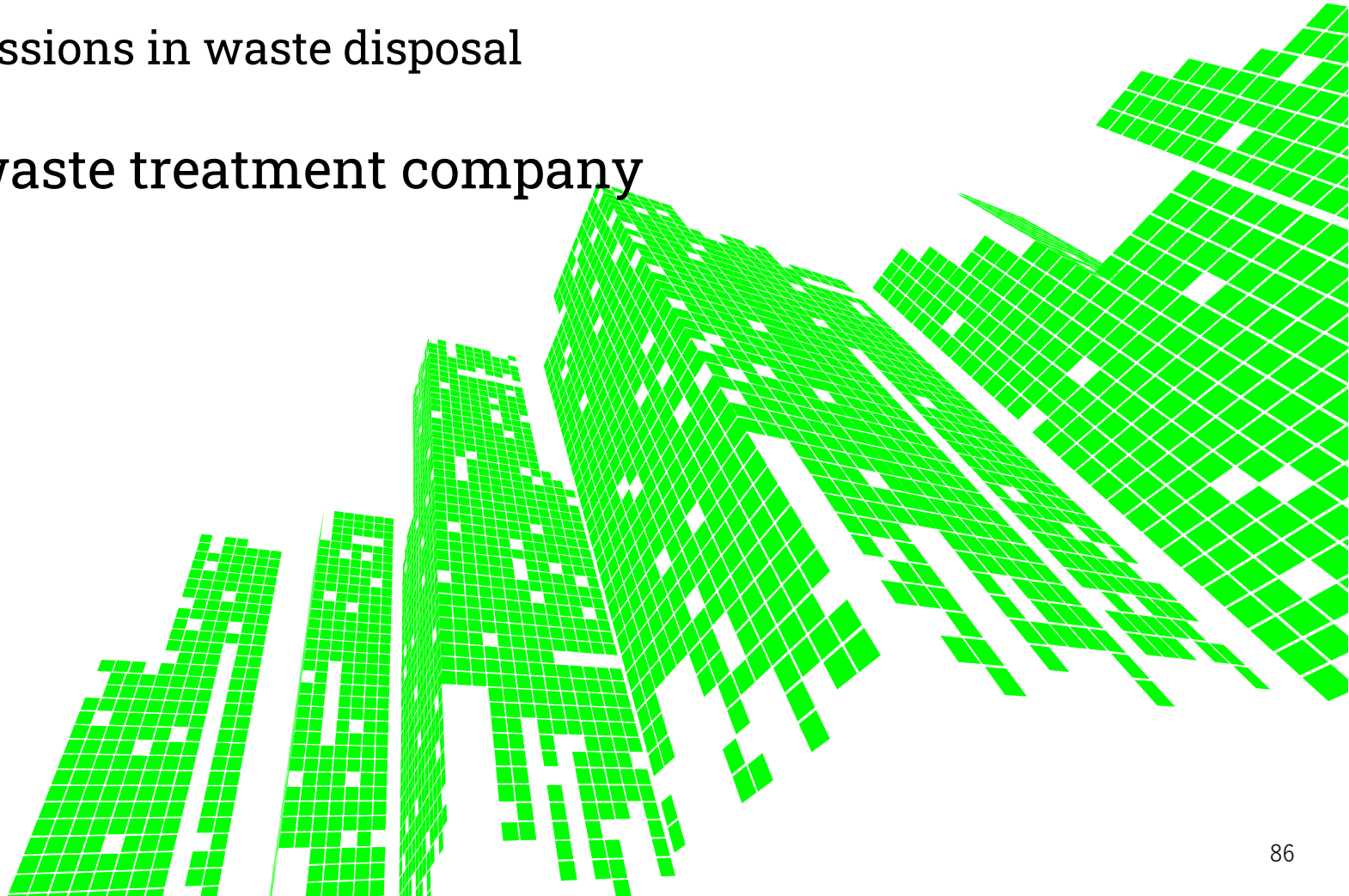
For the specific baseline figures, we referred to the Greenhouse Gas Inventory Report by Japanese government and the Japan Chemical Industry Association's research results. For the concept, we referred to publications of the National Agriculture and Food Research Organization (NARO). As a result of calculations, avoided emissions from the raising to the shipment of 1 pig were 18.5 kgCO₂e. We calculated avoided emissions by multiplying this by the number of pigs raised using the company's feed additives sold in fiscal year 2022. We have disclosed the total figures for avoided emissions combined with the calculation results for other subject products in our ESG data book.



02

(11) Control of emissions in waste disposal

Example of a waste treatment company



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Waste Treatment
Location: Japan
Business: Collection and treatment of general waste, industrial waste, specially controlled waste, etc. Also, joint development of recycled products, etc.

Points

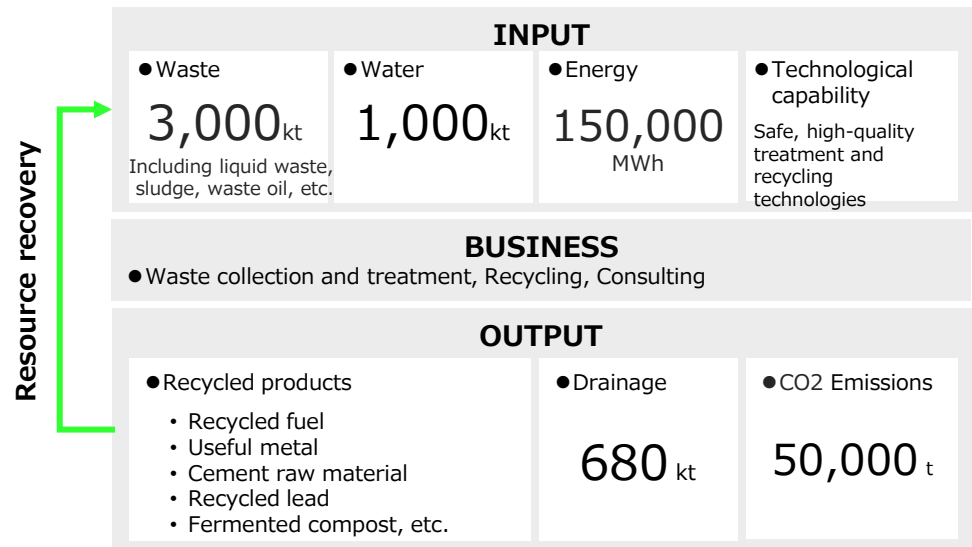
Establishment of a governance structure

We established the Sustainability Committee, chaired by the Representative Director, to promote sustainability, including handling climate change. The company has disclosed its governance system based on the TCFD, described the frequency of reporting to the Board of Directors, etc., and also set KPIs. Moreover, the company has also described an initiative that links those KPIs to the remuneration of executive officers so that the actual implementation and promotion of sustainability management function.

Environmental contributions

Resource recovery and the reduction of environmental burden by the venous industry

As a company in the venous industry, our mission is to contribute to the building of a recycling-oriented society that apprehends waste as a resource. As a waste treatment company, we collect and treat various types of waste, including household waste and industrial waste nationwide, with industrial waste, including waste reagents, oil and sludge, medical waste, and waste acids. It is assumed that the waste treatment business will also be affected by cost increases, including carbon pricing, due to increased environmental awareness increases and the implementation of policy measures. On the other hand, reductions in the use of virgin materials by improving waste recycling technology and moving away from simple incineration will be opportunities for our business. We will respond to climate change and contribute to the circular economy towards realizing a sustainable society, a common issue for humankind. (INPUT details are available on the website)



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Waste Treatment

Location: Japan

Business: Collection and treatment of general waste, industrial waste, specially controlled waste, etc. Also, joint development of recycled products, etc.

Points

Establishment of a governance structure

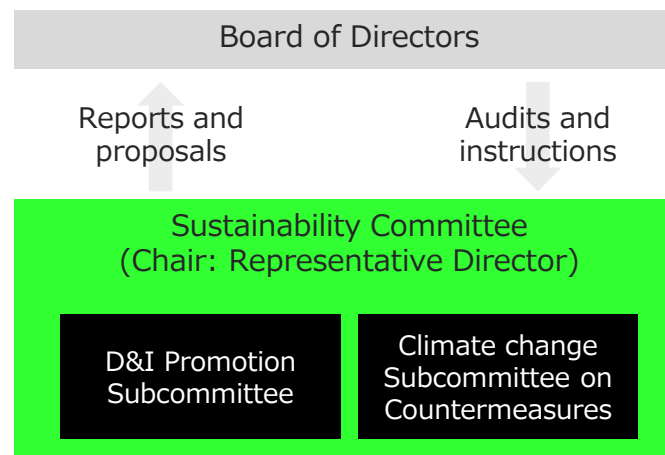
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Governance and strategy

Governance

We have established a Sustainability Committee to implement steady environmental contributions. The Sustainability Committee is responsible for strategies, planning, and risk management concerning sustainability, reports to the Board of Directors each quarter, and adopts resolutions to promote sustainability in conjunction with management. Further, we have linked emission reduction targets to the remuneration of executive officers so that the implementation and promotion of sustainable management functions.



1. Strategies for achieving carbon neutrality

Corporate profile

Industry: Waste Treatment

Location: Japan

Business: Collection and treatment of general waste, industrial waste, specially controlled waste, etc. Also, joint development of recycled products, etc.

Points

Establishment of a governance structure

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Governance and strategy

Strategy

In 2022, SBTi certified that our emission reduction targets set for the handling of climate change were well below the 1.5 ° C level. We aim to achieve net zero by fiscal year 2050. In addition, we have set targets for the handling of climate change and contributing to the circular economy aside from our emissions reduction targets and have also formulated specific actions for target achievement. Since demand for recycled fuel is expected to decrease along with the decline in the use of fossil fuels, we have positioned the promotion of material recycling as an important initiative.

- Scope 1 + 2: 35% reduction by FY 2028 (compared to FY2021)
- Scope 3: 20% reduction by FY2028 (compared to FY2021)
- Switch to renewable energy: 100% renewable energy by FY2030
- Efficiency of water use: 20% improvement by FY2028 (compared to FY2021)

- Conversion to ZEB and introduction of EVs
- Energy-saving factories through the introduction of turbo blowers and use of waste heat
- R&D on material recycling technology
- Supply chain engagement

FY2050
Net Zero

Our GHG emissions in the fiscal year 2022 increased by 3% from the fiscal year 2015. This was due increases in energy-derived emissions caused by factors such as difficulties in the procurement of renewable energy associated with the business withdrawal of electric power companies. On the other hand, non-energy-derived emissions have decreased for 5% by incinerating waste plastic and greatly reducing its volume. For the details of emissions, please see the ESG data book.

2. Avoided emissions

Target products and services:
Recycling technology

Points

Consideration of energy use and emissions when recycling

While the Ministry of the Environment has established that emissions associated with recycling waste oil are zero because CO₂ is emitted by using energy in processes such as oil-water separation, the company takes these emissions into account when calculating avoided emissions. At the same time, emissions other than process-derived CO₂ are included in recycling emissions.

Consideration of the adverse impacts of recycling

The scope of calculation in the case on the right covers emissions at the time of disposal. However, after stating that there are emissions associated with the use of fuel reused after disposal, the company then explains that these are not included as an adverse impact for the reason that emissions do not greatly from normal fuel use and considers whether or not there are adverse effects associated with recycling.

Contribution to the reduction of the greenhouse effect through recycling

Currently, some waste is treated by simple combustion, which emits a large amount of CO₂ at the time of disposal and then goes into landfill as incinerated ash. We are contributing to the realization of a decarbonized society and a circular economy by reusing resources through the use of recycling technologies.

The concept of avoided emissions is presented as an indicator of such contributions to the decarbonization of society. The Basic Guidelines for Disclosure and Evaluation of Climate-related Opportunities were formulated by the GX League in March 2023, organizing the league's way of thinking on avoided emissions. Based on the Basic Guidelines and the WBCSD guidance, we have calculated the avoided emissions due to our recycling technology to visualize the impact of our business.

Simple combustion treatment and recycling

Waste oil, which is the subject of the company's avoided emission calculation, accounts for about 30% of all CO₂ emissions from all types of disposal in Japan. About 40% of these are simply combusted, and the carbon contained in waste oil is emitted into the atmosphere as CO₂ during combustion (according to a survey conducted by the Ministry of the Environment in 2019). By reusing this waste oil as biodiesel oil using the company's recycling technology, it can be used as a new energy source.

2. Avoided emissions

Target products and services:
Recycling technology

Points

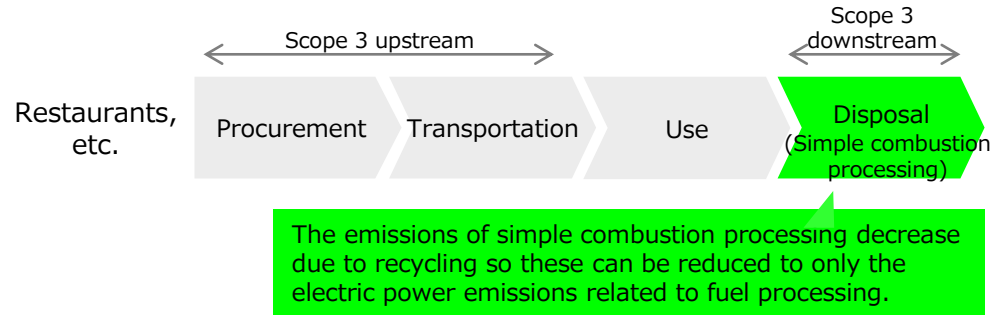
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In the Emission Intensity Database for Calculating Greenhouse Gas Emissions and Other Emissions of an Organization Through Its Supply Chain (Ver. 3.1) published by the Ministry of the Environment, the emission intensity in the case where waste oil is recycled is set to zero so this will lead to the reduction of our customers' Scope 3 category 5 (Waste) emissions. When calculating avoided emissions, the baseline is defined as emissions from simple combustion processing, and the difference with the amount of fuel used when the company recycles waste oil is calculated as the avoided emissions.



If 1 ton of waste oil is processed in Japan

The calculated value of avoided emissions in association with the recycling of waste oil is a theoretical value that compares the company's processing results in fiscal year 2022 with the emissions generated when customers process waste oil by simple combustion. Emissions in the case of simple combustion treatment are based on the carbon-derived CO₂ contained in waste oil and are calculated using emission factors from the Manual for the Calculation and Reporting of Greenhouse Gas Emissions published by the Ministry of the Environment.

2. Avoided emissions

Target products and services:
Recycling technology

Points

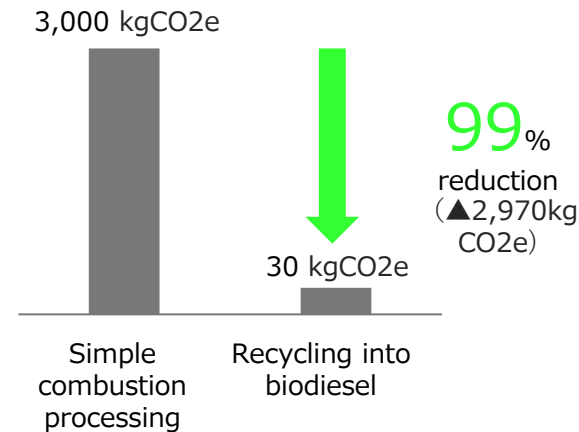
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On the other hand, the emissions due to the company's recycling fall into two categories: energy-derived emissions associated with oil-water separation and fuel processing and CH₄ and N₂O generated by wastewater treatment, calculated to be 30kgCO₂e. Energy-derived emissions are calculated by multiplying the amount of energy used by the energy intensity announced by the Ministry of the Environment. For emissions associated with wastewater treatment, we use the figures calculated by converting CH₄ and N₂O into their CO₂ equivalents. On this basis, avoided emissions per ton of waste oil in Japan were 2,970 kgCO₂e / t, so based on the company's processing results in fiscal year 2022, avoided emissions associated with the recycling of waste oil were 100,000 t-CO₂e.



Recycling into biodiesel leads to the reduction of emissions at the time of disposal, but recycled fuel is consumed at the time of its use and CO₂ is emitted. However, because the emissions at the time the fuel is used do not increase significantly compared to the use of other fuels, we have not identified these as an important adverse impact, but we will continue to evaluate the impacts on the environment from various perspectives.