Brother Earth

よりよい地球環境を、あなたとともに。

brother at your side

Carbon Neutrality Report
Kariya Factory,
Brother Industries, Ltd.

April 1, 2023–March 31, 2024

October 1, 2024

Brother Industries, Ltd.

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*“GHG” stands for greenhouse gas and indicates substances that cause global warming.

1. Declaration of Carbon Neutrality

1.1 Overview of Kariya Factory

Brother Industries, Ltd.'s Machinery Business consists of the Industrial Equipment Business, which handles machine tools, and the Industrial Sewing Machine Business, which handles industrial sewing machines and garment printers. The Kariya Factory, meanwhile, develops and manufactures machine tools and garment printers and so on.

When launching into sewing machine manufacturing, Brother began developing (producing) machine tools in-house as processing equipment to manufacture important sewing machine parts. Later, Brother began selling the equipment externally as machine tools, which are now used by customers in an array of businesses including automobiles and general machinery, among others in the parts processing sector.

For garment printers, Brother applies the inkjet technology that it developed through office-use printers, thereby contributing to boosting customers' productivity by meeting clothing-related digital printing needs.

1.2 Declaration of Carbon Neutrality

In the Group's Vision "At your side 2030," the Brother Group explicitly states that its raison d'être ("Our Purpose") is that "by being 'At your side,' we enable people's productivity and creativity, contribute to society, and help protect the earth." This reflects the Brother Group's hope to contribute—through its business operations—to solving global environment-related and other social issues as well as realizing a sustainable society. The Kariya Factory, currently Brother's largest manufacturing facility in Japan, has a solar power generation system installed on its site as an endeavor to become carbon neutral. An array of other approaches are underway as well to reduce electricity consumption at the factory. Examples include introducing set control operations of compressors, looping air piping, taking measures against air leakage, switching to LED lighting, and optimizing ventilation fans. Plans are in place to build more solar power generation systems on the site and procure a Brother Industries-dedicated renewable energy through off-site solar PPA in Nagano prefecture. Furthermore, the in-production compact machining center SPEEDIO boasts industry-leading environmental performance and significantly alleviates the burden on the environment by reducing the four wastes (time, resource, energy, and space) found in customers' parts machining processes. For many years, Brother has calculated the life cycle assessments (LCA) of its products and set the results as indicators for environmental protection activities. The carbon footprint figure of the products can be further reduced through the current carbon neutrality approaches.

Based on the "Brother Group Environmental Vision 2050," we, the Brother Group, will endeavor to solve the CO_2 emissions reduction issue as a matter of materiality, and proactively contribute to realizing a sustainable society. We will also extend our actions beyond business operations and work in solidarity with the entire value chain to minimize the burden on the global environment. By doing so, we will contribute to shaping a world where everyone can enjoy a prosperous future together.

Makoto Hoshi
Senior Managing Executive Officer
Head of Machinery Business Division

2. Subjects of Carbon Neutrality

2.1 Subjects of the Declaration of Carbon Neutrality

The Kariya Factory of Brother Industries, Ltd. (“Kariya Factory”) is Brother’s largest manufacturing facility in Japan and serves a key role in the Machinery Business. Direct GHG emissions from the Kariya Factory (Scope 1) and indirect GHG emissions from the energy imported to the factory (Scope 2) are covered by the Declaration of Carbon Neutrality. To realize carbon neutrality, approaches will be made to reduce these two types of emissions through the factory’s operations.

GHG emissions from raw material procurement, manufacturing, distribution, sales, and disposal related to business operations (Scope 3) are addressed with the Brother Group’s target for a 30% reduction from the FY2015 level across the value chain by 2030, and are thus excluded from the scope pertaining to the Kariya Factory’s carbon neutrality. To minimize CO_2 emissions across the value chain by 2050, the Brother Group will contribute toward creating a carbon-free society.

2.2 Scope of quantification

The quantification of the Kariya Factory’s GHG emissions applies to the scope below.

Table 1. Scope of GHG emissions quantification

Category	Source of emissions
1	Direct GHG emissions
1.1	Direct GHG emissions from the use of city gas
1.2	Direct GHG emissions from the fuel consumption of company vehicles
	Direct GHG emissions from the fuel consumption of forklifts
	Direct GHG emissions from the fuel consumption of lawn mowers
1.3	CO_2 emitted by the combustion of raw materials at catalytic combustion VOC processing facilities
	CH_4 and N_2O emissions from water-purifier tanks
1.4	Direct GHG emissions caused by the leakage of refrigerant from air conditioners, chillers, and other hydrofluorocarbon (HFC) equipment
2	Indirect GHG emissions from imported energy
2.1	Indirect GHG emissions from electricity consumption

2.3 Methodology for the calculation of GHG emissions

To quantify Brother’s contribution to global warming, GHG emissions are calculated in accordance with the international standard ISO 14064-1:2018. The totalized scope of GHG emissions is limited to the Kariya Factory and is described in carbon dioxide equivalent (t-CO_2e) . The absolute values of carbon dioxide equivalent GHG emissions are used for comparison with past results.

2.4 Verification body

BSI Group Japan K.K., a third-party verification organization

2.5 Base period
Approaches to reduce GHG emissions will be made by setting the emissions of the base period as baseline. The base period is between April 1, 2022 and March 31, 2023 (FY2022).

2.6 Reporting period
The carbon neutrality reporting period for this report is between April 1, 2023 and March 31, 2024 (FY2023).

3. Quantification of GHG Emissions

3.1 GHG emissions in the base period (baseline)

Table 2. GHG emissions in the base period

Category	Source of emissions	GHG emissions ($t\text{-}CO_2e$)
1	Direct GHG emissions	
1.1	Use of city gas	1400.26
1.2	Fuel consumption of company vehicles	60.10
	Fuel consumption of forklifts	2.60
	Fuel consumption of lawn mowers	1.00
1.3	Catalytic combustion VOC processing	85.77
	CH_4 and N_2O emissions from water-purifier tanks	0.77
1.4	Leakage of refrigerant from HFC equipment	141.48
Total of category 1		1691.98
2	Indirect GHG emissions from imported energy	
2.1	Electricity consumption (market-based)	4434.68
	Electricity consumption (location-based)	5694.88
Total of categories 1 and 2 (market-based)		6126.66
Total of categories 1 and 2 (location-based)		7386.86

When the GHG emissions of the base period are inconsistent or inappropriate, they are recalculated retroactively. This applies without exception, and to both the increases and decreases in the emissions.

3.2 Identification of GHG emissions sources and calculation methods
Operations and processes rolled out at the Kariya Factory had their sources of GHG emissions identified. Significant figures pertaining to the emissions from the identified sources were retained, and were not rounded off, discarded, or rounded up in the calculation process. The third decimal place was rounded off for the first time after entering the GHG emissions reporting phase.
The GHG calculation method references the “Greenhouse Gas Emissions Accounting and Reporting Manual” of the Japanese Ministry of the Environment’s Greenhouse Gas Emissions Accounting, Reporting, and Disclosure System. For global warming potential (GWP), values

based on 100-year scenarios presented in the Intergovernmental Panel on Climate Change (IPCC) were used. For emission factors, we used the following and referenced values publicly disclosed as of April 1 of the subject year.

- Fossil fuels: Emission factors publicly disclosed by GHG Protocol, which are global averages
- Location-based electricity: Japan's emission factor in the IEA's Emissions Factors resource
- Market-based electricity: Emission factor publicly disclosed by power utilities
- Global warming coefficients: Coefficients publicly disclosed in the IPCC Fourth Assessment Report

3.3 Exclusion of GHG emissions

All major GHG emission sources are subject to GHG emission calculations, excluding the sources listed below. This is because they collectively account for no more than 0.5% of the entire emissions and each source contributes less than 0.1 t-CO_2e, resulting in an insignificant overall impact.

- Use of gasoline and diesel oil in test operations of emergency generators
- Release of filler gas from aerosol cans
- Combustion of engine oil added to the gasoline of lawn mowers
- Release from CO_2 fire extinguishers

3.4 GHG emissions in the reporting period

Table 3 shows the GHG emissions of the base period and the reporting period, as well as the differences between them. During the reporting period, category 1 (direct GHG emissions) totaled approximately 486 t-CO_2e lower than the base period. This result was impacted by the benefits of renewing gas heat pump air conditioners and the low amount of refrigerant leakage from air conditioner equipment.

Only CO_2-free electricity derived from on-site solar power generation and renewable energy was used during the reporting period. As a result, no real-term CO_2 was generated from electricity consumption. Regardless, we calculated GHG emissions by multiplying the Kariya Factory's total electricity consumption (i.e., the total of electricity purchased from power utilities and the electricity generated through on-site solar power generation equipment) by a conversion factor. For market bases, we made conversions using emission factors that power utilities publicly disclosed; for location bases, we made conversions using Japan's emission factor in the IEA's Emissions Factors resource. During the reporting period, category 2 (indirect GHG emissions from imported energy) decreased by approximately 212 t-CO_2e on market-based terms and by approximately 514 t-CO_2e on location-based terms from the base period. The contributing factors of this include the energy-saving benefits of compressors and air conditioners.

Table 3. GHG emissions in the base period and the reporting period and their differences

Category	Source of emissions	Base period ($t\text{-}CO_2e$)	Reporting period ($t\text{-}CO_2e$)	Difference ($t\text{-}CO_2e$)
1	Direct GHG emissions			
1.1	Use of city gas	1400.26	1047.38	-352.88
1.2	Fuel consumption of company vehicles	60.10	58.57	-1.53
	Fuel consumption of forklifts	2.60	1.71	-0.89
	Fuel consumption of lawn mowers	1.00	1.14	0.14
1.3	Catalytic combustion VOC processing	85.77	82.90	-2.87
	CH_4 and N_2O emissions from water-purifier tanks	0.77	0.81	0.04
1.4	Leakage of refrigerant from HFC equipment	141.48	13.36	-128.12
2	Indirect GHG emissions			
2.1*	Electricity consumption (market-based)	4434.68	4222.34	-212.35
	Electricity consumption (location-based)	5694.88	5181.07	-513.81
Total*	Total (market-based)	6126.66	5428.20	-698.46
	Total (location-based)	7386.86	6386.94	-999.93

Table 4. The Kariya Factory's electricity consumption

		Base period	Reporting period
Total electricity (MWh)		11701.01	10882.31
GHG emissions of total electricity ($t\text{-}CO_2e$)		4434.68	4222.34
	On-site solar power generation (MWh)	122.65	123.09
	CO_2-free electricity (MWh)*	0.00	10759.22
Electricity from renewable energy (MWh)		122.65	10882.31
Electricity from non-renewable-energy sources (MWh)		11578.35	0.00
Real-term GHG emissions ($t\text{-}CO_2e$)		4388.20	0.00

*CO_2-free electricity indicates purchased renewable energy, and is procured through certificates.

Table 5. Real-term GHG emissions and differences

Category	Base period ($t\text{-}CO_2e$)	Reporting period ($t\text{-}CO_2e$)	Difference ($t\text{-}CO_2e$)
1	1,691.98	1205.87	-486.11
2	4,388.20	0.00	-4388.20
Total	6,080.18	1205.87	-4874.31

3.5 Uncertainty

The GHG emissions pertaining to "CO_2 emitted by the combustion of raw materials at catalytic combustion VOC processing facilities" assume that all organic solvents used in the process have evaporated and have been input into the catalytic combustion VOC processor (combustion furnace). Given the assumption that all organic solvents including the ones not input to the combustion furnace burned and turned into CO_2, the GHG emissions are likely overestimated compared with the actual amount.

The drainage discharge pertaining to "CH_4 and N_2O emissions from water-purifier tanks" is calculated by multiplying the annual average of the regularly measured daily drainage discharge by the number of days in the year. Measurements are taken on weekdays. Given that drainage discharge is lower on holidays than on weekdays, its annual average is likely overestimated. The GHG emissions are thus likely calculated to be higher than the actual level.

"Direct GHG emissions caused by the leakage of refrigerant from air conditioners, chillers, and other HFC equipment" are calculated from the amount of refrigerant added to the equipment. The leakage could potentially span multiple years beyond the calculated one, but the calculations are based on the maximum amount from the relevant year.

Given that at least 95% of the entire GHG emissions are calculated from reliable source data, the impact of uncertainty is likely very small.

4. Carbon Neutrality Management Plan

4.1 Carbon neutrality pathway

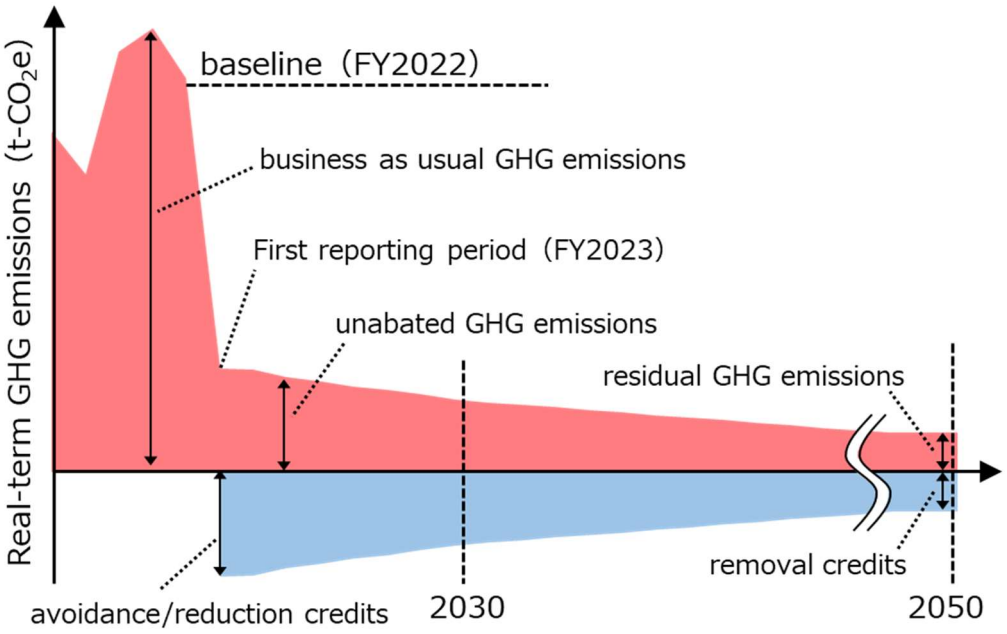

Figure 1. The Kariya Factory's carbon neutrality pathway

The Kariya Factory will endeavor to reduce GHG emissions by following its carbon neutrality pathway. A short-term target has been set for FY2030 and a long-term one for FY2050 as well, setting base- period GHG emissions as baseline.

Table 6. GHG emission targets

FY2022 (base period)	Real-term GHG emissions: 6,127 t-CO_2e (business as usual)
FY2030 (short-term target)	Real-term GHG emissions: 1,120 t-CO_2e or less
FY2050 (long-term target)	Residual GHG emissions only (aim for 613 t-CO_2e or less)

In support of the Paris Agreement, the Brother Group aims to contribute to creating a carbon-free society with zero GHG emissions. The Group accordingly formulated its global environment action plan “Brother Group Environmental Vision 2050,” targeting a 65% reduction from the FY2015 level for Scopes 1 and 2 in FY2030. This has been certified as a scientific evidence-based target (1.5°C target) by the Science Based Targets initiative (SBTi), an international initiative established to help achieve GHG emissions reduction targets.
The base period set for the Kariya Factory is FY2022, which differs from that (FY2015) of the “Brother Group Environmental Vision 2050.” A production factory was added onto the Kariya Factory site after 2015, which is the reason for setting FY2022, when the production factory took on its current form, as the base period.
Furthermore, the Kariya Factory will reduce its residual GHG emissions to 613 t-CO_2e or less by 2050. This is an endeavor to realize Brother Group’s 2050 Vision, which involves aiming to achieve carbon neutrality in all business operations (achieve zero CO_2 emissions overall from the Brother Group) and minimizing CO_2 emissions from the entire value chain by 2050, so as to contribute toward creating a carbon-free society.

4.2 Plan to reduce GHG emissions

The Kariya Factory aims to maximize its CO_2 emissions reduction through its own approaches, and will reduce GHG emissions by 10% from the base period by FY2030 through energy-reduction and switching endeavors. Plans are also being formulated to expand the renewable energy ratio to 20% or more, using dedicated power sources for the factory.
From GHG reduction approaches such as those described in Table 7, the following measures will be implemented as priority issues by FY2030 to achieve 1,120 t-CO_2e, the real-term GHG emissions target for said year.

- Introduction of motion sensor
- Air leakage countermeasure
- Optimization of compressor operating conditions
- Air conditioner renewal and load factor reduction
- Introduction of renewable energy
- Switching to electric from gas heat pump air conditioner

Table 7. GHG reduction approaches

Item	Examples of actions taken
Energy conservation measures	• Reduction of wasted approaches through visualization
	• Deactivation of light with motion sensors
Energy reduction by achieving higher efficiency	• Renewal to high-efficiency equipment
	• Reduction of energy loss
Introduction of renewable energy	• Increase of solar power generation equipment on site
	• Supply of electricity through off-site PPA
Switching of energy	• Replacement of GHG sources
	• Switching to electric city gas equipment
Offsetting of residual GHG emissions	• Purchase of carbon credits

The Kariya Factory will achieve carbon neutrality by 2050; only residual GHG emissions will remain, which will be fully offset by carbon removal credits. The assumed future sources of residual GHG emissions are provided below.

- Use of some gas heat pump air conditioners
- Use of gasoline and diesel oil in some vehicles
- Use of city gas in cafeterias as well as experiment and research equipment
- CH_4 and N_2O emissions from water-purifier tanks
- Leakage of refrigerant from HFC equipment

4.3 Evaluation of effectiveness and corrective actions

Departments in charge of environmental affairs evaluate the progress in energy conservation, energy creation, and CO_2 reduction approaches, thereby monitoring the effective implementation of the Carbon Neutrality Management Plan. The departments also collect information on climate change, and incorporate into the plan any newly confirmed scientific information or changes in technological, economic, or social conditions that significantly impact the plan. The plan will be reviewed every year. If the plan results in major changes in the short-term (FY2030 target) or long-term (FY2050 target) targets due to external or internal factors, relevant parties will be called to discuss corrective actions, and effective measures will thereby be taken to maintain a carbon-neutral status.

4.4 Means to avoid negative environmental and social impacts

Negative environmental impacts are expected when air conditioners are changed to latest models or when gas heat pump air conditioners are switched to electric ones, as the older systems are discarded. Negative impacts will be minimized by prioritizing the renewal of equipment that reached the end of their service life and by resource-recycling the old replaced equipment as much as possible.

5. Reduction of GHG Emissions During the Reporting Period

The following energy conservation and GHG emission reduction measures were implemented during the reporting period.

- Improvement of exhaust ducts in the compressor room to suppress the rise in room temperatures and lower the compressor intake air temperature, thereby reducing the electricity consumption of the compressor
- Installation of temperature sensors on the compressor room ventilation fan to make changes so that the fan operates only when the room temperature exceeds a certain level, thereby reducing the electricity consumption of the fan
- Installation of a motion sensors and deactivation of unnecessary lighting, thereby reducing the electricity consumption of lighting
- Reduction of direct GHG emissions by switching to electric from gas heat pump air conditioners and reducing the consumption of city gas
- Renewal of air conditioners to the latest model, thereby enhancing their energy-saving performance and reducing the electricity they consume

6. Offsetting of Unabated GHG Emissions

6.1 Principles for the offsetting of GHG emissions

The Kariya Factory is working to reduce GHG emissions under a policy to place top priority on both actively introducing renewable energy and improving energy consumption efficiency through energy conservation. GHG emissions that are inevitably difficult to reduce will be entirely offset with carbon credits, though their use is planned to be reduced in phases.

ISO 14068-1:2023 stipulates requirements for carbon credits, such as additionality, permanence, and the avoidance of double counting. The Kariya Factory uses carbon credits issued through the Verified Carbon Standard (VCS) and accordingly ensures that the offsets are transparent and reliable.

In FY2023, with hopes to contribute to the achievement of sustainable development goals (SDGs) not only at the Kariya Factory but worldwide, reduction credits derived from the technologies of China, where machine tools are produced and used, were leveraged. After reducing GHG emissions down to the point where only residual emissions remain, Brother will use carbon removal credits only. Carbon credits will be used in accordance with international rules, even after the reporting period.

6.2 Details of carbon credits

The Kariya Factory's market-based GHG emissions during the reporting period was 5,428.20 t-CO_2e, but the procurement of 10,882.31 MWh of renewable-energy-based electricity resulted in 1,205.87 t-CO_2e of unabated GHG emissions on a real-term basis. The Kariya Factory's carbon neutrality was achieved through the purchase of carbon credits and the offsetting of the unabated emissions. The purchased carbon credits and projects are VCS-verified, and corresponding adjustments will be made once an international system is established.

Table 8. Details of carbon credits

Serial number	Certification authority	Type and country Project name	Vintage	Volume ($t\text{-}CO_2e$)
15043-641829182-641830481-VCS-VCU-997-VER-CN-13-2464-01072021-31122021-0	VCS	Emission avoidance and reduction; China Nanning Landfill Gas Power	2021	1,300

無効化証明書

無効化日： 2024年5月22日
Beneficial Owner： Brother Industries, Ltd.

シリアルナンバー	認証機関	種類・所在国 プロジェクト名	ビンテージ年	購入数量	無効化数量 (ton)	残数
15043-641829182-641830481-VCS-VCU-997-VER-CN-13-2464-01072021-31122021-0	VCS	排出回避/削減型・中国 Nanning Landfill Gas Power	2021	1,300	1,300	0.00

Figure 2. Carbon credits

7. Verification opinion

Verification Opinion

<table>
<tr><td colspan="2">Subject: Brother Industries, Ltd. Kariya Factory.
件名：ブラザー工業株式会社　刈谷工場</td></tr>
<tr><td colspan="2">Verified as Satisfactory
充足であることを検証済み</td></tr>
<tr><td colspan="2">Reasonable Assurance:
For the part of the Carbon Neutrality Claim "Carbon Neutrality Report of Brother Industries, Ltd. Kariya Factory" produced by Brother Industries, Ltd., among the carbon neutrality claims based on Table 1, reasonable assurance was implemented for the part relating to direct GHG emissions (Scope 1) and indirect GHG emissions from imported energy (Scope 2).
合理的保証
ブラザー工業株式会社が作成したカーボンニュートラル主張「ブラザー工業株式会社刈谷工場　カーボンニュートラルレポート」のうち、表 1 に記載の直接的な GHG 排出（Scope1）と供給されたエネルギーによる間接的な排出（Scope2）に関連する部分については、合理的な保証が実施された。</td></tr>
<tr><td rowspan="2">Based on the processes and procedures conducted it is concluded that for this part of the Carbon Neutrality Claim it:
実施されたプロセスと手順に基づいて、カーボンニュートラル主張のかかる部分については次のように結論づけられた。</td><td>• Is materially correct and is a fair representation of GHG and carbon neutrality data and information.
• 実質的に正確であり、GHG及びカーボンニュートラルのデータと情報を公正に表現している。</td></tr>
<tr><td>• Has been prepared in accordance with ISO 14068-1:2023 and it's principles.
• ISO 14068-1:2023 及びその原則に従って作成されている</td></tr>
<tr><td>Lead Verifier
主任検証人</td><td>Hiroshi Nishinaka
西中　宏</td></tr>
<tr><td>Independent Reviewer
独立したレビュアー</td><td>Le Huy Thanh</td></tr>
<tr><td>Signed on behalf of BSI
BSI の代表者の署名</td><td> 
Masaki Urushihara, Managing Director</td></tr>
<tr><td>Issue Date</td><td>01 Oct. 2024</td></tr>
<tr><td colspan="2">NOTE: BSI Group Japan K.K. is independent to and has no financial interest in Brother Industries Ltd. This 3rd party Verification Opinion has been prepared for Brother Industries Ltd. only for the purposes of verifying its statement relating to its GHG emissions more particularly described in the scope above. It was not prepared for any other purpose. In making this Statement, BSI Group Japan K.K. has assumed that all information provided to it by Brother Industries Ltd. is true, accurate and complete. BSI Group Japan K.K. accepts no liability to any third party who places reliance on this statement.
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