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Policy

Contributing to society has been the management philosophy for the Panasonic Group ever since its founding, and we have been taking measures against pollution since the 1970s. We announced the Environmental management basic policy in 1991, and the Environmental Statement in 1993, clarifying our approaches to address global environmental issues as a public entity of society. Since then we have been carrying out initiatives including matters on global warming prevention and resources recycling corporate-wide, aiming to attain a sustainable, safe, and secure society.

After the completion of the Green Plan 2010 which was established in 2001, the Green Plan 2018 was established in 2010 to clarify our targets for fiscal 2019 (from April 1, 2018 to March 31, 2019) as well as an action plan for all employees in order to achieve the targets. The Green Plan 2018 will continue our initiatives in five areas: CO₂ reduction, resources recycling, water, chemical substances, and biodiversity.

In 2013, we introduced a new brand slogan, “A Better Life, A Better World,” aiming to realize a better life for all its customers, and is promoting environmental initiatives as an important element in achieving that goal. Based on this, the Green Plan 2018 was revised in 2013, followed by the newly-established Environmental Action Guideline.

Furthermore, in response to rising demand by the society for CO₂ reductions following the 21st session of the Conference of the Parties (COP21) of the United Nations Conference on Climate Change, and to the need to make changes to our business structure, including growth in the automotive and B2B businesses, the Plan was revised again in 2016.

Additionally, we formulated the Environment Vision 2050 in 2017 to achieve “a better life” and “a sustainable global environment,” aiming for a society with clean energy and a more comfortable lifestyle. Under the Vision, through the development of products, technologies, and solutions relating to energy creation, storage, saving, and management, we will work towards creation and more efficient utilization of energy which exceeds the amount of energy used.

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We announced Green Plan 2021 in 2019, following completion of Green Plan 2018, with a focus on key issues for achieving the Panasonic Environment Vision 2050, and we have been working on the issues. On January 2022, we announced Panasonic GREEN IMPACT, our long term environment vision, founded based on Panasonic Group's belief that the top priority action for the entire Group should be focused on global environment issues including climate change, which is a pressing task for the entire world.

The Panasonic GREEN IMPACT is the result of a shift from the Panasonic Environment Vision 2050, with the aim of achieving carbon neutrality together with creating impacts from actions (ACT) that reduce CO₂ emissions from Panasonic Group as well as from various sectors of the society. To achieve Panasonic GREEN IMPACT, we are working on initiatives under our newly developed GREEN IMPACT PLAN 2024.

Environmental Policy

Environmental Statement

Fully aware that humankind has a special responsibility to respect and preserve the delicate balance of nature, we at Panasonic acknowledge our obligation to maintain and nurture the ecology of this planet. Accordingly, we pledge ourselves to the prudent, sustainable use of the earth's resources and the protection of the natural environment while we strive to fulfill our corporate mission of contributing to enhanced prosperity for all.

Environmental Action Guideline

Toward achieving a sustainable society, we will strive to develop our business through the creation of environmental value. For this purpose, we will address environmental challenges through our business activities and will expand our environmental initiatives based on collaboration with stakeholders.

(1) Initiatives to address environmental challenges

- We will reduce CO₂ emissions through production activities and products/services.
- We will work to efficiently use resources by pursuing Recycling-oriented Manufacturing.
- We will conserve water resources through efficient use of water and prevention of contamination.
- We will reduce the impact of chemical substances on human health and the environment.
- We will consider and conserve biodiversity.

(2) Initiatives based on collaboration with stakeholders

- We will provide products and services that create environmental value for customers with our technical strengths.
- We will expand our environmental contributions with our partner companies.
- We will deepen communications with local communities and work as a team to address environmental challenges.

Environmental Action Plan

Environmental action plan "GREEN IMPACT PLAN 2024" to realize Panasonic GREEN IMPACT (see [pages 12](#))

We strive to grow and develop our business through the creation of environmental value for customers with our technical strengths while each and every employee follows the Environmental Policy to address environmental challenges. Therefore, collaboration with stakeholders including our partners is essential. We will continue to sincerely work on environmental sustainability management through further collaboration with stakeholders.

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What we should be in the future as the Panasonic Group and solution for global environmental issues

The true mission of the Panasonic Group is to achieve both of 'material and spiritual prosperity', in other words 'an ideal society with affluence both in matter and mind' that is pursued by our founder Konosuke Matsushita in his entire life. In 1932, the founder declared his ambition to create an ideal society over a span of 250 years. Since then, taking over the founder's ambition, we have solved social issues by manufacturing useful products and providing useful services, etc., while seeking for happiness of individual customers. At present, the biggest obstacles preventing us from achieving our mission are global environment issues. In order to reduce depletion of limited natural resources and urgent problems caused by climate change or global warming as much as possible, it is indispensable to take actions to achieve net zero CO₂ total emissions in society at large as early as possible.

Panasonic has acted promptly to fulfill our corporate responsibility and contribution; and in January 2022, we announced the Group's long-term environmental vision "Panasonic GREEN IMPACT (PGI)" that leads to achieve much greater contribution to definitely solve such problems and we have accelerated our activities to reduce environmental loads through our value chains, and at the same time, to contribute to reduce CO₂ emissions discharged from society and customers.

Regarding global environment issues, not only for global warming, but also for the depletion of limited natural resources, importance of confronting with their effects on our business activities, our customers, and society in the same manner is growing. Panasonic has worked on both effective use of resources and maximization of customer value for a long time. In order to recognize that improving resource efficiency contributes to decarbonization, reduce resource consumption, and set contribution to achieve sustainable society as basis of business operations, we established 'a Circular Economy (CE) Group Policy' and disseminated it internally and externally in November 2023. We will identify CE issues according to characteristics of each business division, and lead them to formulate and implement strategies and action plans based on the policy.

Circular Economy Group Policy (Excerpts from three circularity principles)

1. Maximize the product lifetime and maintain the material value with a focus on circular business models and product design, extended servicing, as well as through further enhancing recycling activities.
2. Minimize the use of materials and extend the usage of recycled and renewable materials.
3. Take a joint approach with customers and partners for establishing circularity-oriented business operations, information sharing, and product usage options.

Please visit [here](#) for the entire text.

Panasonic GREEN IMPACT

PGI is an overview of environmental strategy for our respective business fields back casted from the reforms to be implemented by 2030, looking ahead to creation of sustainable society by 2050. With a classification of PGI into fulfillment of own responsibilities (① OWN IMPACT), opportunities to contribute (② CONTRIBUTION IMPACT and ③ FUTURE IMPACT), and positive ripple effects on our customers



The Panasonic Group aims to achieve both a better life and a sustainable global environment, by creating impacts from actions that reduce our own CO₂ emissions, contribute to avoiding CO₂ emissions of society, and realize a circular economy.

and society (+INFLUENCE), it was declared to create an impact by 2050 from our emissions reductions of more than 300 million tons^{*1} in total for ①, ② and ③: that is approx. 1% of the global CO₂ emissions of 31.7 billion tons^{*2} in 2020. We aim at 'to achieve net zero emissions for all of our operating companies (Scope 1 and 2 in ①)' and 'to create avoided CO₂ emissions of approx. 100 million tons (②) as our interim milestones, and we formulated "the GREEN IMPACT PLAN 2024", our action plan for 2022-2024.

*1 2020 energy-derived CO₂ emissions (Source: IEA)

*2 The emissions factor is fixed to the 2020 emissions level in order to properly measure the amount of own efforts to CO₂ reduction.

① OWN IMPACT

We will achieve net zero emissions from all of our value chains (110 million tons^{*3}), with decarbonization effects in society^{*4}. Specifically, we will achieve net zero for total emissions from our business activities (Scopes 1, 2, and 3), including emissions from our operating companies (Scopes 1 and 2) by fiscal 2031, emissions from manufacturing components and materials (Scope 3, Category), and emissions in product use (Scope 3, Category 11).

*3 Fiscal 2021 actual results *4 Improvement in CO₂ emissions factor for electricity by respective electric power suppliers.

② CONTRIBUTION IMPACT

In our present business fields, we will contribute 100 million tons or more in avoided emissions from society and our customers. We will visualize the avoided emissions by each product or service, and use the avoided emissions as a common measure in society at large.

③ FUTURE IMPACT

We plan to achieve avoided emissions of 100 million tons or more by creating new technologies and business fields.

+ INFLUENCE

These are communication activities to generate PGI. We will have positive ripple effects on reforms in the energy demands and supply, and decarbonization through transformation in behaviors of customers, relevant business operators, governments, and investors. Although the direct impact on reduction cannot be calculated at present, we will move forward in this direction, being convinced that this is part of our mission.

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Environmental Action Plan “GREEN IMPACT PLAN 2024”

As milestones in reaching the 2050 reduction targets of 300 million tons set in “the Panasonic GREEN IMPACT,” our long-term environmental vision, we set out the fiscal 2031 target linked to our groupwide business strategy, and formulated “the GREEN IMPACT PLAN 2024 (GIP 2024),” the three-year environmental action plan from fiscal 2023 to fiscal 2025, for which we are working on. Under GIP 2024, we have set out the fiscal 2025 targets for OWN IMPACT: CO₂ emissions reduction across our entire value chain (VC) (Scopes 1, 2 and 3), CONTRIBUTION IMPACT: Avoided CO₂ Emissions for customers and society and the Resource/Circular Economy (CE).

In OWN IMPACT, we plan to cut down CO₂ emissions from our entire VC of 110 million tons in fiscal 2021 to 31.45 million tons in fiscal 2031 and to 16.34 million tons in fiscal 2025 respectively as our businesses grow. As a part of this plan, we are aiming to achieve net zero CO₂ emissions in our factories (‘Zero- CO₂ factories’) for all of our operating companies by fiscal 2031 under the drive to achieve net zero emissions from our business activities (Scopes 1 and 2).

In CONTRIBUTION IMPACT, we plan to achieve avoided emissions for customers and society of 93 million tons* in fiscal 2031 and to 38.3 million tons in fiscal 2025*.

Key 3 activities for our Resources/CE are;

1. Maintain the global factory waste recycling rate constantly at 99% or higher (zero emissions)
2. Increase the total recycled resin used over three years to 90,000 tons
(Double the total recycled resin usage of 43,300 tons over fiscal 2020 to 2022)
3. Newly establish at least 13 CE business models by fiscal 2025, aiming at efficient resource utilization and customer value maximization

Additionally, we plan to continue working on the issues of ‘biodiversity’, ‘water’, ‘chemical substances’, ‘local communities’, and ‘compliance’, paying attention to the scale of social issues and empathy with our customers and society and corresponding to our business fields and regional characteristics and needs.

* Calculated with emissions factor (IEA 2021) at the time of the PGI formulation (FY2021.)

■ Status of the second year of GIP 2024

The CO₂ emissions from our entire value chain (VC) increased to 126.52 million tons in fiscal 2024 (negative in OWN IMPACT) with increase of 19.01 million tons from 107.51 million tons in fiscal 2021. For the Scopes 1 and 2, there had been progress in both energy conservation and introduction of renewable energy with 44 Zero- CO₂ factories and CO₂ reduction of 0.68 million tons. Scope 3 emissions, which come from during use of our products, account for 70% of all of our own emissions, and have increased due to expansion of business fields subject to the calculation (increased by 5.1 million tons compared with fiscal 2021). On the other hand, the avoided emissions for our customers and society (CONTRIBUTION IMPACT) have reached 36.97 million tons, which is an increase over fiscal 2021, thanks to the growth of our core businesses and further visualization of the avoided emissions in our businesses.

In the area of resource/CE, our factory waste recycling rate reached 99.3% globally, maintaining our target figure. The amount of used recycled resin has remained at 29.6 thousand tons in total over two years since fiscal 2023. We are now working hard to make up the lost opportunities by strengthening our competitiveness, e.g., enhancing and stabilizing our supply chain from waste resin recovery, to reprocessing and reuse. Finally, we launched three new CE business models. This makes a total of 13 business models, which enabled us to achieve the fiscal 2025 target one year ahead of schedule.

GREEN IMPACT PLAN 2024 (Fiscal 2025 and 2031 targets, and Fiscal 2024 actual results)

(Mt = million ton)

Item		Fiscal 2021 results (Starting point of PGI)	Fiscal 2024 actual results GREEN IMPACT PLAN 2024	Fiscal 2025 targets	Fiscal 2031 targets		
Material Issues	OWN IMPACT CO ₂ emissions reduction in our own Value Chain ²	(Starting point)	-19.01 Mt (12.08 Mt) ⁶	16.34 Mt	31.45 Mt ⁷		
	CO ₂ / Energy	Scopes 1 & 2 ¹	Zero-CO ₂ factories	Total 7 factories		Total 44 factories	Total 37 factories
			CO ₂ reductions	(Starting point)		0.68 Mt	0.26 Mt
		Scope 3 ¹ (Category 11)	CO ₂ reductions during use of our products by customers	(Starting point)		-5.1 Mt	16.08 Mt
		CONTRIBUTION IMPACT Avoided CO ₂ Emissions for society ³		23.47 Mt		36.97 Mt	38.30 Mt
Resources/CE *Circular Economy	Factory waste recycling rate ⁴	98.7%	99.3%	99.0%			
	Recycled resin used ⁵ (Fiscal 2023 to 2025 total for GIP2024 targets)	15,200 tons	Fiscal 2023 to 2024 total 29,600 ton	Fiscal 2023 to 2025 total 90,000 ton			
	Circular economy business models and products (Total)	5 businesses	13 businesses	13 businesses			

Continuing Challenge	Biodiversity	Reducing and restoring the impact of business activities on the ecosystem to become nature positive. Procurement of sustainable raw materials, businesses that contribute to biodiversity green spaces, and products and services that contribute to biodiversity.
	Water	Reducing water consumption in business activities and products/services
	Chemical substances	Reducing the environmental impact of chemical substance’s business activities and products
	Local communities	Promoting environmental initiatives to contribute to local communities and educating the next generation
	Compliance	Ensuring compliance with environmental laws and regulations

*1 Classification according to the GHG protocol (Accounting and Reporting Principles). *2 Amount obtained by subtracting the amount of emissions in the relevant fiscal year from the amount of emissions in fiscal 2021. *3 Amount calculated by subtracting the lifetime CO₂ emissions after introduction from the lifetime CO₂ emissions assuming that the Group’s products and services do not exist, using the IEC 2021 value as the emission factor. *4 Amount of resources recycled/(Amount of resources recycled + Amount of landfill). *5 Mass of recycled materials contained in the recycled resin used in our products. *6 Includes Scope 1, 2 and Scope 3 Category 11, plus increases or decreases in Category 1 (procurement), Category 12 (disposal), and other indirect emissions. The figures in the parenthesis is a comparison between fiscal 2023 results and fiscal 2021 results (starting point) reflecting the equivalent amount of emissions from the products whose calculations became available after 2021. *7 The CO₂ emissions factor for electricity calculated with the IEA World Energy Outlook’s 2° C scenario.

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■ Status of CO₂-related indicators in fiscal 2024

CO₂ emissions (upper part of figure)

Our CO₂ emissions in fiscal 2024 totaled 126.52 million tons, which was an increase of 19.01 million tons compared with 107.51 million tons in fiscal 2021 (negative in OWN IMPACT) This was significantly affected by our activities implemented as our responsibilities in the last 3 years, i.e., expansion of the items subject to our emissions reduction and refinement of the calculation formulas. On the other hand, the fiscal 2021 figure using the items subject to fiscal 2024 was 138.6 million tons. Therefore, this represents a reduction of 12.08 million ton over the three years since fiscal 2021.

The CO₂ emissions from during use of products (Scope 3, Category 11), which accounts for more than 70% of the entire emissions across the value chain, have increased to 91.03 million tons from 56 businesses in fiscal 2024, compared with 85.93 million tons from 33 businesses in fiscal 2021. This fiscal 2024 figure includes emissions from those businesses for which the emission calculation formulas were established in fiscal 2022 and later, and CFC emissions from refrigerant-related equipment during use by customers from fiscal 2023. We aim to reduce CFC emissions during use by spreading refrigerants with low environmental loads (CO₂ refrigerant/propane). In fiscal 2023 we also added the calculation methods to reflect negative impact from disposal of refrigerants after refining the calculation methods with an aim to collect more refrigerants from refrigerant-related equipment disposed by customers (Scope 3, Category 12). We will recognize the reduction targets in Scope 3 accurately as our Group's responsibilities, and we will continue to improve the accuracy of Scope 3 figures through reviewing the scope and the calculation methods.

Avoided CO₂ emissions (lower part of figure)

The avoided CO₂ emissions from our products and services (CONTRIBUTION IMPACT) in fiscal 2024 reached 36.97 million tons, steadily approaching the fiscal 2025 target of 38.3 million tons. The number of businesses subject to this calculation has increased from 28 in fiscal 2021 to 56 in fiscal 2024. The total avoided emissions of 26 businesses, which we have been working on visualization (28 as of fiscal 2021), was 27 million tons in fiscal 2024. This was a 3.53-million-ton increase compared with 23.47 million tons in fiscal 2021. The main reason for this was the decrease in the avoided emissions from

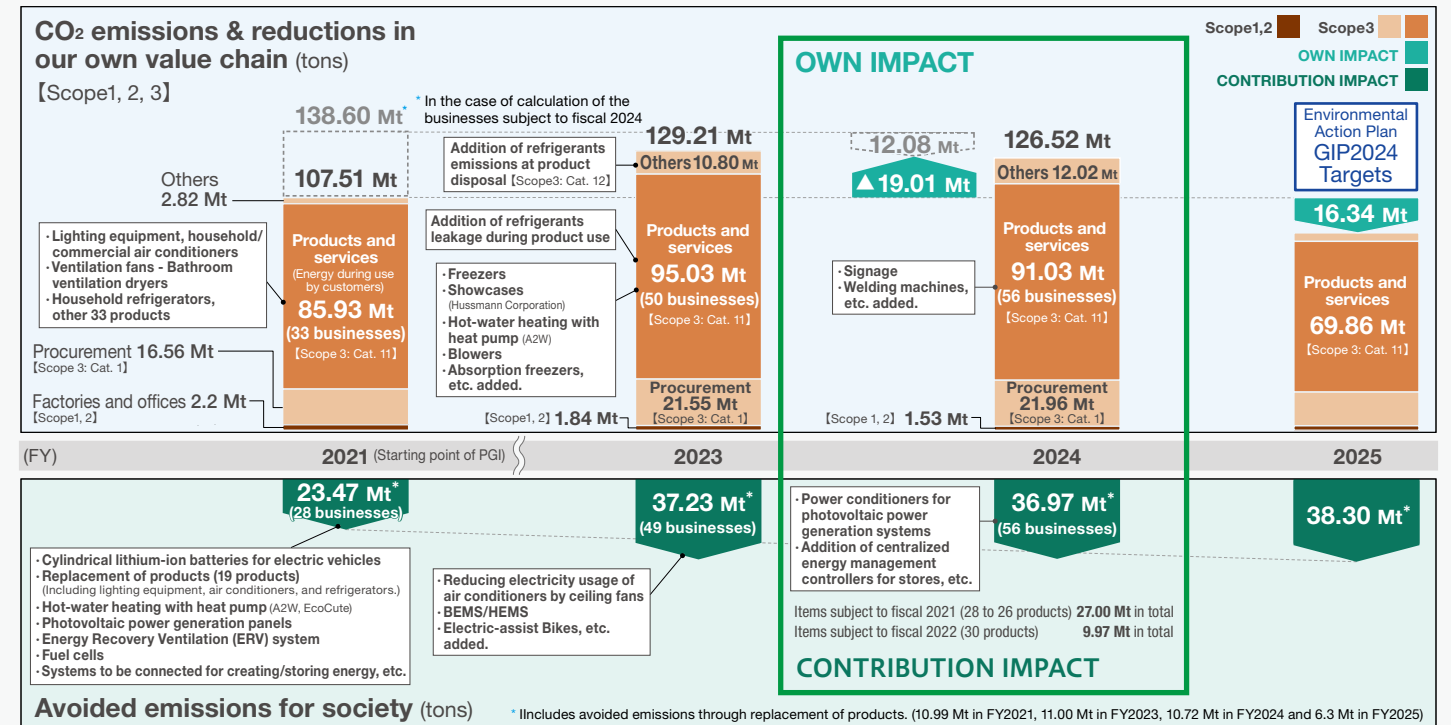
cylindrical lithium-ion batteries for in-vehicle use, which produce the biggest amount of avoided emissions in our Group, as a result of the refinement of the emission calculation methods from the viewpoint of their life cycle. (If the calculation method for cylindrical lithium-ion batteries for vehicles had not been refined, the figure would have been 28.70 million tons, an increase of 5.23-million-tons.) On the other hand, visualization has newly progressed in the 30 new businesses and produced 9.97 million tons of avoided emissions in fiscal 2024.

Panasonic GREEN IMPACT is our vision to aim at carbon neutrality together with customers and society by accumulating diligent efforts (ACT), taking our Group's responsibilities and opportunities seriously to prevent climate change as early as possible. We believe that reducing the 'emissions' and increasing the 'avoided emissions' should be accelerated at the same time, after we understand accurately and rationally that the 'emissions' and the 'avoided emissions' respectively

have different concepts and utilization purposes, and our Group responsibilities (emissions) are not offset by contributions to our customers and society (avoided emissions), in other words, these two measurements are 2 sides of the same coins, i.e., inextricably linked.

The avoided emissions in particular still have a lot of issues to be addressed to become a measurement used commonly in society, as the flexibility in its calculation methods is high. Once calculation methods become standardized and turn out to be different from our methods, we will review our calculation methods, and updating our targets and numbers of the results using the standardized calculation methods, while regardless of updating calculation methods, we will contribute to the achievement of carbon neutrality of society by enhancing our competitiveness to reach the goals of each business. We will continue to report contents of changes and their progress in avoided emissions as proof of our accelerating efforts in both business transformation and growth.

GREEN IMPACT PLAN2024 (GIP2024): Status of CO₂-related indicators in fiscal 2024



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■ Avoided CO₂ Emissions

CONTRIBUTION/FUTURE IMPACT is commonly referred to as the avoided CO₂ emissions (hereafter, avoided emissions). Avoided emissions are an indicator of the value of the amount of assumed CO₂ emissions reduction made of customers and society through introducing our products and services, compared to the amount when not introduced (Reference Scenario, also called as the Baseline Scenario). Both 'emissions' and 'avoided emissions' are CO₂-related indicators; however, 'emissions' are a measurement of the CO₂ amount that should be reduced across our value chain (VC), while 'avoided emissions' measures the amount of contribution to decarbonization by our customers and society through our businesses. Thus, the methods of calculation and usage for these two indicators differ. Also, 'avoided emissions' cannot be used to offset the 'emissions' from VC of own company.

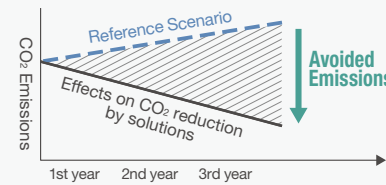
Formulation of international standards for the calculation methods for the avoided emissions are still in progress. We are actively involved in discussions^{*2} aiming at establishing international standards, while developing, disclosing, and improving rational calculation methods based on the guidance and policy, and IEC discussions. In case that the standardized calculation methods will become different from our methods, we will of course comply with the adopted standards and work to achieve the targets after correction of our targets in accordance with such new standards. In addition, both our calculation methods and the evidence data stated in this data book have been verified by a third-party organization, in order to enhance the objectivity of the disclosed information.

The total CONTRIBUTION IMPACT of our products and services sold in fiscal 2024 was 36.97 million tons across our 56 businesses. This value was equivalent to the last year's figure in total as a result of the reduction amount caused by refinement that had made to the calculations related to cylindrical lithium-ion batteries for in-vehicle use (see page 16), despite the increase from the seven products and services newly quantified. Panasonic classifies CO₂ emissions reduction effects into four categories depending upon the type of contribution:

- Electrification:** Spreading electrified appliances and components that use energy more efficiently than those that use fossil fuels.
- Replacements:** Spreading products with improved energy efficiency while providing the same efficacy as conventional products.
- Solutions:** Optimizing power consumption throughout entire building spaces and facilities.
- Others:** Various contributions other than the above, including clean power generation, heat insulation, and reducing delivery.

Our current focus is on the Lifestyle business (including heat pump equipment, lighting equipment, refrigerators, and photovoltaic power generation systems) and the Energy business (including cylindrical lithium-ion batteries for in-vehicle use), which together comprise approximately 50% of Group sales. Although electricity demands increase as electrified appliances spread, by continuously increasing the efficiency of energy use in appliances themselves and the spaces they are connected to, we will reduce the load on grid power and promote renewable energy in each region.

Definition of the Avoided Emissions^{*1}



The avoided emissions are defined as positive impact on society by a solution in terms of CO₂ emissions reduction when comparing to those in the reference scenario where the solution is not used.

^{*1} We edited the definition based on the Guidance on Avoided Emissions by WBCSD (March 2023).

^{*2} Such as the guidance and policies related to the avoided emissions published by WBCSD and the GX League in March 2023, and discussions in the IEC. (For more details, see page 21 Recognition of Avoided CO₂ Emissions and Activities to Develop Value, Standardization).

For further examples of our avoided emissions products that contribute to CO₂ reduction for customers and society, see the following website.

[WEB https://holdings.panasonic/global/corporate/sustainability/environment/vision/product.html](https://holdings.panasonic/global/corporate/sustainability/environment/vision/product.html)

To achieve the decarbonization of society, efforts by both energy power suppliers and users are indispensable. Assuming that use of renewable energy will increase through the efforts by energy power suppliers, we will improve energy efficiency in each of our various products and services, while contributing to energy use optimization in socioeconomic systems, such as in mobility, whole spaces of buildings, etc., and supply chain processes. We continue to calculate and disclose avoided emissions with rational methods as a proof of accelerating both the reforms and growth of our businesses to contribute to decarbonization.

The avoided emissions can be an indicator to identify companies and solutions that contribute to CO₂ emissions reduction by visualizing emissions across their VCs. Utilizing the avoided emissions as a part of business evaluation and adding the avoided emissions as deciding factor for investment should stimulate competition among businesses that can potentially contribute to decarbonization. We expect this will help build robust and efficient carbon-neutral VCs.

CONTRIBUTION IMPACT

[Unit: ton] [Calculation example](#) † See the following pages for further examples.

Category	Top 22 Businesses in FY2024		
Electrification 9.74 million in FY 2021 → 4 businesses 14.80 million	Cylindrical Lithium-ion Batteries for In-vehicle Use Calculation example		
	Hot-Water and Heating Systems with Heat Pump (A2W ^{*3}) Calculation example		
	Electrically-assisted Bikes		
	Hot-Water Heating with Heat Pump (EcoCute) Calculation example		
Replacements <Energy efficiency performance> 9.45 million in FY 2021 → 38 businesses 10.72 million <small>Calculation example (Home appliances in general)</small>	Household Air Conditioners	Washing and Drying Machines	
	LED Lighting	Projectors	
	Household Refrigerators	LCD TVs	
	Electric Showers/Electric Water Heaters	CO ₂ freezers	
	Commercial Air Conditioners	Dryers	
	Energy Recovery Ventilation (ERV) System <Reducing heat loss from the residential houses>	Calculation example	
Solutions 2.42 million in FY 2023 → 5 businesses 2.27 million	Ceiling Fans <Improving energy efficiency in spaces>		
	BEMS ^{*4} /HEMS ^{*5} <Improving energy efficiency in space>		
	Centralized Energy Management Controllers in Stores <Monitoring and controlling of equipment>		
	Photovoltaic Power Generation Systems (Panels and Power Conditioners)	Calculation example	
Others 6.01 million in FY 2023 → 9 businesses 9.19 million <small>Calculation example</small>	Vacuum Insulated Glasses <Reducing heat loss in spaces>	Fuel Cells	
	Home Delivery Communication Boxes <Reducing the number of redeliveries>	Creation and Storage Collaboration System (Storage batteries)	
	Total 56 products and services: 36.97 million		

[Reference] Our Businesses' Contribution to Carbon Neutrality (See page 34)

^{*3} Air to Water ^{*4} Building Energy Management System ^{*5} Home Energy Management System

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Electrification

Hot-Water and Heating Systems with Heat Pump (EcoCute, A2W^{*1})

^{*1} A2W (Air to Water) : Air-to-water Heat Pumps bound for Europe

Product life stages subject to avoided CO₂ emissions



■ Overview

A heat pump is equipped with electrification technology that captures heat energy from the ambient air and transfers it to heat water or air utilizing the characteristic that temperature changes when gas is compressed or expanded. With the technology, the equipment with heat pump is 2.4 to 4.3 times more energy-efficient compared to the equipment uses heat energy from fossil fuel combustion.^{*2} Furthermore, on the premise that the ratio of renewable energy use in each energy sources will increase year by year as the electrified equipment with heat pump is spread, whereas CO₂ is always emitted from gas equipment in combustion of city gas, we will contribute to accelerate the transition to a decarbonized society.

^{*2} Our own calculation based on information in METI's 'Top Runner Program'.

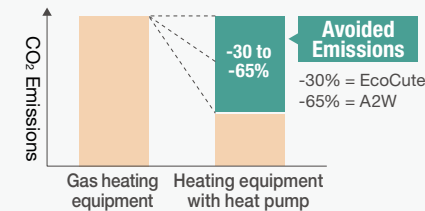
^{WEB} https://www.enecho.meti.go.jp/category/saving_and_new/saving/enterprise/equipment/

■ Avoided CO₂ emissions mechanism

Compared to the average hot-water and heating systems with gas combustion type that are water heaters widely available in markets, our heating equipment with heat pump with equivalent capacity emit less CO₂ from the electricity used throughout their lifetimes, therefore, the difference of CO₂ emissions becomes avoided emissions.



Average CO₂ emissions from water & air heating energy by one gas heating equipment and one heating equipment with heat pump.



■ Calculation formula of avoided emissions

Amount of activities	Avoided emissions for a given amount of activities	CO ₂ emissions-related values and factors	Period
[Amount of activities] (Units) The number of units that replaced existing gas heating equipment in the total annual sales volume ^{*3}	$\left(\begin{aligned} &\text{Annual city gas consumption per gas heating equipment (m}^3\text{)} \times \text{City gas CO}_2\text{ emission factor (kg CO}_2\text{/m}^3\text{)} \\ &- \text{Annual power consumption per unit of the heating equipment with heat pump (kWh)} \times \text{Electric power CO}_2\text{ emission factor per sales region (kg CO}_2\text{/kWh)} \end{aligned} \right) \times \text{Period (Ten years)}$		
<p>Annual avoided emissions by one heating equipment with heat pump replacing a gas heating equipment.</p> <ul style="list-style-type: none"> • Electric power CO₂ emission factor: Japan - 0.487 kg/kWh, and Europe - 0.277 kg/kWh (Source: IEA 2021) • City gas CO₂ emission factor: 2.240 kg/m³ (Source: Document by Ministry of the Environment) 			

^{*3} Japan: Approximately 70% of sales are heating equipment with heat pump replacing gas heating equipment. (Source: Industrial association data). Europe: 100% of sales are heating equipment with heat pump replacing gas water heaters. (We deemed that the replacement of existing A2Ws can be ignored as the sales started in 2008.)

Sales regions: Japan for EcoCute, and Europe for A2W

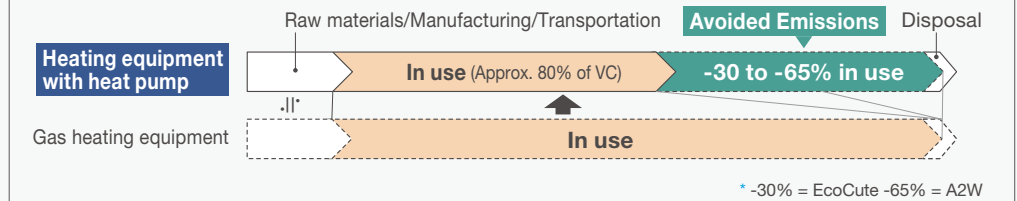
■ Baseline (Subject to comparison)

CO₂ emissions from gas combustion to capture heat energy required for heating the same amount of water or air. Conventional gas by gas combustion is predominantly used in Europe where there are many cold climate areas. (Transformation of an A2W to its electrification is possible by using gas pipe used for the existing gas heating equipment.)

■ Coverage of quantification (Way of thinking and its rationalization)

When the heating equipment with heat pump is in use. We deemed that CFP^{*} of the equipment when it is in use can be ignored because both of a heating equipment with heat pump and a gas heating equipment show a relatively greater CFP when they are use.^{*4}

^{*4} 79.9% for 'in use' of CO₂ emissions in the value chain (VC) of the Panasonic heating equipment with heat pump. (FY2020 Panasonic actual result)



^{*} -30% = EcoCute -65% = A2W

^{*}CFP (Carbon Footprint of Products): CO₂ emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

■ Amount of activities (Unit)

EcoCute: The number calculated by the following equation: the annual sales volume in Japan x 70%^{*5} which is the replacement ratio of gas heating equipment with heating equipment with heat pump.

^{*5} Data from a Japanese industrial association. The calculation excludes the number of replacements of an end-of-life EcoCute with a new unit.

A2W: The number of annual sales of A2W in Europe (Unit)^{*6}

^{*6} We deemed that replacement ratio of old A2Ws with new ones can be ignored as the sales started in 2008.

■ Avoided CO₂ emissions per unit of amount of activities (Basic unit)

Regarding the annual energy consumption used for the same amount for heating water or air, which was converted to CO₂ emissions, difference between those of heating equipment with heat pump and gas heating equipment.

■ Period (Flow method: Include entire lifetime CO₂ emissions of the product in its first sales year)

- The holding years of repair parts
- CO₂ emissions reduction effect continues during that period.

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Electrification

Cylindrical Lithium-ion Batteries for In-vehicle Use

Product life stages subject to avoided CO₂ emissions



*The calculation formula has been revised from a life cycle perspective since disclosure Sustainability Data Book 2023.

Sales regions: North America

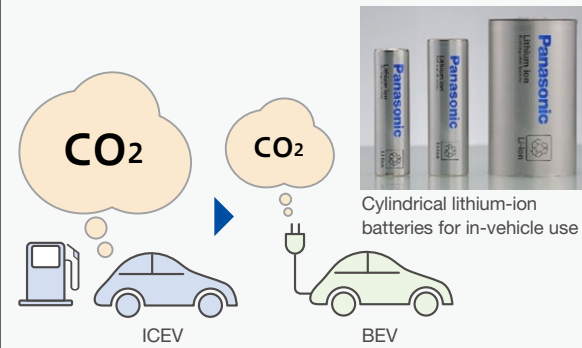
Overview

Transition from internal combustion engine vehicles (ICEVs) to electric vehicles (EVs) is expected to hasten decarbonization in transportation sectors all over the world as EVs, in addition to their energy efficiency advantages^{*1}, emit only small amounts of direct CO₂. In particular, Battery Electric Vehicles (BEVs) that do not use an internal combustion engine, employ a motor driven by electricity supplied from a rechargeable battery. Thus the rechargeable batteries that are equivalent to the fuel supply function in an ICEV, are recognized as one of the most important components of the BEV.

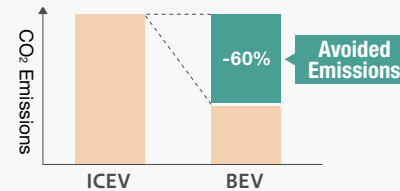
^{*1} Energy efficiency: The percentage of consumed energy that reaches to the wheels;
BEV: 87-91% ICEV: 16-25%.
Source: Yale Climate Connections. August, 2022 "Electrifying transportation reduces emissions and saves massive amounts of energy"

Avoided CO₂ emissions mechanism

In the case that a BEV and an ICEV with our rechargeable batteries installed drives the same distance, a difference arises between the amount of CO₂ emissions converted from fuel consumed by the ICEV and the amount of electricity charged and discharged in the BEV because BEV's energy conversion efficiency to electricity is high.



CO₂ emissions throughout the entire product life cycle of an ICEV and a BEV in the U.S.



Refer to CCT (The international council on clean transportation) Global-Vehicle-LCA-White-Paper-A4-revised-v2.pdf (theicct.org)

Calculation formula of avoided emissions

Amount of activities	Avoided emissions for a given amount of activities	CO ₂ emissions	Period
[Amount of activities] (Units)	$\left(\begin{array}{c} \text{CO}_2 \text{ emissions for an ICEV throughout the entire product life cycle}^{*2} \\ \text{CO}_2 \text{ emissions for a BEV throughout the entire product life cycle}^{*2} \end{array} \right) \times \text{Lifetime mileage}$	$\left(\begin{array}{c} \text{CO}_2 \text{ emissions for an ICEV throughout the entire product life cycle}^{*2} \\ \text{CO}_2 \text{ emissions for a BEV throughout the entire product life cycle}^{*2} \end{array} \right) \times \text{Lifetime mileage}$	Average annual mileage respectively in Japan, U.S. and Europe x 10 years
The CO ₂ emissions converted from the number of BEVs of the battery capacity sold per year			
<p>Avoided emissions per travel distance for one BEV replacing an ICEV</p>			

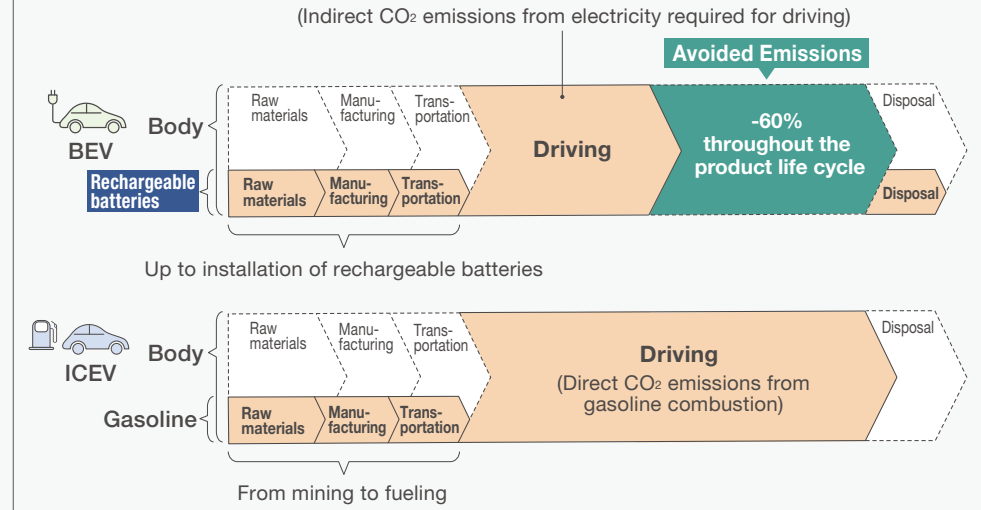
^{*2} Not only during use of batteries (driving the vehicle), but also at every stage from the mining of raw materials needed for production, manufacturing, transportation, and disposal.

Baseline (Subject to comparison)

CO₂ emissions for an ICEV throughout the entire product life cycle including gasoline usage

Coverage of quantification (Way of thinking and its rationalization)

The difference in total CO₂ emissions for BEVs and ICEVs compared in emissions at each stage for rechargeable batteries or gasoline from mining raw materials, disposal, recycling and emissions during driving respectively.



Amount of activities (unit)

CO₂ emissions converted from the number of sold cylindrical lithium-ion batteries for in-vehicle use per year to the number of BEVs.

Avoided CO₂ emissions per unit of amount of activities (Basic unit)

Difference in total CO₂ emissions per travel distance throughout the entire life cycle for one BEV replacing an ICEV.

Period (Flow method: Include entire lifetime CO₂ emissions of the product in its first sales year in one time.)

Lifetime travel distance
= Average annual travel distance respectively in Japan, U.S. and Europe x Vehicle life (10 years)

Avoided CO₂ emissions in fiscal 2024: 12.03 million tons

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Replacements (Energy Saving)

Energy-saving Effects from replaced Home Appliances

Product life stages subject to avoided CO₂ emissions



Sales regions: Japan, China, North America, Central and South America, Europe, Southeast Asia, Middle east, etc.

Overview

Improving efficiency of energy consumed by a large number of home appliances now widely used throughout society will reduce the load of local grid power for the use of appliances, lower the hurdle to transform to use renewable energy as their energy source. This facilitates transition to decarbonization society from demand sides. One of the characteristics of home appliances with high durability is that their dominant stage of CO₂ emissions (CFP*) in the life cycle is from energy use through the whole period in which product are used by customers and in society. This accounts for 80 to 90% of large home appliances such as lighting and refrigerators. Replacing the product used enough of the life with a new product that has equivalent function and performance in use together with improved energy efficiency will cause effect of reducing CO₂ emissions both from users and power suppliers.

Avoided CO₂ emissions mechanism

Regarding electric products whose guaranteed year of durability is expired, the total amount of energy saved used in its product life time before and after replacing with a new product with equivalent functions is converted to CO₂ emissions.

Example of Hair Dryers

Annual power consumption 36.50 kWh
EH-NA95



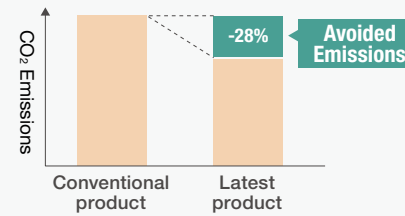
Annual power consumption 26.28 kWh
EH-NA0J



Achieved fast-drying and airflow through improved performance while enhance the nanoe™ effect (28% energy consumed compared conventional products).

<https://panasonic.jp/hair/products/EH-NA0J.html>

[Example] Comparison of CO₂ emissions converted from lifetime power consumption between conventional dryers and the latest products.



Calculation formula of avoided emissions

[Amount of activities] (Number of units)
The number of units sold per year*1

*1 'Before replacement' refers to the average penetration status of existing products that can be replaced with a new product with equivalent functions and performance at the time of the sale, per region. The amount of activities was broken down according to each situation and then totaled.

$$\begin{aligned}
 & \times \left(\text{Annual power consumption of the product before replacement (kWh)} - \text{Annual power consumption of the product after replacement (kWh)} \right) \\
 & \times \text{CO}_2 \text{ emission factor for electricity per sales region (kg CO}_2 \text{ /kWh)} \times \text{Period} \\
 & \text{(5 to 10 years depending on the product)} \\
 & \text{Annual avoided emissions from energy-saving effect by one replaced product}
 \end{aligned}$$

Amount of activities | Avoided emissions for a given amount of activities | CO₂ emissions-related values and factors | Period

CO₂ emission factors for electricity (Source: IEA2021) Unit: kg/kWh

Regions	Factors
Japan	0.487
Europe	0.277
North America	0.383
China	0.623
India	0.723
Asia and Pacific	0.386
Latin America	0.252
Middle East & Africa	0.616

Baseline (Subject to comparison)

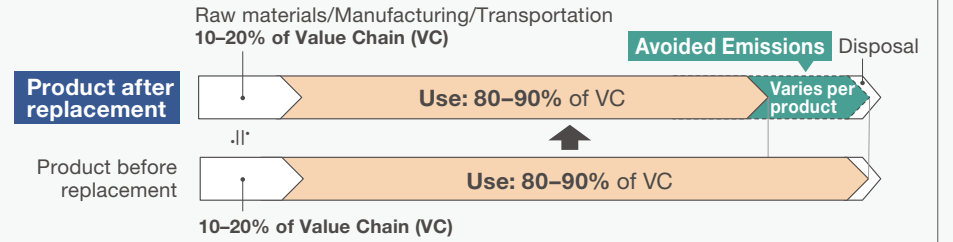
CO₂ emissions converted from lifetime power consumption of the average product in markets at the penetration rate of the product with functions and performance equivalent to the new product per sales region*2.

*2 Example: Dryers penetration rate per country, and the like.

Coverage of quantification (Way of thinking and its rationalization)

When hair dryer is in use. The average CFP* of home appliances are dominant*3 'in use'. We deemed that we can ignore the impact from the CO₂ emissions difference between those from the products before and after the replacement.

*3 'in use' accounts for approx. 80 to 90% of CO₂ emissions in the home appliances value chain.



Amount of activities (unit, piece, etc.)

The number of annual sales depending on the status (penetration rate, etc.) per sales region for the new product.

Avoided CO₂ emissions per unit of amount of activities (Basic unit)

Difference between CO₂ emissions converted from lifetime power consumption*4 between those from the products before and after replacement in each sales region.

*4 Example: Rated power in design x annual 'time in use' etc.

Period (Flow method: Include entire lifetime CO₂ emissions of the product in its first sales year)

- This was set by product, which can maintain holding a spare parts (5-10 years), optimum operational period for basic performance etc.
- CO₂ emissions reduction effect continues during the period.
- We deemed that 5 to 10 years for holding spare parts is a conservative estimate as the life of home appliances can be extended with appropriate use and maintenance.
- With the extended product life, further CO₂ emissions reduction effects are also expected because of efficient utilization of resources

*CFP (Carbon Footprint of Products): CO₂ emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

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Solution (Reducing heat loss) Energy Recovery Ventilators (ERV) System

Product life stages subject to avoided CO₂ emissions

*1 Reduction in CO₂ emissions from reducing air conditioning heat loss from room spaces during the period of use of the products.



Sales regions: **Japan, China, North America, and Europe**

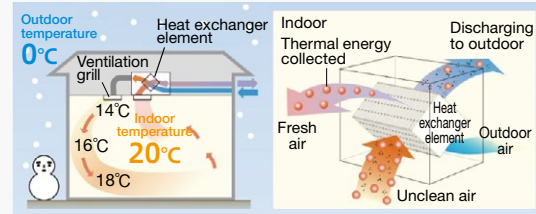
■ **Overview**

To achieve decarbonization in the consumer and business sectors, it is important to reduce environmental impact from air conditioning at living spaces in houses and offices. Energy Recovery Ventilators (ERV) System reduces heat loss from the interior of buildings and provide comfort maintaining appropriate air quality at the same time. ERV System exchanges heat of indoor and outdoor with a heat exchange element during ventilation and either heat or cool the air before being taken into the building, which reduces air conditioning load. Moreover, the system is equipped with air purifier that is a high performance system. Therefore, ERV System is used in wide areas in residential, commercial, and office buildings, where high air tightness is required including Japan, the U.S., Europe, and China.

■ **Avoided CO₂ emissions mechanism**

CO₂ emissions converted from the reduced amount of power or fuel consumption by adopting this ERV System in room spaces under the same conditions compared to those from average ventilation method for ventilation in the market.

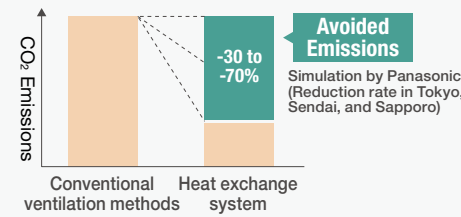
How ERV System works (winter)



* Efficiency varies according to model.

WEB <https://sumai.panasonic.jp/air/kanki/kodatekicho/>

CO₂ emissions converted from energy consumption with adjusted heat loss from ventilation



WEB <https://sumai.panasonic.jp/air/kanki/kabekakefan/>

■ **Baseline (Subject to comparison)**

CO₂ emissions converted from power and fuel consumption per each sales region from the use of air conditioners in a residential house where the current average ventilation systems in the market is installed.

■ **Coverage of quantification (Way of thinking and its rationalization)**

Difference 'in use'. 'in use' account for the dominant (approx. 80%) of the CFP* of ventilators,, and effects from other than 'in use' are equivalent with other ventilators. Hence, we deemed that their CFPs when not 'in use' can be ignored.

CO₂ emissions equivalent to the amount of energy consumed by air conditioning system in a residential house with air conditioner installed using **conventional ventilation techniques**

CO₂ emissions equivalent to the amount of energy consumed by air conditioning system in a residential house with air conditioner installed using **ERV System**

Avoided Emissions
-30 to -70%

CFP* of the equipment with conventional ventilation system

CFP* of the equipment with ERV System

Both systems ventilate same amount of air using a fan (i.e. CFPs* are equivalent)

*CFP (Carbon Footprint of Products): CO₂ emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

■ **Amount of activities (unit)**

The number of annual sales of heat exchange units, which is the core function of the system.

■ **Avoided CO₂ emissions per unit of amount of activities (Basic unit)**

We calculated the average air conditioning load from an average ventilation method in the living space of a residential house in Japan using our simulation for each sales region. We then determined the difference in the volume of energy consumed by system operation for air conditioning in living spaces between the conventional ventilation method and the energy exchanged method, and multiplied it by the CO₂ emission factors for electricity or fuel*1 by each sales region.

*1 Kerosene was used as the fuel.

■ **Period (Flow method: Include entire lifetime CO₂ emissions of the product in its first sales year in one time.)**

- Designed lifetime of ERV System (10 years)
- CO₂ emissions reduction effect continues during the period.

■ **Calculation formula of avoided emissions**

Amount of activities	Avoided emissions for a given amount of activities	CO ₂ emissions-related values and factors	Period
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[Amount of activities]

Annual system installation volume (The number of heat exchange systems)

$$\begin{aligned}
 & \times \left(\begin{aligned} & \text{Annual energy consumed by air conditioning in} \\ & \text{a residential house with conventional ventilation} \\ & \text{methods (volume of thermal loss) (kWh or liters)} \end{aligned} \times \begin{aligned} & \text{CO}_2 \text{ emission factors by electricity} \\ & \text{or fuel type in each sales region} \\ & \text{(kg CO}_2 \text{ /kWh or liters)} \end{aligned} \right. \\
 & \left. - \begin{aligned} & \text{Annual energy consumed by air conditioning in} \\ & \text{a residential house with a ERV System (volume} \\ & \text{of thermal loss) (kWh or liters)} \end{aligned} \times \begin{aligned} & \text{CO}_2 \text{ emission factors by electricity} \\ & \text{or fuel type in each sales region} \\ & \text{(kg CO}_2 \text{ /kWh or liters)} \end{aligned} \right)
 \end{aligned}$$

Annual avoided emissions by installed one ERV System × **Period** (Ten years)

- CO₂ emission factor for **electricity**: **0.487** kg/kWh in Japan, **0.623** kg/kWh in China, **0.383** kg/kWh in North America, and **0.277** kg/kWh in Europe (Source: IEA 2021)
- CO₂ emission factor for **kerosene**: **2.49** kg/liter (Source: Data from Ministry of the Environment)

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Others (Reducing heat loss) Vacuum Insulated Glass (VIG)

Product life stages subject to avoided CO₂ emissions *1 Reduction in CO₂ emissions from reducing loads in cooling or heating in the building during the period of use of the products.



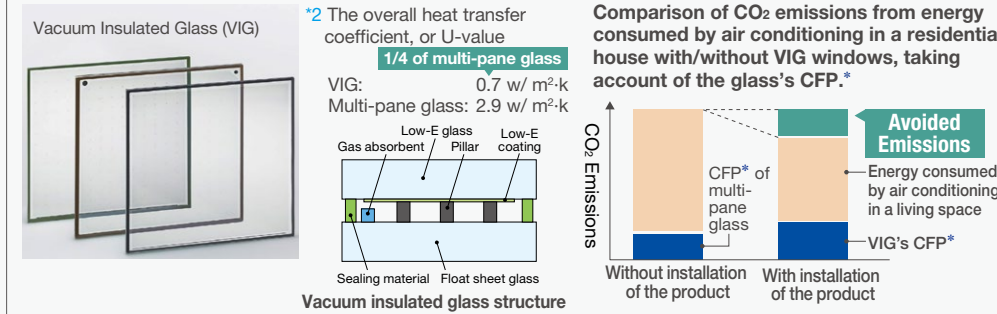
Sales regions: Japan

Overview

One effective means of achieving decarbonization in the consumer and business sectors is through reducing the air conditioning load at spaces in residential houses and offices by maintaining stable room temperatures through improvement of building insulation. According to our estimation, heat loss through the windows in all heat loss in an average detached house in Japan accounts for 30 to 40%. Our Vacuum Insulated Glass (VIG) achieves high insulation while at the same time maintaining its thinness, that can be adopted for existing openings (windows) in buildings as they are. Therefore, VIG has a potential to offer high applicability to a wide range of room spaces in different types of both new and older buildings.

Avoided CO₂ emissions mechanism

Vacuum insulated glass (VIG) shows significantly higher thermal insulation compared to those of single-pane glass and Low-E multi-pane glass.*2 CO₂ emissions converted from the reduced amount of power of electricity required for operation of air conditioning equipment by installation of the VIG for glass material of buildings.



Calculation formula of avoided emissions

$$\begin{aligned}
 & \left[\text{Amount of activities} \right] \text{ (m}^2\text{)} \\
 & \text{Amount of VIG sold per year} \\
 & \times \left(\text{Power consumed by air conditioning in a residential house with single-pane or Low-E multi-pane glass}^{\ast 3} \text{ per year (kWh/m}^2\text{)} - \text{Power consumed by air conditioning in a residential house with VIG}^{\ast 3} \text{ per year (kWh/m}^2\text{)} \right) \\
 & \times \text{CO}_2 \text{ emission factor for electricity (kg CO}_2\text{/kWh)} \times \text{Period (Designed lifetime)} \\
 & \text{CO}_2 \text{ emission factor for electricity Japan } 0.487 \text{ kg/kWh (Source: IEA 2021)} \\
 & \text{Annual avoided emissions achieved by installation of 1 m}^2 \text{ of VIG} \\
 & \left(\text{VIG's CFP}^{\ast 4} \text{ (kg CO}_2\text{/m}^2\text{)} - \text{Single-pane or Low-E multi-pane glass's CFP}^{\ast 4} \text{ (kg CO}_2\text{/kWh/m}^2\text{)} \right)
 \end{aligned}$$

*3 Calculated based on our simulation using data from the Architectural Institute of Japan.

*4 Calculated based on data from the Flat Glass Manufacturers Association of Japan, by Panasonic.

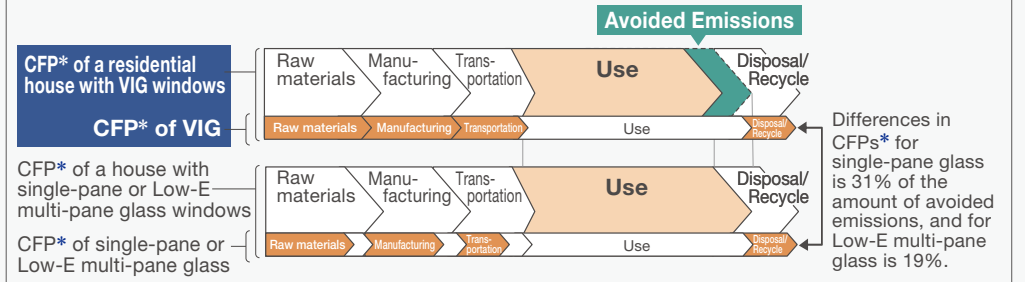
Baseline (Subject to comparison)

CO₂ emissions converted from electricity consumed by air conditioning operations in the entire space of a respective residential house in Japan.

For the installation of VIG, it is set that VIG replaces single-pane glass when reforming a house, and replaces Low-E multi-pane glass when building a new house.

Coverage of quantification (Way of thinking and its rationalization)

- In use: CO₂ emissions derived from electricity consumed by air conditioning in an entire residential house.
 - Glass's CFP*: VIG's CFP* is greater than that of single-pane or Low-E multi-pane glass, however, there are no CO₂ emission from the glass in use.
- The difference between the CFPs* from VIG and single-pane glass is 31% of avoided emissions, and the difference between VIG and Low-E multi-pane glass is 19% of avoided emissions. These differences were subtracted from the avoided emissions, instead of ignoring them.



Amount of activities (m²)

Amount of VIG sold per year

Avoided CO₂ emissions per unit of amount of activities (Basic unit)

- In use: Differences in electricity consumed by air conditioning in residential houses per different type of glass. Note: Annual power consumption was calculated by us, using a simulation of a two-story wooden house with a floor space of 120 m² based on standard weather data from the Architectural Institute of Japan using air conditioning heat load computing software.
- CFPs* for glass: Calculated by ourselves, per type of glass based on data from the Flat Glass Manufacturers Association of Japan.

Period (Flow method: Include entire lifetime CO₂ emissions of the product in its first sales year in one time)

- Designed lifetime of VIG.
- CO₂ emissions reduction effect continues during the period.
- We believe that the CO₂ emissions effects are estimated from a conservative view because the life of a Japanese residential house is generally deemed much longer.

*CFP (Carbon Footprint of Products): CO₂ emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

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Others (Reduction of redelivery)

Home Delivery Communication Box

Product life stages subject to avoided CO₂ emissions *1 Reduction of CO₂ emissions by home delivery services during the period of use of the products

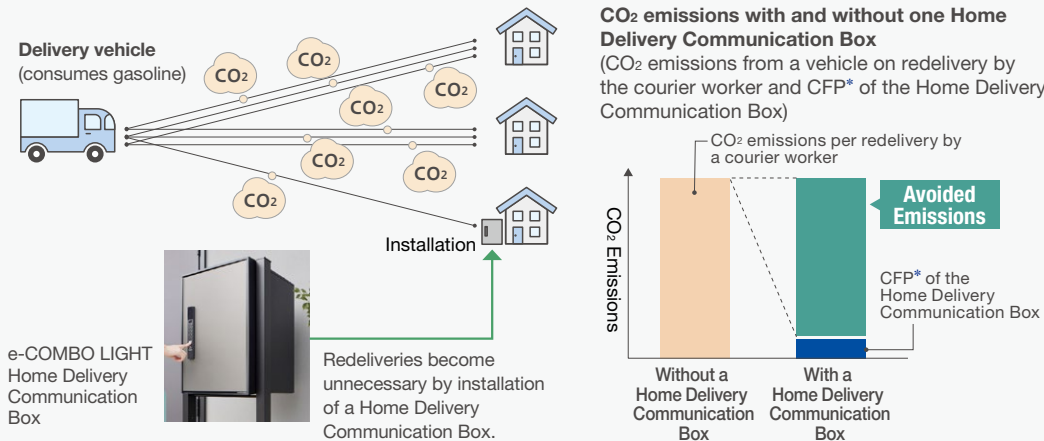


Overview

In the household business sector in Japan, because of increase in e-commerce trading and increase in the time when none is at home along with changes in lifestyle, load for distribution on couriers is on increase as the number of redelivery of goods increases. Installation of a Home Delivery Communication Box at home can avoid redelivery of goods, lowers the burden for the parcel receivers, and decreases the working hours of couriers workers. At the same time, it reduces CO₂ emissions from energy consumption such as fuel for deliveries, which contributes to reduction of load in local distribution networks and decarbonization.

Avoided CO₂ emissions mechanism

Reduction of CO₂ emissions from energy consumption (combustion of fossil fuel such as gasoline) required for courier workers to redeliver goods, by avoiding redeliveries.



Calculation formula of avoided emissions

Amount of activities	Avoided emissions for a given amount of activities	Values related to CO ₂ emissions	Period, etc.
[Amount of activities] (Units) The number of Home Delivery Communication Boxes sold per year.	Avoided emissions per vehicle per redelivery (0.46 kg/redelivery) <small>* Verified data by Ministry of Land, Infrastructure, Transport and Tourism (MLIT)</small>	Annual number of redeliveries <small>* Verified data by Panasonic</small>	Period (Designed lifetime of the product)
$\times \left(\text{Avoided emissions per vehicle per redelivery (0.46 kg/redelivery)} \times \text{Annual number of redeliveries} \times \text{Period} \right)$			$- \text{CFP}^* \text{ of a Home Delivery Communication Box}$ <small>* Estimated by Panasonic</small>

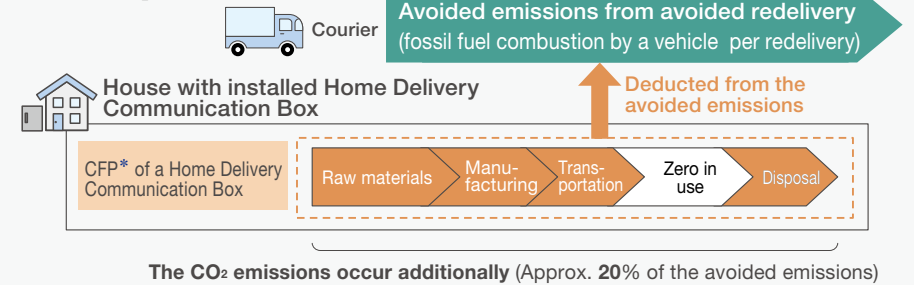
Baseline (Subject to comparison)

CO₂ emissions converted from the average energy consumption from redelivery of goods by courier workers, in the case that the receivers of the goods did not receive the goods at the first delivery as they were not at home where a Home Delivery Communication Box is not installed.

Coverage of quantification (Way of thinking and its rationalization)

When the box is in use (avoided emissions from avoided redelivery by installation of a Home Delivery Communication Box). Although the box emits no CO₂ when it is in use, the CFP* of the box itself is 20% of entire avoided emissions (by our estimation). However, this was not included in the avoided emissions as it is an additional effect.

[Situation where redelivery is avoided]



Amount of activities (unit)

The number of Home Delivery Communication Boxes sold per year

Avoided CO₂ emissions per unit of amount of activities (Basic unit)

- Avoided emissions per redelivery: 0.46 kg (Source: Verified data by MLIT)
- The number of redeliveries: Verified data by Panasonic

Period (Flow method: Include entire lifetime CO₂ emissions of the product in its first sales year)

- Designed lifetime of a Home Delivery Communication Box.
- CO₂ emissions reduction effect continues during the period.
- We deemed that the design life of the Home Delivery Communication Box is a conservative estimate for CO₂ emission effects as the box's life can be extended further with appropriate use and maintenance.

*CFP (Carbon Footprint of Products): CO₂ emissions converted from GHG emissions throughout the entire product life cycle—from raw material procurement to disposal and recycling of a product and service (per one unit).

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Activities to raise awareness of and valorize Avoided CO₂ Emissions

Under the current GHG Protocol, it is possible to evaluate CO₂ emissions from our business activities; however, it does not take into account the contribution to society through our business (opportunities, i.e., business chance) as of now. On the other hand, although there is a concept of the avoided emissions, in reality awareness of the avoided emissions is still low in society and no uniformed standard for the avoided emissions has been established. Therefore, it is a must to establish a structure to facilitate and encourage respective corporations efforts to decarbonation (technical development and innovation), as well as to contributes to the acceleration of the realization of a carbon-neutral society by preparing environment where respective corporation's contribution to decarbonization is properly evaluated.

Our environmental vision, Panasonic GREEN IMPACT (PGI), sets out the CO₂ emissions reduction targets not only for our company but also for society as a whole. It is important to spread significance of the avoided emissions as 'a standard measurement' to evaluate the corporation's contribution to decarbonization efforts and expand awareness of the avoided emissions, together with stakeholders such as corporations and financial institutions who share the same ambitions. Therefore, we are currently implementing the following activities regarding the avoided emissions towards its global standardization, and raising and spreading its awareness

■ Standardization Activities

■ International Electrotechnical Commission (IEC)

In September 2020, activities of standardization of a new IEC standard proposed by Japan's proposal started. Specifically, the activities are calculation of the avoided emissions from new technologies, such as AI, IoT, and a digital twin; provision of requirements for the calculation methods; establishment of requirements for communications and information disclosure, and preparation of an international standard IEC63372 titled "Quantification and communication of GHG emissions and emission reductions/avoided emissions from electric and electronic products and systems - Principles, methodologies, requirements, and guidance." A voting has started since May 2024 on the Committee Draft IEC TC111 (Environmental standard for electrical and electronic equipment and systems). If all goes well, the new IEC standard is expected to be published in the early half of 2025. The Panasonic Group has involved and worked on the above activities from their initial stage.

■ World Business Council for Sustainable Development (WBCSD)

WBCSD is a global organization of approximately 200 leading companies committed to

sustainable development, working together to contribute to transformation to sustainable society. Endorsing the principles of WBCSD, Panasonic Holdings Corporation (PHD) joined WBCSD in 2022 to accelerate the Panasonic Group's PGI activities. In response to the Guidance on Avoided Emissions issued by the WBCSD in March 2023, Panasonic is working in close collaboration with the member companies for revising the standards and promoting activities to disseminate the avoided emissions.

[WEB Panasonic Holdings Joins WBCSD \(World Business Council for Sustainable Development\)](https://news.panasonic.com/global/press/en221007-2)
<https://news.panasonic.com/global/press/en221007-2>

■ GX League*

With the aim to establish a system whereby the opportunities for Japan's corporations contributions to climate change such as emissions reduction by their products and services provided to markets is properly evaluated and ultimately to achieve global carbon neutrality, Panasonic, as a leading member of the GX Business Working Group, has participated in the GX League following to the last year, in the area of rulemaking for market creation that is one of the GX League activities.

To expand awareness of the avoided emissions that is one of the disclosure items used in the Panasonic Group's long-term environmental vision in evaluating opportunities related to climate change, we jointly published with other GX league member company a collection of use examples by financial institutions in December 2023, and in May 2024 a virtual collection of recommended information disclosure by our operating companies, following to "the Basic Policy for disclosure and evaluation for opportunities related to climate change" published in fiscal 2023.

* GX stands for 'Green Transformation'. In February 2022, the Industrial Science and Technology Policy and Environment Bureau of the Ministry of Economy, Trade and Industry (METI) announced the GX League Basic Concept. GX League was launched as an apparatus where the company groups who are proactively working for GX with players in industry, government, academia and financial institutions challenge towards GX as a whole to discuss transformation of a whole society, economic and environmental system and implement activities to create new markets.

[WEB Establishment of the GX League Business Working Group and Appointment of PHD as a Leader - Building a Framework and Promoting Evaluation and Disclosure on Climate-Related Opportunities](https://news.panasonic.com/jp/topics/204865)
<https://news.panasonic.com/jp/topics/204865>

■ Appeal of the avoided emissions at international events

As a result of our fiscal 2023 activities for raising awareness and dissemination of the avoided emissions at international events, the activities were clearly stated in the 2023 G7 outcome documents.

We have continued working to raise awareness and valorize the avoided emissions in fiscal 2024.

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■ G7 Ministers' Meeting on Climate, Energy and Environment in Sapporo

In April 2023, "There is value in acknowledging avoided emissions." was clearly stated in the outcome documents.

■ G7 Hiroshima Summit

In May 2023, "We also encourage and promote private entities' work to foster innovation contributing to the emissions reductions of other entities through decarbonization solutions." was clearly stated in the outcome documents.

■ GGX x TCFD Summit

At the GGX x TCFD Summit sponsored by the METI as an international event integrating the Global Green Transformation (GGX) meeting and the Task Force on Climate-related Financial Disclosures (TCFD) meeting, held in October 2023, Panasonic Group participated in the panel discussion as a panelist on the themes of corporate problem-solving capabilities and the avoided emissions. Our panelist explained that the avoided emissions are a benchmark for measuring the contribution of each business to solving climate change issues and use of the benchmark will lead to decarbonization of the entire society. He also referred to that while there is a growing interest in the avoided emission as a measurement to evaluate the level of corporations contribution to decarbonization as the avoided emissions was clearly stated in the G7 Summits outcome documents, the avoided emissions are significant in terms of fairness and comparability for corporations.

■ COP28 (The 2023 Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC))

In December 2023, Panasonic Group participated in the METI-sponsored seminar at the Japan Pavilion and actively involved in discussions with WBCSD, GFANZ (Glasgow Financial Alliance for Net Zero, a global alliance of leading financial institutions engaged in for acceleration of economic decarbonization), BlackRock, and other related organizations. In the seminar with a theme of "Tech for Transition," we discussed rulemaking and technology related to the avoided emissions. In the seminar on "appropriate evaluation of the avoided emissions towards a net zero society," we suggested that, for the financial industry to utilize the avoided emissions as an indicator in evaluating business enterprises and projects, the calculation method should be standardized in order to facilitate a fair and easy comparison for corporations.

[WEB](https://news.panasonic.com/jp/stories/15099) Panasonic Holdings Uses COP28 Discussions, Exhibition to Broaden Global Understanding of Avoided Emissions

<https://news.panasonic.com/jp/stories/15099>

■ CES2024

At the CES 2024 Conference held in January 2024, Panasonic Group announced its intentions to continue to lead society, establish the concept of the avoided emissions, make rules in the area, and ultimately to contribute to its dissemination of the avoided emissions throughout the world, touching upon its participation in the G7 Hiroshima Summit.

[WEB](https://news.panasonic.com/jp/stories/15238) Communicating our corporate stance on making social contributions to both "resolving issues in the global environment" and "lifelong health, safety and comfort" — CES 2024

<https://news.panasonic.com/jp/stories/15238>

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Promoting Group-wide Environmental Sustainability Management Centering on PDCA

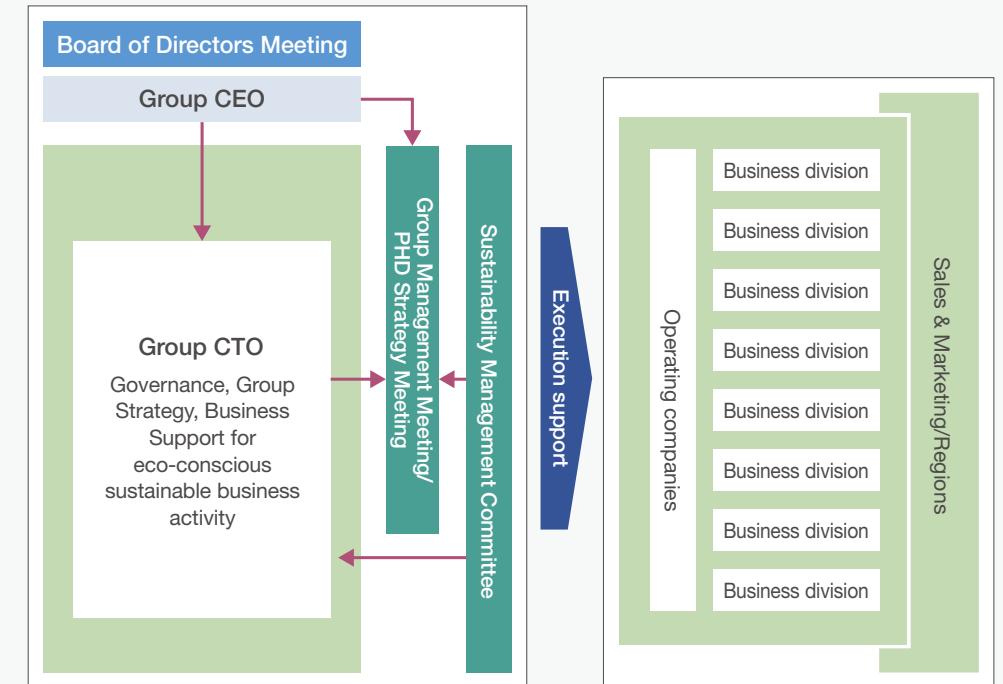
Striving for the creation of a sustainable society, we are following our initiative under the Group Chief Technology Officer (CTO) (Tatsuo Ogawa Executive Officer, as of April 2024) and working to fulfill our corporate social responsibility through eco-conscious business activities as well as resolve environmental issues such as climate change, resources, water, etc. through our products and services. The Panasonic Group formulates its annual environmental management policy in accordance with the Group's management policy, "Panasonic GREEN IMPACT"—our long-term environmental vision announced in fiscal 2023, our Environmental Action Guidelines and the GREEN IMPACT PLAN 2024—our environmental action plan. Our environmental policy is shared annually across the entire organization through the policy presentation led by the Group CTO, who is delegated authority by the Group CEO. Operating companies and business divisions establish their own environmental policies and targets based on the Group management policy and "Panasonic GREEN IMPACT", and plan and promote their activities accordingly. The progress and results of activities for the key environmental targets we pledged to society to achieve under the Environmental Action Plan, GREEN PLAN 2024 are examined and determined on the directions, issues, and particularly key measures in the Group Management Meeting where top management such as the Group CEO and presidents of the operating companies participate. Matters of special importance are deliberated on by the Board of Directors Meeting.

Panasonic GREEN IMPACT, our Group's long-term environmental vision as stated above, was put through this process and was released in April 2022. In promoting our environmental sustainability management activities in Panasonic Group, we have built a structure to promote implementation of such activities collaborating other departments in the entire Group through determination by the Sustainability Management Committee (established in December 2021) led by the Group CEO. For activities organized by theme, we have set up committees specifically for dissemination of our environmental policy and targets to all members of the Group without fail, deliberation on how to respond to issues, and chemical substances management used in our products. We started our Sustainable Management Promotion Consortium activities in September 2020 as opportunities for volunteers to resolve sustainability issues and integrating business growth, which are underway, building consultative reporting ties with the Sustainability Management Committee as mentioned above. (approx. 960 participants)

In principle, results of activities relevant to environmental targets are gathered and assessed on a monthly basis as environmental performance data, to identify the achievements, and

additional measures are taken as needed. Feedback of annual performance data is given internally and disclosed externally after review, onsite audits, and independent assurance by a third-party. Moreover, reviews and feedback from stakeholders are utilized in subsequent measures to ensure further continuous improvement.

Promotion System of Environmental Sustainability Management in Fiscal 2025



* See [page 5](#) for more details on Promotion System of Sustainability Management

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Implementation of Environmental Sustainability Management Based on Environmental Management Systems (EMSs)

As the foundation of environmental sustainability management, Panasonic Group set up EMS at all of our manufacturing sites across the world in fiscal 1999, and has continued to have the respective sites ISO14001 certified since then.

Moreover, in order to further strengthen the environment management world-wide, we set up EMS also at all of our nonmanufacturing sites; in principle, the respective sites also have obtained ISO 14001 certification. In October 2011, we published the Environmental Management System Establishment Guidelines that summarizes the EMS concepts for different business forms such as manufacturing, sales and services, and head office administration, aiming to build the EMS in accordance with the Basic Rules for Environmental Affairs on a global scale. Based on the Guidelines, we are implementing Environmental Sustainability Management to achieve the targets set in the Green Impact Plan 2024.

Panasonic Automotive System Co., Ltd., Panasonic Industry Co., Ltd. and Panasonic Energy Co., Ltd. provide seminars for their members to learn the basics of the EMS, and training for auditors to work at different levels, such as internal and chief auditors. Due to the COVID-19 pandemic, holding trainings in conventional assembly form was impossible from fiscal 2021. The remote training scheme has enabled employees who could not participate in training because of time constraint participate in the training actively, resulting in highly effective training. Since fiscal 2024 when the pandemic subsided, holding training in face-to-face form has been possible, and some of our operating companies restarted training in hybrid form with face-to-face and online, utilizing merits of both forms. Furthermore, each operating company is upgrading its program contents to implement and enhance their management on sites. Such programs include practical programs including various methods such as roleplaying, and audit-related programs such as on audit policy and focused auditing points aiming to standardize internal auditors skills at high level.



Seminars for nurturing internal auditors

Acquired status of the ISO 14001 Certification (as of March 31, 2024)

Region	Number of certifications obtained*1		Total
	Manufacturing	Non-manufacturing	
Japan	20	10	30
North America & Latin America	13	0	13
Europe & CIS	7	1	8
Southeast Asia, & Oceania	34	8	42
China & Northeast Asia	43	1	44
India, South Asia, Middle East & Africa	6	1	7
Total	123	21	144

*1 The above number includes the one for integrated certification. The number of acquired status varies every year depending on the situation such as reorganization or closure of BDs, or promotion to acquire integrated certification.

[PDF | Panasonic Group ISO 14001 Certification Sites](https://holdings.panasonic/jp/corporate/sustainability/pdf/eco_isolist2023.pdf)
https://holdings.panasonic/jp/corporate/sustainability/pdf/eco_isolist2023.pdf

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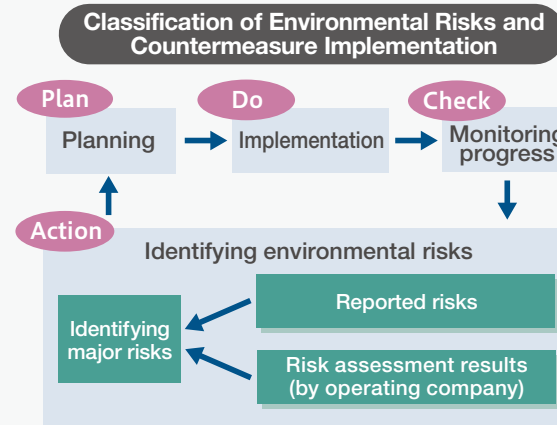
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Group-wide Systems to Manage Environmental Risks

As a tool to continuously reduce environmental risks, Panasonic Group has established an Environmental Risk Management System specific to each operating company. In accordance with the basic risk management policy for all Panasonic group operating companies (see pages 138-139), we promote identification of environmental risks and group-wide risk management each year, and ensuring quick responses to reported environmental risks.



To identify environmental risks and implement the management system, environmental risks are identified for each operating company and for each region in the world each year. From these risks, environmental risks on a Panasonic group-wide level are selected. The risks that show a high level of frequency or seriously impact business management are designated as major risks and prioritized in planning and executing risk reducing measures. These measures are implemented for each major risk, and progress is monitored and followed up on a quarterly basis in the PDCA cycle.

When an environmental risk is found, the relevant operating company, related job functions, and local companies collaborate to promptly implement emergency measures and recurrence prevention measures adapted to the risk level. Also, the management flow in case of risk discovery is standardized to prevent the occurrence of secondary risks as a result of confusion.

Environmental Compliance Management at Factories

Panasonic Group manages environmental systems in full compliance with laws and regulations. We regularly measure emissions of gas, wastewater, noise, odor, etc., and introduce preventative measures for cases that may lead to serious violations. Furthermore, key human resources are developed for information sharing among the operating companies/business divisions, environment-related job functions, and local companies, to ensure exhaustive compliance with legislation related to factory environment management in respective countries where our manufacturing sites are located. Specifically, activities to share information as well as

specialized training are conducted for factory management officers in charge of the management of chemical substances, waste, wastewater, and exhaust gas, either by country or by region in Japan, Europe, China, and Southeast Asia. Field surveys on laws and regulations using checklists were conducted on a global scale to confirm comprehensive implementation of environmental compliance, and we also conducted verification of the effectiveness of various measures.

As a result of these measures, there were 4 violations of environment-related regulations across the world in fiscal 2024. In response to the violation, we promptly reported the violation to the authority, and at the same time, implemented measures against the causes to fulfill the criteria. We continue our efforts for thorough legal compliance and the prevention of any recurrence.

Case of Violations of Laws and Ordinances (e.g., excess of the standard legal level) in Fiscal 2024

Region	Environmental pollution					Other	Total
	Air	Water quality	Noise	Odor	Waste	Permission / Approval	
Global (including Japan)	2	0	0	0	2	0	4
(Japan)	(0)	(0)	(0)	(0)	(0)	(0)	(0)

Compliance with Environmental Regulations Relating to Products

We manage compliance with regulations relating to our products through a quality management system. Compliance with regulations is ensured with our Products Assessment System which incorporates environmental performance targets such as customer demands for environmental performance, the energy efficiency labeling program, and third-party certification systems, as well as evaluation of compliance with regulations on chemical substance management, energy efficiency, 3R, and recycling, to (1) set up overview for achieving targets at the product planning stage, (2) define concrete targets at the design planning stage, and confirm compliance at the design stage, (3) conduct interim assessment at the design completion stage, and (4) conduct final assessment at the mass production decision-making stage. In compliance with the RoHS regulations on 10 hazardous chemical substances, regular acceptance inspections are being conducted for purchased parts and goods and our suppliers are audited under our environmental quality assurance system. These are designed in cooperation with our suppliers to improve the management of chemical substances in our products. However, unfortunately, a violation related to the restricted substances in our products was found in fiscal 2024. The restricted substance content was derived from an upper stream supplier (a supplier in higher-tier) who has not directly contacted with Panasonic Group in the supply chain. Due to the

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difficulty of clearly understanding the state of quality control at suppliers in higher-tier, we believe strengthening the quality control system (audit system and training of the suppliers in higher-tier) at a supplier who directly contracted with the Group (Primary suppliers) is important to eliminate such violations. Therefore, our Quality, Environment, and Procurement Divisions will work to ensure further product compliance management and take recurrence measures, taking lead in collaboration with other relevant divisions for providing support to our primary suppliers.

Measures Against Soil and Groundwater Contamination and Air Pollution

In the latter half of the 1980s, soil and groundwater contamination due to chlorinated organic solvents was detected at some Panasonic group sites. In response, we have conducted anticontamination activities across the Group. Specifically in 1991 we created the Manual for Preventing Contamination of Soil and Groundwater and began conducting necessary surveys and measures. In 1995 we discontinued the use of chlorinated organic solvents, and in 1999 created Guidelines on the Prevention of Environmental Pollution to ensure there would be no recurrence of similar problems at our sites. In fiscal 2003 we began enhancing our surveys and measures to comply with relevant laws and regulations, including the Soil Contamination Countermeasures Act,

Soil and Groundwater Risk Management Policy

Conditions subject to management supervision	Procedure
Pollution dispersion prevention beyond Panasonic premises	<ol style="list-style-type: none"> 1. Conduct historical surveys 2. Determine and install monitoring wells at the premises' borders 3. Analyze groundwater at the borders 4. Check possibility of pollution from external sources 5. Report to management department 6. Determine the external pollution dispersion prevention methods 7. Install the external pollution dispersion prevention methods 8. Install assessment wells 9. Begin assessments (monitoring)
Thorough pollution source elimination	<ol style="list-style-type: none"> 10. Conduct brief status check 11-1. Horizontal direction detailed analysis 11-2. Vertical direction detailed analysis 12. Determine the magnitude of pollution 13. Discuss the areas and methods of purification 14. Conduct purification and install pollution dispersion prevention measures 15. Monitor pollution source (groundwater) after purification 16. Report purification completion to management department

which was enforced in Japan in 2003, and in fiscal 2004 started implementing measures to place all our bases across the globe under management supervision with regard to soil and groundwater.

Specifically, we conduct onsite inspections and interviews at the bases, in addition to surveying their use of volatile organic compounds (VOCs) and heavy metals. Furthermore, we implement surface soil surveys within the premises. For the sites where contamination was detected beyond the regulatory pollution standards, we conduct detailed borehole surveys to identify the boundaries of the contaminated areas and take remedial measures.

As a result of these efforts, we were able to place all our bases under management supervision in 2008. Furthermore, in fiscal 2011, the management supervision scheme was purpose-specifically reorganized and reinforced to establish a new management supervision scheme. With the highest priority given to preventing dispersion of pollution beyond our premises, this new scheme is implemented across all operating sites to further improve the level of measures against contamination.

Soil and Groundwater Pollution Surveys and Remedial Measures for Fiscal 2024

Region	Number of sites that completed remedial measures	Number of sites currently taking remedial measures
Global (including Japan)	4	40
Japan	(4)	(35)

In addition to the above, Panasonic Group is also working on responses to air pollution.

Besides the efforts making in factories as matters of course, we are working as a company to comply with the Act Concerning Special Measures for Total Emission Reduction of Nitrogen Oxides and Particulate Matter from Automobiles in Specified Areas (Act No. 70 of 1992), which regulates nitrogen oxides (NOx) and particulate matters (PM) emitted from company cars owned and/or managed by Panasonic Group. The company cars owned and/or managed by Panasonic Group business sites in Japan are centrally managed on the group-wide vehicle management system. Annually required reports are submitted through the vehicle management system. Also each business site undertakes thorough regular vehicle checkup and fuel economy management on these cars, as well as taking the initiative in reducing air pollution, such as by advising employees on eco-driving techniques and hosting related workshops, and promoting introducing hybrid cars.

Initiatives for PCB Pollution

Our initiatives for PCB pollution are introduced on the following website.

[WEB https://www.panasonic.com/global/corporate/sustainability/eco/governance/risk.html](https://www.panasonic.com/global/corporate/sustainability/eco/governance/risk.html)

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Panasonic Group endorsed the TCFD recommendations^{*1} in May 2019. As Panasonic Group recognizes risks and opportunities concerning climate change as a critical management issue, we identify our business risks and opportunities and verify business resilience and strategy by thoroughly analyzing the scenarios, considering the TCFD's recommendation. We also disclose information on thematic areas recommended by TCFD, i.e., 'governance', 'strategy', 'risk management', and 'indices and targets', assuming future engagement with investors, etc.

^{*1} TCFD: an abbreviation of Task Force on Climate-related Financial Disclosures. The task force was set up by the Financial Stability Board (FSB) in response to a request by the G20 Finance Ministers and Central Bank Governors. TCFD published its recommendations in 2017.

Governance

Panasonic Group system to promote group-wide environmental sustainability management is headed by board of directors, so that information on group-wide environmental sustainability management from all of the operating companies are reported to the board of directors.

Also, the progress and results of activities for the key environmental targets we promised to society to achieve under the GREEN IMPACT PLAN 2024 (GIP2024) are examined and determined on the directions, issues, and particularly key measures in the Group Management Meeting where Group CEO, presidents of operating companies, and senior managers participate. Matters of special importance are deliberated on by the Board of Directors Meeting.

Our long-term environmental vision "Panasonic GREEN IMPACT (PGI)", was put through this process and was released in April 2022. In promoting our environmental sustainability management, we have built a system with which all operating companies and business sites members effectively collaborate and promote group-wide activities through determination by the Sustainability Management Committee (established in December 2021) led by the Group CEO. For activities organized by theme, there are specific committees for disseminating our environmental policy and targets to all members in the Group, for deliberating on how to respond to issues, and for managing the chemical substances used in our products.

See [page 23](#) for more details.

Strategy

We analyzed impacts on certain items of Panasonic Group Businesses that are likely to affect climate change, based on our assessment of the risks and opportunities in Panasonic Group

business operations. The results were used to develop a social scenario for the year 2030, focusing on matters with the greatest impact. We then used the scenario as the basis for examining strategies, and verified the business resilience in our strategy. See [pages 30-33](#) for more details.

Panasonic GREEN IMPACT (PGI) is our transition plan to low-carbon economy as a Panasonic group. To support this transition, we have set up short-term targets in our Green Impact Plan (GIP) 2024. We have also set out following medium-term targets.

- Make our total CO₂ emissions (Scope 1 and Scope 2) net-zero by 2030.
- Reduce CO₂ emissions from use of our products that Panasonic Group sold by 30% compared with the 2019 level by the year 2030.

We would like to introduce specific examples as our contribution to energy reduction and energy transformation in society.

The first is an example of our energy reduction activities for product use in Scope 3; that is, action on lighting equipment that emit large volumes of CO₂. In addition to the conventional lighting that is designed to "light up a plane" such as a floor or desktop, by using an index for 'feeling of brightness in space' and knowhows of "optical control technology" and "spatial presentation with proper lighting at a right place" that are developed based on our accumulated research results on comfortability, we will achieve energy reductions of up to 30% without compromising comfort.

The next is an example of our contribution to energy transformation in society through electrification. To speed up energy transformation in society, the demand side must itself push for electrification by replacing fossil fuel-fired equipment with electric devices. For instance, the heat pump water heater is capable of warming up water by using a heat pump to collect heat from the air efficiently, minimizing the electric power consumption. The heat pump can be used not only in new houses, but also in existing houses that use oil or gas-fired boilers without replacing the pipework. Electrification increases opportunities to make effective use of electric power derived from renewable energy sources. In addition to that frequency of utilizing opportunity to use energy derived from renewable energy sources increases thanks to the electrification, storing unstable supply of renewable energy as the warm water enables energy time shift and mitigates the load on the power grid, thus contributing to wider use of renewable energy resources.

[PDF](#) [Panasonic's Sustainable Management \(Group CEO Briefing, January 2022\)](#)

https://holdings.panasonic/global/corporate/investors/pdf/20220106_sustainability_e.pdf

See [pages 41-44](#) for initiatives for Scope 1 and Scope 2.

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Risk Management

As a tool to continuously reduce environmental risks, Panasonic Group is working to establish operating company-specific Environmental Risk Management Systems, in accordance with the basic risk management policy for all Group companies (see [pages 138-139](#)). The management policy includes identification of environmental risks and group-wide risk management each year, and ensuring quick responses to reported environmental risks. In addition, The Panasonic Group is promoting risk management based on the same process at Panasonic Holdings Co., Ltd. (PHD) and operating company. The PHD Enterprise Risk Management Committee conducts deliberations from the perspective of the Group's management and business strategies and social responsibilities, and decides the Group's significant risks. In fiscal 2024, strategic risks in Panasonic Group's significant risks such as climate change, environmental regulations and development of circular economy, and operational risks such as natural disasters and supply chain management have been addressed.

See [page 25](#) for more details.

Metrics and Targets

The Panasonic Group has set its medium- to long-term targets for reducing greenhouse gas emissions which were accredited SBT^{*2} 2.0°C in October 2017. Furthermore, in May 2023, our new greenhouse gas emissions reduction target was accredited as SBT 1.5°C.

^{*2} SBT: an abbreviation of Science Based Target. It is a target to reduce GHG emissions in consistent with scientific knowledge toward the goals to limit the increase of global temperature to less than 2.0°C, or less than 1.5°C if possible, above pre-industrial levels.

GHG emissions reduction targets (SBT 1.5°C accreditation)

	Targets	Progress rate
Emissions from Panasonic Group business activities (Scopes 1 and 2)	Reduce by 90% by 2030 (compared to FY2020) 2019: 2,311 kt	38%
Emissions from use of Panasonic Group products (Scope 3)	Reduce by 30% by 2030 (compared to FY2020) 2019: 106,309 kt	— ^{*3}

^{*3} Progress rate not calculated due to increase in emissions because of expansion of products subject to calculation (see [page 13](#))

Moreover, regarding indices related to climate change, we are discussing to set targets for following each item.

• Transition risk

In response to a rise in the awareness of environmental issues, we are particularly focusing on the risks associated with the introduction and expansion of environmental regulations and policies in the international community. The rise in energy procurement costs, forced purchase of emission credits, increase in manufacturing costs because of switching to use materials with lower environmental impact, and commoditization of low-carbon products, resulting from the introduction of carbon pricing, such as a carbon tax and the Emission Trading System, are all may adversely affect our Group's business operations and performance. In addition, any delay in taking action to take measures against these environmental issues may lead to a loss of business opportunities to expand in the European and other markets as well as a loss of business opportunities as a result of trade halts. Furthermore, our drive to use tax deductions, subsidies and other methods to gain business opportunities under regulatory systems for energy security assurance and climate change measures in these countries may adversely affect our Group's business since we will not be able to receive fruitful results as we expected.

• Physical risk

Each operating company assesses and monitors natural disaster risks, as well as their emergency responses to those risks. Each operating company also established financial assessment standards on the scale of the impact of the potential risks, rating the risk as high when the impact is more than 10 billion yen and as medium or low according to the impact risk.

• Climate-related business opportunities

As the target set under our PGI announced in April 2022, we will strive to reduce CO₂ emissions, with a aim of by 2050, achieving reduction impact of more than 300 million tons that is 'approx. 1%' of the total CO₂ emissions discharged all over the world as of now, through group business activities.

In addition to our business operations in automotive battery business for environmentally friendly vehicles, aiming to reduce huge amount of CO₂ emissions and activities to reduce CO₂ emissions by the air quality and air conditioning business in Europe, in 2022 we started up an experimental facility under 'our RE100 solution' that had been designed to supply 100% of the power needed for a fuel cell manufacturing plant with renewable energy from hydrogen and photovoltaic power generation,^{*4} aiming at locally producing energy and consuming the energy locally.

• Capital allocation

Panasonic Group plans to invest 600 billion yen for the three years from 2022 to 2024 under our medium- and long-term business strategies, mainly in automotive battery business that is

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in our priority investment areas. Following the investment in automotive battery business, we have air quality and air conditioning business and supply chain management software business that we invest in our priority investment areas.

Our automotive battery business will play a central role for PGI by developing a supply chain with lower environmental impact and increasing avoided emission by such business growth. As for our air quality and air conditioning business, we plan to expand the business in the European market where measures against climate change have been implemented, by focusing on air-to-water systems that will contribute to reducing CO₂ emissions. As for our supply chain management software business, we will contribute to reducing the environmental impact by eliminating waste and delays in the supply chain.

 **Panasonic Group Strategy Briefing by Group CEO (May 18, 2023)**
https://holdings.panasonic/global/corporate/investors/pdf/20230518_groupstrategy_e.pdf

• Internal carbon pricing

Panasonic Group introduced internal carbon pricing (ICP) in March 2022 for capital investment, with a setting the price of CO₂ emissions at 6,000 yen/t-CO₂.^{*5} We plan to increase the installation of energy-saving facilities and renewable energy-fueled equipment, including photovoltaic power generation, while maintaining economic rationality that is consistent in the future, by considering the impact of future carbon taxation and the like. As for further expansion in the scope of our activities and price setting, we will determine in line with our business decisions.

In order to accelerate our competitiveness in businesses contributing to 'carbon neutrality (decarbonization)' and 'circular economy', Panasonic Corporation, one of our Panasonic Group companies, introduced the ICP scheme where CO₂ emissions reduction in Scope 3 in our entire value chain and avoided CO₂ emissions contribute to society are used as criteria for investment decision, to its divisional company Living Appliances and Solutions Company on a trial base in fiscal 2024. Under the ICP scheme, respective Operating Company or Business Division introduces the scheme on its own to be suited to own individual business characteristics, in addition to taking into account capital investment decision in Scopes 1 and 2 common to Panasonic group, setting the CO₂ price at 20,000 yen/t-CO₂ with priority to long-term investments. We plan to gradually roll out the ICP scheme, expanding to all Panasonic Corporation from fiscal 2025.^{*6}

• Remuneration

Since April 2022, we have adopted a new performance evaluation system for executive remuneration of directors and executive officers of the holding company and of the presidents of the operating companies. The evaluation items for performance-based remuneration include those related to sustainability viewpoint such as environmental contributions. One of

the examples of the contribution to our environmental performance index is reduction of CO₂ emissions in our own value chain.

*4 See  <https://news.panasonic.com/global/press/en220427-1>

*5 Subject to change because of market conditions

*6  <https://news.panasonic.com/jp/press/jn230602-2>

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To verify the strategic resilience of our business, Panasonic Group initially analyzed their impacts of climate change risks and conducted a scenario analysis based on the result of the impact analysis.

In the course of the impact analysis, we listed every possible impact on our business from climate change or measures against climate change, and then identified the risks and opportunities brought by such impacts by Panasonic Group's major businesses. The following table lists risks and opportunities by business, and integrated results of the different impacts of climate change (Table 1).

Table 1 Extracted Risks and Opportunities

		Risks	Opportunities	
Transitional risks	Policies/laws and regulations	Acceleration of carbon pricing	- Energy procurement costs increase. - Competition from low-carbon businesses intensifies toward carbon neutrality.	- Energy procurement costs stabilize because of increased demand for renewable energy. - Businesses related to fuel cells, energy-saving products, solution services, and energy management expand.
		Accelerated shift to electric vehicles	- As more firms enter the automotive business, competition intensifies. - Increased demand for automotive batteries intensifies material procurement competition. - Higher cost of automotive batteries production reduces car business profitability and pressurize costs of components.	- Electric vehicle-related markets expand.
	Reputation	Increased environmental awareness among consumers	- Insufficient environmental efforts and promotion lead to unsupported by consumers. - Value shift from purchasing to leasing decreases sales.	- Recognition as a sustainable company and of sustainable products attracts more customers. - Businesses related to low-carbon products, eco materials, and energy management expand.
		Increased risk to reputation	- Insufficient efforts in decarbonization reduce business opportunities.	- Recognition of environmental technologies and products increases business opportunities.
	Technologies	Expansion of renewable energy usage	- Investment in facilities with renewable energy increases.	- Highly efficient solar cells open new markets.
		Expansion of carbon-free power generation	- Production energy procurement costs increase. - Regional disparity of carbon-free power generation lead to review the strategies of production sites.	- CO ₂ emissions reduction throughout product lifecycles encourages shift to electric vehicles leading to related market expansion.
		Spread of ZEH/ZEB	- Low-carbon products in housing equipment become mere commodities.	- Increased opportunities to provide energy management & total solution services through housing equipment and home appliances. - Demand for heat insulation materials increases.
		Replacement with low-carbon products	- Increases development costs of lightweight and robust materials for competitive low-carbon products.	- Increases demand for materials that contribute to reduction of energy consumption.
		Streamlining of supply chain	- Expanded capital investment puts stress on balance sheet.	- Demand for energy management systems increase. - Lowered prices from reduced production costs increase sales.
	Markets	Response to depletion of resources	- Delay in recycling and reuse technologies increases costs. - Resource recycling does not suit consumers' tastes.	- Business models change to circular economy- based models. - Demand for recycled resources increases.
Physical risks	Chronic	Constant temperature rise	- Poor health of employees reduces productivity. - High energy consumption from excess usage of air conditioners puts off consumers.	- Businesses related to healthcare, air conditioning and ventilation, energy management, housing, and cold chain expand.
	Acute	Physical risk management related to climate change	- Suspension of operations at our factories. - Negative impact on supply chain.	- Demand for needs of resilient infrastructure increases. - Fuel cell business with resilience expands. - Disaster-resilient manufacturing by managing risks with BCPs.

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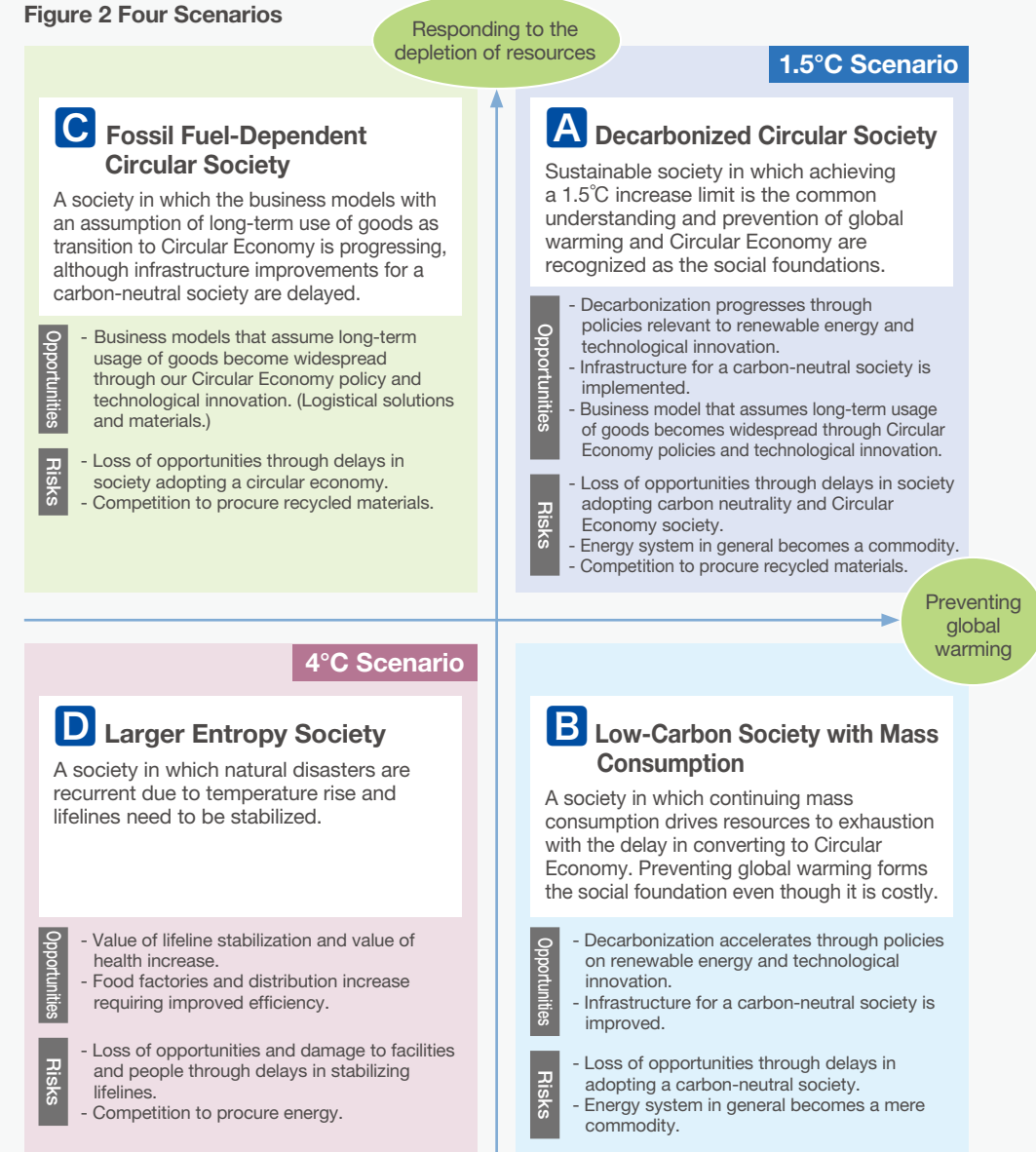
The following figure shows the impact analysis results of climate change risks (Figure 1) regarding the results of analyzed factors based on the identified risks and opportunities and analyzed impact on our businesses.

Figure 1 Impact Analysis of Climate Change Risks

Risk categories related to climate change	Transitional risks	Markets			● Response to depletion of resources	
		Policies/laws and regulations		● Acceleration of carbon pricing	● Progressive shift to electric vehicles	
		Technologies	● Expansion of carbon-free power generation	● Expansion of renewable energy usage ● Replacement with low-carbon products ● Streamlining of supply chain	● Spread of ZEH/ZEB	
		Reputation		● Rise of environmental awareness among consumers ● Increase of reputational risks		
	Physical risks	Acute		● Physical risk management related to climate change		
		Chronic	● Constant temperature rise			
			Strong	Impact on our businesses	Extremely strong	

We extracted “response to depletion of resources” and “prevention of global warming” from the climate change viewpoint and identified their materiality as factors that have an extremely high impact on our business. Setting these two factors as the axes of a matrix, we created four scenarios toward 2030 in the following quadrants (Figure 2). We defined a society in which global warming is prevented and response to depletion of resources is taken as ‘the 1.5°C scenario’, and a society in which global warming is advanced and resources are depleted as ‘the 4°C scenario’.

Figure 2 Four Scenarios



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The society named as a **A** Decarbonized Circular Society is equivalent to the 1.5°C scenario. If **A** continues to deplete resources, society becomes a **B** Low-Carbon Society with Mass Consumption. If **A** increases global warming, society becomes a **C** Fossil Fuel-Dependent Circular Society. Scenario **D** a Larger Entropy Society is equivalent to the 4°C scenario.

Fuller descriptions of each set of social conditions are given below.

A Decarbonized Circular Society

● Impact on industries

Concurrent progress of legislation and technological innovation related to preventing global warming and creating a circular economy help to form a related infrastructure for a carbon-neutral society and Circular Economy. This encourages investment in decarbonization in automotive and real estate industries, and advances the shift to business models that assume long-term use of goods in industries involved in the supply chain. It is also expected that not only products but also the construction of sustainable towns designed for carbon neutrality and Circular Economy will attract investment.

● Changes in customer value

Consumers: Eco-consciousness, cost reduction, ethical, on-demand usage, etc.

Corporations: Eco-consciousness, cost reduction (energy saving, asset-light approach, better fuel efficiency, etc.), effect and efficiency enhancement (maximization of customer value, i.e. better experience value, etc.).

B Low-Carbon Society with Mass Consumption

● Impact on industries

Progress of carbon-related legislation (NEV/ZEV laws and ZEH/ZEB subsidy policies, etc.) and technological innovation (reduced cost of renewable energy and storage batteries, etc.) encourages standardization for decarbonization in the automotive and real estate industries and attracts investment. This helps the shift to electrification and a renewable energy infrastructure. Adoption of renewable energy and hydrogen also expands.

● Changes in customer value

Consumers: Eco-consciousness, cost reduction (energy saving, better fuel efficiency, etc.).

Corporations: Eco-consciousness, energy saving and better fuel efficiency (downsizing, weight-reduction, high density and capacity, high efficiency, etc.).

C Fossil Fuel-Dependent Circular Society

● Impact on industries

Progress in technological innovation of waste plastic and for a circular economy (data linkage, material recycling, etc.) and their related legislation eliminate waste in the supply chain and encourage a shift to a circular economy. Corporations involved in the supply chain (manufacturers, distributors, etc.) change their business models from sales and consumption-based models to those that assume long-term usage of goods, including leasing, sharing, and repair. Products made of recycled resources become mainstream backed up by the formation of waste collection networks and material recycling systems.

● Changes in customer value

Consumers: Eco-consciousness, ethical, on-demand usage, etc.

Corporations: Effect and efficiency enhancement (maximization of customer value, i.e. better experience value, etc.), cost reduction (energy saving, asset-light approach, etc.).

D Larger Entropy Society

● Impact on industries

Changes in rainfall amounts and patterns make it difficult to control the yield and quality of agricultural products. This encourages a shift to demand and supply matching consumption, which eliminates waste in distribution. Deterioration of living and working environment and increases in illness due to constant temperature rises expand demand for companies related to indoor environments and health (building, home appliances, healthcare, etc.). In response to the increase in natural disasters, investment in infrastructure resilience to maintain the supply chain will increase.

● Changes in customer value

Consumers: Lifeline stabilization and resilience enhancement, health.

Corporations: Productivity enhancement, demand and supply matching, supply chain resilience.

We can address the risks and opportunities corresponding to the above scenarios through any of our seven main operating companies shown below.

1. Panasonic Corporation
(Home appliance business, Air quality and air conditioning business, Food distribution business, Smart Energy System business, Electrical facility materials business)
2. Panasonic Automotive Systems Co., Ltd.
3. Panasonic Connect Co., Ltd.
4. Panasonic Energy Co., Ltd.
5. Panasonic Industry Co., Ltd.
6. Panasonic Entertainment & Communication Co., Ltd.
7. Panasonic Housing Solutions Co., Ltd.

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For each type of society, we have formulated strategies for our seven operating companies from the viewpoint of climate change. Some of the strategies are listed below, with the applicable society type indicated by the corresponding scenario from **A** to **D**.

The total sales of the respective operating companies for fiscal 2024 are also shown as financial information.

1. Panasonic Corporation

Sales for fiscal 2024: 3,494.4 billion yen

1-1 Living Appliances and Solutions Company

- Build a circular value chain with customers through products and services. **A B C**
- Achieve extension of the product life cycle and improve customer engagement looking ahead of circular economy. **A C**

1-2 Heating & Ventilation A/C Company

- Provide the optimum and highest air and water quality values with low environmental impact, not found in conventional air conditioning, with a combination of our unique air and water technologies. **A B C D**
- Create unprecedented value with water and air heating systems with heat pump (A2W), chillers, and combination of air quality and air conditioning in the air conditioning business of water circulation type to contribute to improvement for decarbonization and air quality values. **A B C D**

1-3 Cold Chain Solutions Company

- Promote energy conservation offering comprehensive support for our energy monitoring system covering from system installation to operations and maintenance. Our equipment refurbishing service prolongs system usage while contributing to a circular economy. **A B C**
- Accelerate development of natural refrigerants with lower environmental impact through wider use of CO₂ refrigeration equipment. **A B**

1-4 Electric Works Company

- Provide a sustainable and safe and secure facility infrastructure based on our wiring fixtures to contribute to electrification and disaster-resilient society with zero environmental impact in the world. **A B C D**

1-5 Direct Control (Hydrogen Related Businesses)

- Achieve local production for local consumption of energy by developing a decentralized energy package business utilizing hydrogen. **A B D**

2. Panasonic Automotive System Co., Ltd.

Sales for fiscal 2024: 1,491.9 billion yen

- Contribute to electrification of vehicles through power chargers with high voltage/output using power electronics technology and devices that improve vehicle's weight saving and rate of electricity consumption. **A B C D**
- Promote to make own products more energy efficient and further expand the range of products that use recycled resin materials. **A B C**
- In our sites that achieved net zero CO₂ emissions, we are further reducing energy usage through energy-saving activities and increasing the ratio of non-external dependency on renewable energy supply. Start operation using renewable energy purchased from a corporate power purchase agreement (PPA), and raise our non-external dependency rate of renewable energy to 10% by 2025. **A B**

3. Panasonic Connect Co., Ltd.

Sales for fiscal 2024: 1,202.8 billion yen

- Reduce waste energy and waste goods by supply chain orchestration, including streamlining corporate customers' logistics and responsive tuning of demand and supply. **A B**
- Offer solutions to improve energy efficiency and automation at corporate customers. **A B**

4. Panasonic Industry Co., Ltd.

Sales for fiscal 2024: 1,042.6 billion yen

- Develop and supply products that contribute to electrification of vehicles and improvements in vehicles electricity consumption rate and mileage. **A B**
- Reduce environmental impact through development and provision of products that contribute to product/equipment downsizing, light weight, low energy loss, and longer product life. **A B C**
- Reduce CO₂ emissions by promoting energy conservation and increasing use of renewable energy in manufacturing activities. **A B**

5. Panasonic Energy Co., Ltd.

Sales for fiscal 2024: 915.9 billion yen

- Increase avoided CO₂ emissions, by increasing the number of electric vehicle users through improving the competitiveness of our automotive batteries and enhancing our production capacity, and promoting electrification of power equipment such as construction machine through modularization and systematization of batteries for industrial use. **A B C**
- Reduce to half the carbon footprint in fiscal 2031 comparing the fiscal 2022 level by making Zero- CO₂ Factories at own sites, locally procuring materials for lithium ion batteries, and establishing circular economy business models. **A B C**

6. Panasonic Entertainment & Communication Co., Ltd.

Sales for fiscal 2024: 243.1 billion yen

- Promote energy-saving per product category by introducing devices with high energy efficiency, improving their control methods, and the like. **A B**
- Promote circular economy through expansion of refurbishing businesses, acceleration for using recycled resin, adoption of eco packaging, and the like. **A C**

7. Panasonic Housing Solutions Co., Ltd.

Sales for fiscal 2024: 446.1 billion yen

- Reduce CO₂ emissions in our value chain by thorough implementation of energy-saving initiatives and electricity generation, and at the same time, enhance product ranges that contribute to CO₂ emissions reduction in society. **A B**
- Increase use of recycled materials, plant-derived materials, and the like for resource circulation. **A C**

The scenario analysis found that either of the businesses in our group can respond to the situation even if any of the 4 scenarios of the societies is achieved. In other words, the analysis successfully verified the resilience of our business strategies. The analysis also helped us understand that we can contribute to building a sustainable society through our businesses. We continue our efforts to build the 1.5°C world, represented by our society **A**.

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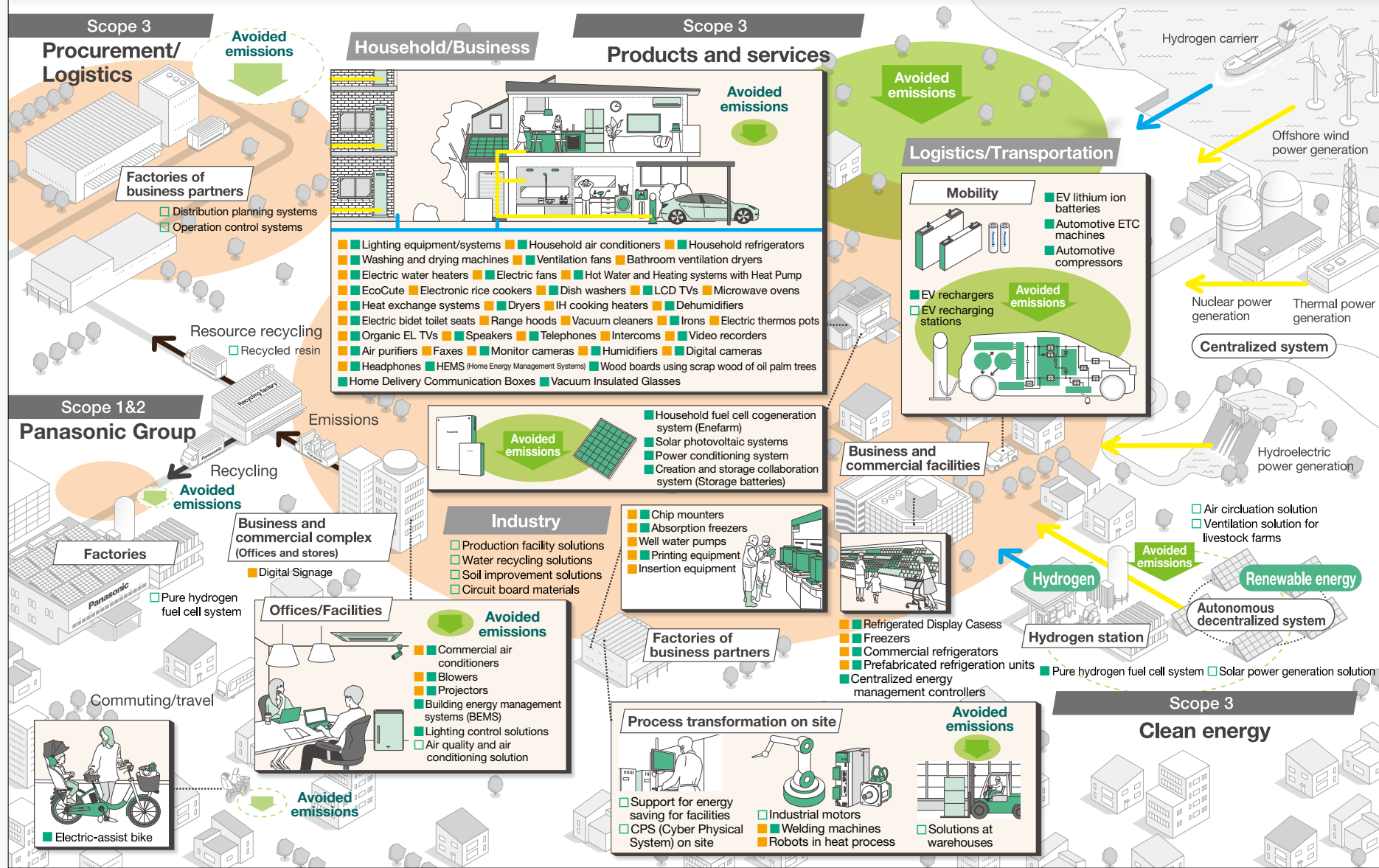
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(From FY2024 business results)

● Amount of GHG emissions
● Reduced amount (Estimates indicated by ♻️)
■ Products with emissions
■ Products with avoided CO₂ emissions
■ The products with avoided CO₂ emissions that are not included in the total
→ Flow of electricity
→ Flow of hydrogen
→ Flow of emitted recyclables

* The size of circle indicates size of GHG emissions amount.
 * The amount of GHG emissions and reduced amount were calculated from the energy usage amount.

Scope 1 Panasonic Group's direct emissions of GHGs (Fuel combustion and industrial processes). **Scope 2** Panasonic Group's indirect emissions from using electricity, heat, and steam provided by third parties.
Scope 3 Other indirect emissions, excluding Scope 1 and Scope 2 (emissions from third parties involved in Panasonic Group's business activities).



* The number of businesses with emissions or avoided emissions does not match with the number stated in "the GREEN IMPACT PLAN 2024" on pages 12-14 because of sub categorization for calculation in businesses such as those for heat exchange systems, electric fans, microwave ovens, and display cases. As the extracted business fields are the fields whose positive and negative impact on climate change are obvious, names and their coverage may differ from those in the business segments used in the TCFD-related reports.

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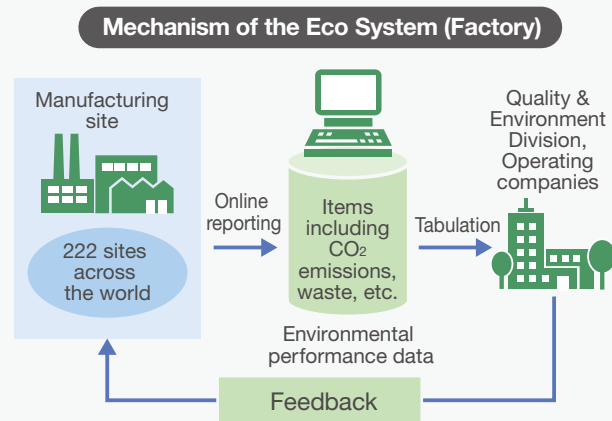
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Integrated Management of Corporate Environmental Information

In order to implement the PDCA cycle for environmental sustainability management, it is essential to collect a significant amount of data, such as amounts of used energy, waste, valuables, discharged and transferred chemical substances, and used water, etc. at each business site in a prompt and accurate manner.

Panasonic Group has built and introduced an environmental performance system, the Eco System (Factory), to globally collect and manage environmental data from all of own business sites. With this system, monthly CO₂ emissions are managed in particular, allowing checking the progress of initiatives and identifying issues. The system plays an important role in achieving the reduction of CO₂ emissions by sharing the information and taking measures.

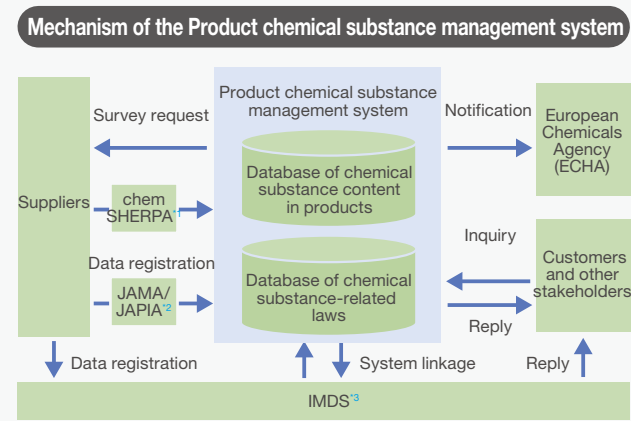
The Eco System (Factory) is also functioning as a scheme for sharing information on the status of compliance among sites across the world. In the event of complaints from local community residents or when a specific value exceeds ordinance regulated levels, as soon as the person in charge at the business site inputs the data on the system,



information of the data is instantaneously e-mailed to relevant persons at the operating companies and the Quality & Environment Division of Panasonic Operational Excellence Co., Ltd. Thereby, the system enables rapid information-sharing and appropriate actions.

In addition, Panasonic Group newly established an environmental information infrastructure, aiming to store and share the data necessary for promotion of Panasonic GREEN IMPACT, and for disclosure and appeal of the environmental data, in order to respond to legal demands appropriately and efficiently for environmental information disclosure and stakeholders' requests. The infrastructure centrally manages the information related to calculation and tally of CO₂ emissions across the entire value chain (Scopes 1, 2, and 3), as well as information on the avoided emissions.

As for products, legislation relating to chemical substances in products is becoming more stringent in the world, for example, and communication and disclosure of chemical information in the EU supply chain are mandatory under the REACH Regulations. The Panasonic Group has developed own management system for chemical substances in products based on industry-standard information handling



methods in order to respond to a wide range of regulations and requirements.

In January 2017, we renewed our product chemical substance management system to adopt chemSHERPA^{*1} based on EC62474, the international standard on material declaration for electrical and electronic equipment, i.e., declaration of information of chemical substances and materials comprise such products. Along with the expansion of Panasonic Group's automotive business, we also adopted the JAMA/JAPIA integrated data sheet,^{*2} the standard material data format for the Japanese automotive industry. These adoptions enabled us to respond to increasingly complex and diverse regulations covering the chemical substances used in products in a variety of fields. In addition, to strengthen the response to laws and regulations on chemical substances in products relevant to our automotive businesses, in October 2020 we enhanced the function to operate in conjunction with IMDS,^{*3} the standard system for the global automobile industry.

Furthermore, under the EU Waste Framework Directive, the requirements for information disclosure on substances of very high concern (SVHC^{*4}) to waste disposal companies and consumers have been enhanced, and registration of SVHCs with the SCIP^{*5} database of the European Chemicals Agency (ECHA) has become compulsory (starting on January 5, 2021). For handling registration with the SCIP database, we have strengthened the system-based coordination of information and started registration via the Panasonic Group system.

^{*1} New chemical information format led by METI and recommended by the Joint Article Management Promotion-Consortium (JAMP).
^{*2} A standardized survey datasheet for contained chemical compounds in Japan's automotive industry. The JAPIA Standard Material Datasheet prepared and introduced by the Japan Auto Parts Industries Association (JAPIA) is currently used as its successor tool.
^{*3} International Material Data System: Material data system for the automobile industry that are operated on a global scale.
^{*4} Substances of Very High Concern
^{*5} Substances of Concern In articles as such or in complex objects (Products)

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Overview of Environmental Impact from Business Operation

In order to mainly manufacture and market electrical and electronic products, Panasonic Group consumes petroleum and electricity as energy sources and resources as raw materials of parts and components. As a result, we emit CO₂ and wastes into the environment.
 Production: 222 manufacturing sites and 75 non-manufacturing sites
 Logistics: Logistics stage of procurement, production, marketing and waste by partner companies and Panasonic.

Product use: Lifetime power consumption (a) of major products⁹ with large amounts of energy use and CO₂ emissions (b) associated therewith.

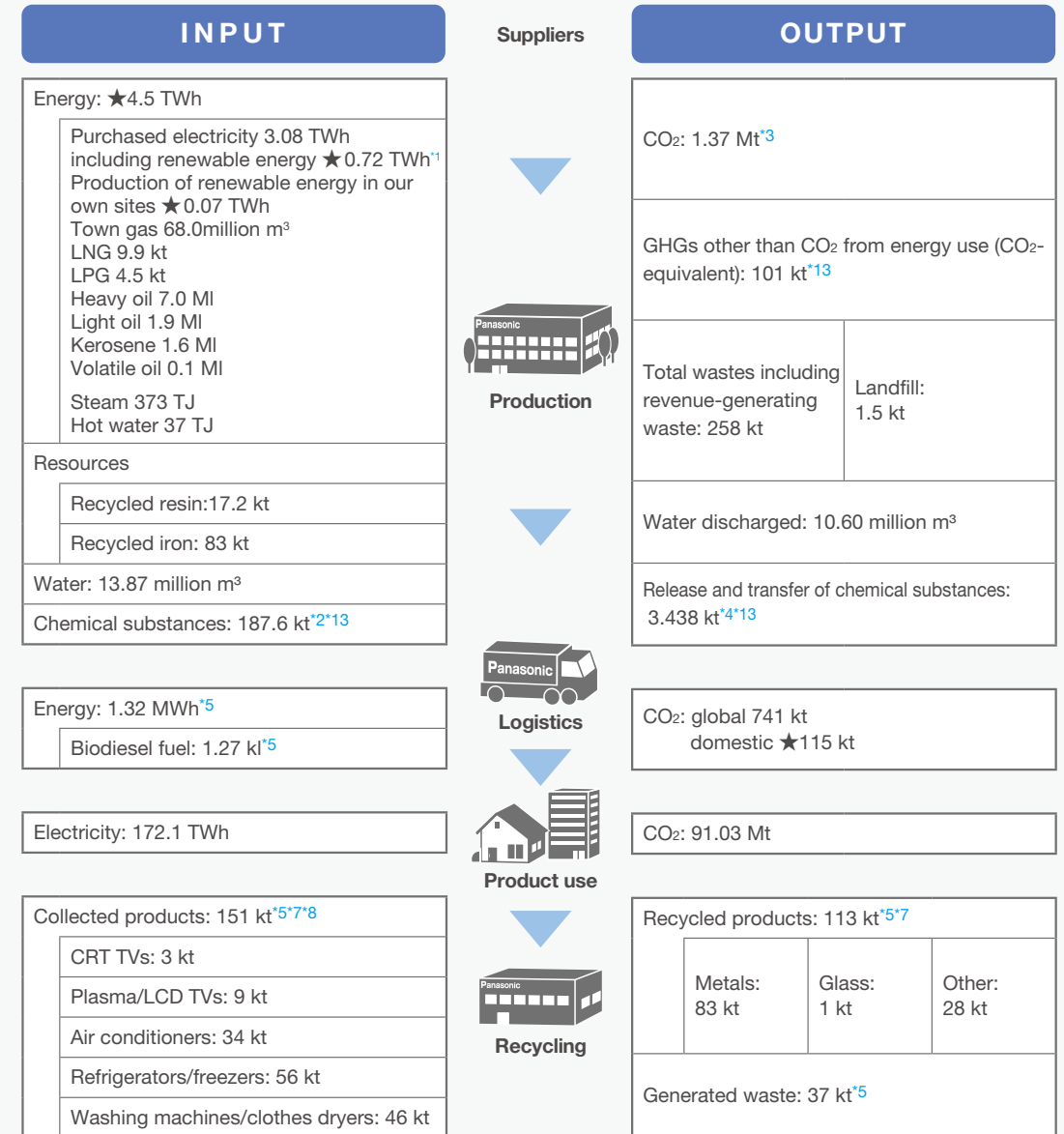
a = Annual power consumption of a model sold¹⁰ x Sales quantity x product life¹¹

b = Annual power consumption of a model sold¹⁰ x Sales quantity x product life¹¹ x CO₂ emission factor¹²

Recycling: Recycling of products means to use by oneself or to make into a state available for sale or free of charge the components and materials of a separated product.

- *1 Figures from photovoltaic, wind, and biomass sources including the amount of renewable energy adopted to manufacturing and non-manufacturing sites of own group. Heat pumps not included.
- *2 Target substances include all substances in the Panasonic Group Chemical Substances Management Rank Guidelines (For Factories).
- *3 The factors related to fuels are based on "the Guidelines for Calculation of Greenhouse Gas Emissions (version 4.7)" published by the Japanese Ministry of the Environment. The latest figures from the "IEA Emissions Factors 2023" issued by the International Energy Agency (IEA) is used for the CO₂ emission factors for electricity purchased from different countries use.
- *4 Release amount: Includes emissions to air, public water areas, and soil.
 Transfer amount: Includes transfer as waste and discharge into the sewage system. Recycling that is free of charge or recycling where we pay a fee for treatment under the Waste Management and Public Cleaning Law is included in "Transfer." (Different from the transferred amount reported under the PRTR Law.)
- *5 Intra-region outside Japan not included.
- *6 Figures for Japan.
- *7 Air conditioners, TVs, refrigerators/freezers, and washing machines/clothes dryers
- *8 As for personal computers, PC 3R Promotion Association collects and recycles PCs under the joint scheme with member companies.
- *9 Household air conditioners, commercial air conditioners, lighting equipments and lamps, household refrigerators, commercial refrigerators, LCD TVs, washing and drying machines, fully-automatic washing machines, dish washer and dryers, IH cooking heaters, EcoCute, bathroom ventilation dryers, humidifiers, dehumidifiers, air purifiers, ventilation fans, electric fans, electronic rice cookers, microwave ovens, electric bidet toilet seats, irons, hair dryers, electric showers, electric water heaters, under-rug heaters, vacuum cleaners, electric water boilers, range hoods, projectors, mounting machines, Digital Signage, Welding Machine, Welding Robot, Component Insertion Machine, Screen Printer, Mobile Computer, etc.
- *10 For each product category, the model that was sold in the largest quantity in the region was selected.
- *11 Number of years during which spare parts for the product are available (defined by the Panasonic Group).
- *12 Regional CO₂ emission factors (kg-CO₂/kWh) used: 0.463 (Japan); 0.277 (Europe); 0.368 (North America); 0.610 (China & Northeast Asia); 0.713 (India & South Asia); 0.382 (Southeast Asia & Oceania); 0.271 (Latin America); and 0.612 (Middle East & Africa).
- *13 Hussmann Parent Inc. and its consolidated subsidiaries not included.

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GHGs from the Whole Supply Chain (by Scope)

We calculate our GHG emissions across the supply chain for Scopes 1, 2, and 3, respectively, according to the GHG Protocol and the guidelines provided by the Ministry of the Environment.

Our CO₂ emissions in fiscal 2024 Scopes 1 to 3 were reduced by 2.69 million tons compared with those in fiscal 2023. This was affected by the increase of CO₂ emissions in some categories, while approximately 0.32 million tons of the CO₂ emissions in the Scopes 1 and 2 were reduced through implementation of steady activities for energy conservation at each factory (Refer to [P41-44](#)), and 4 million tons of the CO₂ emissions in the category 11 was reduced due to decrease of the number of sales units.

We continue to disclose our emission data for transparency.

^{*14} Direct emissions from facilities owned and controlled by the Panasonic Group (e.g., emissions from use of town gas or heavy fuel oil).

^{*15} Emissions from production of energy consumed at facilities owned and controlled by the Panasonic Group.

^{*16} Other indirect emissions, excluding Scope 1 and Scope 2.

^{*17} Including Scope 1 and Scope 2 from FY2023

^{*18} Figures for Japan

^{*19} 8,838 (kt) are due to the influence of CFC

^{*20} 6,058 (kt) are due to the influence of CFC

Category		Emissions (kt)	
		FY2023	FY2024
Scope 1 ^{*14}		406	316
Scope 2 ^{*15}		1,433	1,207
Scope 3 ^{*16}	1. Purchased goods and services	21,543	21,954
	2. Capital goods	880	1,546
	3. Fuel- and energy-related activities	212	243
	4. Upstream transportation and distribution	887	741
	5. Waste generated in operations	0.1	1
	6. Business travel	32	31
	7. Employee commuting	111	107
	8. Upstream leased assets	- ^{*17}	- ^{*17}
	9. Downstream transportation and distribution	61 ^{*18}	146
	10. Processing of sold products	153	234
	11. Use of sold products	95,029	★91,027 ^{*19}
	12. End-of-life treatment of sold products	7,537	7,860 ^{*20}
	13. Downstream leased assets	-	-
	14. Franchises	-	-
	15. Investments	928	1,108
total		127,371	124,995
Scope 1-3 total		129,209	126,518

Numerical values in units of (t) are introduced on the following website.

[WEB https://holdings.panasonic/global/corporate/sustainability/environment/governance/data.html#scope](https://holdings.panasonic/global/corporate/sustainability/environment/governance/data.html#scope)

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Panasonic Group globally collects data on its environmental conservation costs and economic benefits obtained through its environmental activities in relation to generated/controlled environmental impact. This data is internally utilized as basic information for our continuing environmental sustainability management.

Environmental Accounting for Fiscal 2024

Environmental conservation in factories	
Investments ^{*21}	3,791 million yen
Expenses ^{*21*22}	128 million yen
Economic benefit ^{*23}	907 million yen

^{*21} Includes all investments relating to environmental conservation. The difference or appropriate portions (divided proportionally) are not calculated.

^{*22} Expenses include a cost of capital investment depreciation. For example, if latest energy-saving facilities were installed, the value includes depreciation for the first year but not for the second year and later.

^{*23} The economic benefit represent the cost of energy savings achieved through energy conservation, which translates into cost reductions that contribute to climate change mitigation.

Environmental Conservation Benefits for Fiscal 2024 (in physical terms)

Categories	Emission reduction	Reference indicator: environmental impact	
		Fiscal 2023	Fiscal 2024
CO ₂ emissions from production activities	260 kt	1.63 Mt	1.37 Mt
Human Environmental Impact	45 kcount	431 kcount	386 kcount
Landfill of waste	0.8 kt	2.3 kt	1.5 kt
Water consumption	1.47 million m ³	15.27 million m ³	13.87 million m ³

Fiscal 2024 data on the reduced amount of electricity and effect of reduced electricity costs through our energy-saving products are as shown in the chart below.

Economic Effects for Customers for Fiscal 2024

Electricity cost reduction from product usage (global)	
Reduced amount of electricity ^{*24}	46.7 TWh
Reduced electricity costs ^{*25}	1256.7 billion yen

^{*24} Calculated under the same conditions as when determining the size of contribution in reducing CO₂ emissions through energy-saving products (see [page 12](#)).

^{*25} Electricity costs were set for each region based on IEA Statistics.

Panasonic Group published a new vision “Panasonic GREEN IMPACT” in January 2022, with the intention to realize the vision linking with our business activities. Therefore, approximately 490 billion yen for the group-wide total R&D expenses in fiscal 2024 will be invested mostly for promoting “Panasonic GREEN IMPACT”.

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Initiatives for Eco-conscious Products (Green Products)

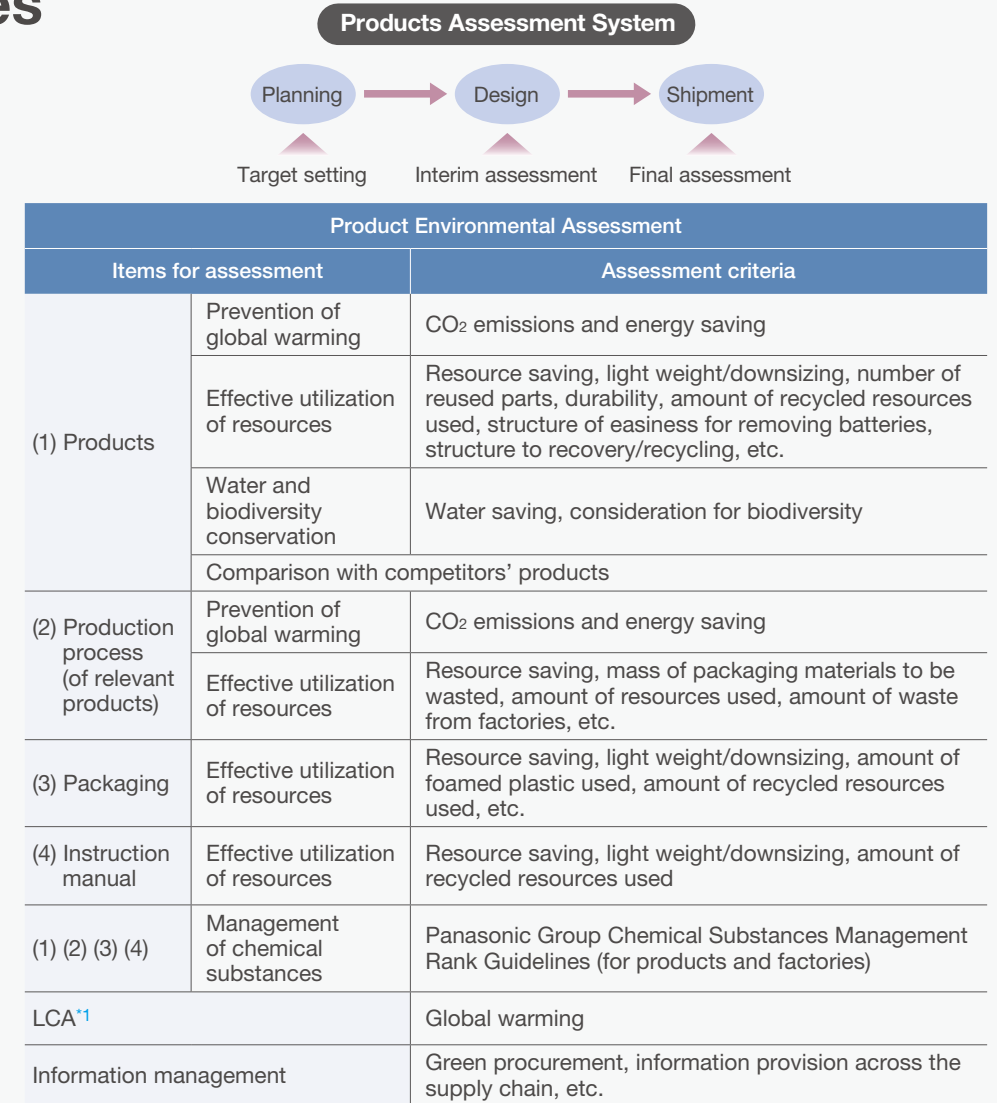
Panasonic Group conducts an environmental assessment to evaluate the product in advance in terms of its possible detrimental effects to the environment from the development stage. In the product environmental assessment, the five environmental issues specified in the Environmental Action Guideline have been set as assessing items for the whole product life cycle.

For global warming in particular that has been a big issue these days, we are working on eco-conscious products to achieve a target set to achieve 'an impact from our emissions reductions of more than 300 million tons by 2050' under our long-term environmental vision, 'Panasonic GREEN IMPACT'.

As for CO₂ emissions in our Group value chain, it is important to enhance energy-saving performance of products during product use, since most of the emissions are discharged when the products are in use. In the Energy Conservation Grand Prize 2023, Panasonic group companies won awards for three themes in the Product and Business Model category; e.g., a METI Minister's Award, which is the highest award, for the GX compatible Refrigerator 9X Series, and an award for the household air conditioners that is a three consecutive years winning following the 2021 METI Minister's Award and the 2022 ECCJ Chairperson's Award.

Category	Award	Recipient	Theme
Product/ Business Models	METI Minister's Award (Energy conservation field)	Panasonic Corporation Living Appliances and Solutions Company	Cloud-controlled GX compatible Refrigerator 9X Series
	ECCJ Chairperson's Award	Panasonic Corporation Heating & Ventilation A/C Company	Development of individual air conditioning system 'Hybrid GHP' to maximize use of renewable energy.
	ECCJ Chairperson's Award	Panasonic Corporation Residential System Equipment Business Division, Heating & Ventilation A/C Company	'Eolia 24XS/HX Series' air conditioner that pursues both energy conservation and user comfort

 Panasonic Honored with Highest Ranking METI Minister's Prize in Energy Conservation Grand Prize 2023 <https://news.panasonic.com/jp/press/jn240201-1>



Laws/regulations and criteria, guidelines, and environmental action plan of Panasonic Group

*1 Life Cycle Assessment: Method of quantitatively assessing the environmental impact of products at each life cycle stage.

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In B2B businesses that Business Divisions for Automotive Systems, Connect, Industry, and Energy that engage in, we are receiving more and more requests to provide data for our customer companies to achieve their sustainability targets. We also conduct a carbon footprint (CFP) assessment that is a quantitative analysis and an assessment using conversion of GHG to CO₂ emissions discharged from the each stage of the product life cycle upon request from our customers.

Initiatives for Eco-conscious Factories (Green Factories)

Panasonic Group We are leading Green Factories (GF) activities in its efforts to cut down the environmental load caused by manufacturing. On the assumption of compliance of laws and regulations in each factory, concretely we formulate a plan to reduce environmental loads in manufacturing activities, such as amounts of CO₂ emission, generated wastes and valuables, water consumption, and discharged and transferred chemical substances, conduct Progress management for total reduction amount with intensity of discharged amount and the like, and improve the activities. Thereby, we intend to achieve reduction of environmental loads and increase of our business at the same time. In fiscal 2011, we started the GF assessment system^{*2} aiming to further improve GF activities by visualizing the progress status in each factory.

In addition, Panasonic Group shares information on global activities for reducing environmental loads, relevant laws and regulations, and social trends through the Manufacturing Environmental Information Sharing Group. In Europe, Southeast Asia, China, and Latin America, we hold information exchanges and competitions on best practices by region to reduce environmental impact (presentation of awards for best practices and roll-out of good examples to other regions). By doing so, we promote GF activities suited to the issues in each region to expand and accelerate the activities.



Cross-Company Mutual Environmental Audit (CCMEA)

As measures to strengthen the group-wide foundation aiming at improving the structures with energy efficiency, we have developed a BA (Before/After) chart search system to share and spread knowhow across the world on the Internet. With the system, each factory can register and share their best practices concerning managing CO₂, waste, chemical substances, water, etc. In addition to the above, in response to environmental regulations, as a new activity to further ensure regulatory compliance in our sites, particularly those in China and Southeast Asia where we have numerous productions sites, we conduct a Cross-Company Mutual Environmental Audit that is carried out by our factories located in the same region, crossing the operating company's boundary. In India, full-scale introduction of the CCMEA started in 2023. The CCMEA were carried out in our 27 sites across the world in fiscal 2023, and has been rolled out to other sites. We had continued these activities during the COVID-19 pandemic, combining online meetings taking account of infection status in different regions, and were thus able to reduce risks and improve interactive skills. As the pandemic is settling down, we conduct the CCMEA effectively utilizing both online and offline, e.g. our Group members from Japan participated in the regional on-site audits. We aim to further enhance the environmental activities by accelerating to carry out the mutual audits worldwide, and encouraging mutual learning among members through

ensuring compliance with relevant laws and regulations, as well as utilizing expertise accumulated in our Group companies.

^{*2} The GF assessment system enables factories to evaluate themselves on a five-point scale across 19 environmental activity items, classified into six basic groups: emissions reduction; environmental performance enhancement; reduction activities; risk reduction; human resource development; and management. Factories then compare their self-assessment results with the results from other factories to obtain a relative assessment to identify issues to be addressed and determine corrective measures. The system was improved in fiscal 2014, in the way that items to assess could be added to the standard 19 items as required by each operating company. For example, a Company may implement tasks concerning compliance with environmental laws and compliance management to strengthen risk management in its factories. Then, in the assessment questionnaire, they can set questions with their own standard values stricter than the legal requirements, for example, for their ventilation systems or other facilities that control air and water quality.

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Reducing the Amount of Energy Used and CO₂ Emissions in Business Activities

To achieve Panasonic GREEN IMPACT, Panasonic Group has been working on toward making zero-CO₂ factories^{*1} by promoting our efforts internally and externally to realize net zero CO₂ emissions at own sites in all our operating companies by 2030.^{*2}

For this medium term, we established the GREEN IMPACT PLAN 2024. As our efforts for OWN IMPACT Scope 1 and 2, we have increased the number of zero-CO₂ factories to 37, aiming to reduce 260,000 tons of CO₂ emissions. In the Zero-CO₂ Factory Promotion Taskforce we started up in September 2021. The taskforce aims to create and provide Group-wide measures to accelerate the creation of zero-CO₂ factories. The Taskforce consists of the Energy Saving Working Group (WG) that promotes a range of energy-saving measures, the Renewable Energy Utilization WG that assess the usage expansion of renewable energy in each site, and the Renewable Energy Procurement WG that promotes the procurement of renewable energy. With the participation of related sectors, our manufacturing, procurement, and environment specialists work together to support the united efforts of all operating companies. During this fiscal year, we held seminars to introduce internal excellent examples and the latest information on energy saving and energy recycling to Group members. We also hold study session by region outside Japan.

We also participate in the Keidanren Carbon Neutrality Action Plan, a voluntary action plan to alleviate global warming promoted by the entire electric and electronics industry. The industry set a target of an “average 1% improvement in energy intensity in factories and large offices per year towards 2030” and we are now working steadily to save more energy in factories and offices.

^{*1} The Panasonic Group's zero-CO₂ factories means realization of net zero CO₂ emissions from factory production across the world. This will be attained by promoting our conventional energy saving activities (e.g. using LED lighting), advanced energy saving technologies, such as Factory Energy Management System (FEMS), productivity improvement, and innovative manufacturing. Other means include a combination of the following efforts: promoting renewable energy usage, such as by adopting photovoltaic power systems, energy storage modules, and hydrogen fuel cells; procuring 100% renewable energy-sourced electricity; and obtaining environmental values. The Panasonic Group publishes, both internally and externally, our accelerating efforts towards reaching our goal of net zero CO₂ emissions in all the operating companies' sites by 2030.

^{*2} Panasonic's direction: To become a top runner in the fields of “environment” and “high usability in business.”
[WEB https://news.panasonic.com/global/stories/2021/90376.html](https://news.panasonic.com/global/stories/2021/90376.html)

Increasing the number of zero-CO₂ factories

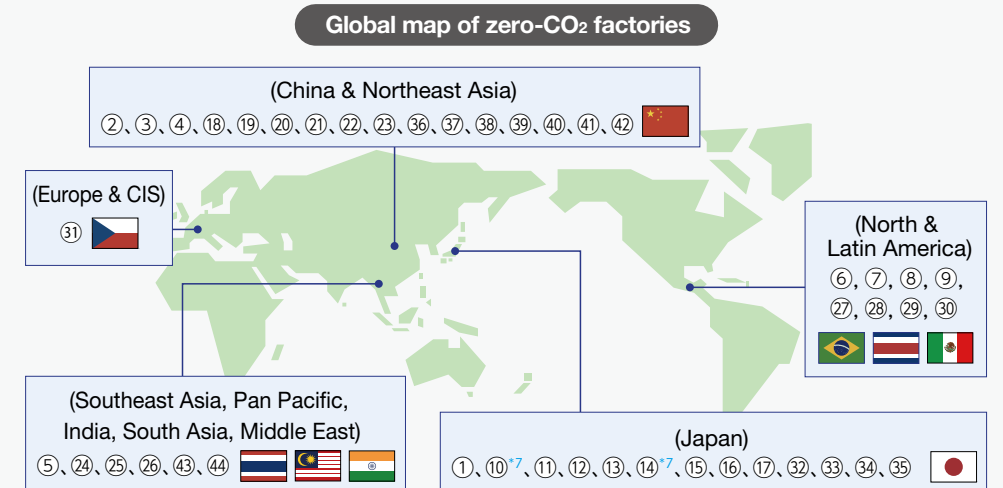
After realizing the group's first zero-CO₂ factory in fiscal 2019, Panasonic Group has realized 9 zero-CO₂ factories in 5 regions^{*3} by fiscal 2022. Since then, it has entered the phase to increase the number of zero-CO₂ factories: to 31 factories in fiscal 2023; in fiscal 2024, total 44 factories^{*4}

- 13 factories in Japan, 16 factories in the China and Northeast Asia region, 6 factories in the Southeast Asia, Pacific, India, South Asia, Middle East, and Africa regions, 8 factories in the North America and Latin America regions, and 1 factory in Europe and CIS. This has exceeded the GIP2024 target of ‘a total of 37 factories achieving zero CO₂ emissions’.

As a fiscal 2024 example, Nishikinohama Factory, Panasonic Energy Co., Ltd. has achieved net zero CO₂ emissions^{*5} since fiscal 2024 when it started operation of photovoltaic panels installed over the entire rooftop for maximum use of renewable energy, aiming at manufacturing in harmony with the environment. For introducing a 2 MW-class photovoltaic power generation system, a new method that does not require significant remodeling works of the transformer substation in the factory was invented and introduced, which contributed to achievement of significant reduction in the construction costs and the construction period.^{*6} The factory will further accelerate efficient and clean manufacturing by implementing energy management for the entire factory through installation of pure hydrogen fuel cell generators and energy storage systems for.



Photovoltaic power generation systems at Nishikinohama Factory, Panasonic Energy



^{*3} Five regions are: Japan; China & Northeast Asia; Southeast Asia, Pan Pacific, India, South Asia, Middle East; North & Latin America; Europe & CIS.

^{*4} ★As of now, 44 factories have realized zero-CO₂ factories. Up to fiscal 2022:① Panasonic Eco Technology Center, ② Panasonic Energy (Wuxi) Co., Ltd., ③ SANYO

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Energy (Suzhou) Co., Ltd., ④ Panasonic Manufacturing (Beijing) Co., Ltd., ⑤ Panasonic Energy (Thailand) Co., Ltd., ⑥⑦⑧ Panasonic Brazil (three factories; San Jose, Manaus and Extrema), ⑨ Panasonic Centroamericana S.A.

Fiscal 2023: ⑩ Panasonic Center Tokyo, ⑪ Panasonic Automotive Systems Co., Ltd. Matsumoto Region, ⑫ Panasonic Automotive Systems Co., Ltd. Tsuruga Region, ⑬ Panasonic Automotive Systems Co., Ltd. Shirakawa Region, ⑭ Panasonic Automotive Systems Co., Ltd. Yokohama Building, ⑮ Panasonic Energy Co., Ltd. SUMOTO Factory, ⑯ Panasonic Energy Higashiura Co., Ltd., ⑰ Panasonic Energy Nandan Co., Ltd., ⑱ Panasonic Electronic Devices (Jiangmen) Co., Ltd., ⑲ Panasonic Industrial Devices (Tianjin) Co., Ltd., ⑳ Panasonic Industrial Devices Materials (Guangzhou) Co., Ltd., ㉑ Panasonic Industrial Devices SUNX Suzhou Co., Ltd., ㉒ Panasonic Automotive Systems (Dalian) Co., Ltd., ㉓ Panasonic Automotive Systems (Suzhou) Co., Ltd., ㉔ Panasonic Automotive Systems Asia Pacific (Thailand) Co., Ltd., ㉕ Panasonic Automotive Systems Malaysia Sdn. Bhd., ㉖ Panasonic Energy India Co., Ltd., ㉗ Panasonic Automotive Systems Monterrey Mexico S.A.de C.V., ㉘ Panasonic Automotive Systems de Mexico S.A. de C.V., ㉙ Panasonic Automotive Systems Reynosa Mexico S.A.de C.V., ㉚ Panasonic Energy Mexico S.A. de C.V., ㉛ Panasonic Automotive Systems Czech, s.r.o.

Fiscal 2024: ㉜ Panasonic Industry Co., Ltd., Motomiya Factory, ㉝ Panasonic Energy Co., Ltd., Suminoe Factory, ㉞ Panasonic Energy Co., Ltd., Tokushima Factory, ㉟ Panasonic Energy Co., Ltd., Nishikinohama Factory, ㊱ Panasonic Motor (Zhuhai) Co., Ltd., ㊲ Panasonic Motor (Hangzhou) Co., Ltd., ㊳ Panasonic Industrial Devices Taiko (Shenzhen) Co., Ltd., ㊴ Panasonic Industrial Devices (Qingdao) Co., Ltd., ㊵ Panasonic Manufacturing (Xiamen) Co., Ltd., ㊶ Panasonic Industrial Devices Materials (Suzhou) Co., Ltd., ㊷ Panasonic Industrial Devices Materials (Shanghai) Co., Ltd., ㊸ Panasonic Industrial Devices Singapore Pte. Ltd., ㊹ Panasonic Carbon India Co. Ltd.

*5 Press Release November 20, 2023

[WEB https://news.panasonic.com/global/press/en231120-2](https://news.panasonic.com/global/press/en231120-2)

*6 Press Release February 1, 2024

[WEB https://news.panasonic.com/jp/topics/205544](https://news.panasonic.com/jp/topics/205544)

*7 Non-manufacturing sites

■ Activities for Increasing the Amount of Renewable Energy Use

To increase the amount of renewable energy in our business use, Panasonic Group has been actively promoting installation of renewable energy facilities in our own sites and renewable energy procurement from external suppliers.

The amount of renewable energy adopted at our sites*⁸ in fiscal 2024 marked 67 GWh.

Installation of renewable energy facilities has been actively encouraged in our own sites across the world in a way to suite to the regional characteristics. Particularly, photovoltaic power generation systems are recommended for installation wherever possible. The major achievement was installation of photovoltaic power generation systems in Japan.

Panasonic Industry Co., Ltd. at Saga site introduced a photovoltaic power generation system, adopting a Power Purchase Agreement (PPA) model. The system



Photovoltaic power generation systems at Saga Site, Panasonic Industry

installed this time, comprises 5,984 photovoltaic panels in total that generate 3,011 kW. We will utilize renewable energy with the system.

For further examples of our renewable energy usage, see the following website:

[WEB https://holdings.panasonic/global/corporate/sustainability/environment/carbon-neutral/site.html](https://holdings.panasonic/global/corporate/sustainability/environment/carbon-neutral/site.html)

Procurement of renewable energy from external sources has been also promoted across the globe. In Japan, at our own site, we are an electricity user, and at the same time, an electricity retailer (registration number: A0136). Since 2005, we have been supplying power to our own sites, factories, and offices. Utilizing our knowhows and experience of electricity procurement and trading that we have accumulated to date, we procure 100% renewable electricity generated from wind, etc., as well as electricity with environmental value such as those with non-fossil fuel energy certificates and credits to offset CO₂ emissions from fossil fuel. This effort contributed to converting factories in Japan, China, and Southeast Asia to zero-CO₂ factories. Furthermore, the photovoltaic power station with approx. 18,000 kW capacity for use at our own sites that we determined to develop in fiscal 2022 started its operations for Panasonic Energy Co., Ltd., in February 2023. In fiscal 2024, operations of power stations (with approx. 11,500 kW capacity) for Panasonic Automotive Systems Co., Ltd., and Panasonic Industry Co., Ltd started. Moreover, operations of another power stations with a capacity of 18,000 kW will be started in fiscal 2025. As described above, we continue to contribute to expanding use of electricity from new renewable energy sources. We also started selling to Panasonic Group employees in Japan, electricity derived from practically 100% renewable energy in fiscal 2021.

[WEB https://news.panasonic.com/jp/topics/204036.html](https://news.panasonic.com/jp/topics/204036.html)

In August 2019, Panasonic Group joined “RE100”⁹, an international initiative that brings together companies committed to sourcing 100% renewable electricity for their global business operations. We aim to switch all the electricity used in our sites across the world to that sourced from 100% renewable energy by 2050. Progress in fiscal 2024 was 24.3%.

*8 The amount from photovoltaic energy, wind power, and so on are included. The amount from heat pumps is excluded.

*9 Press release on August 30, 2019.

Panasonic Joins RE100 Aiming for Business Operations with 100% Renewable Energy

[WEB https://news.panasonic.com/global/press/data/2019/08/en190830-2/en190830-2.html](https://news.panasonic.com/global/press/data/2019/08/en190830-2/en190830-2.html)

■ Activities for reducing energy use and CO₂ emissions

To ensure implementation of reduction of the amount of energy used and CO₂ emissions, it is important to visualize trend of the energy consumption of each facility in factory and the effects of the measures for specific emissions reduction. To date, we are working on CO₂ reduction by adopting more than 40,000 measurement equipment systems and Factory Energy Management System (FEMS) at all of our global manufacturing sites, promoting METAGEJI (Meter and Gauge)¹⁰, which visualizes and analyzes energy consumption. An example of factory energy-

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saving support service is on the following website.

[WEB https://www.panasonic.com/global/corporate/sustainability/eco/co2/service.html](https://www.panasonic.com/global/corporate/sustainability/eco/co2/service.html)

Panasonic Corporation is conducting a demonstration experiment of the RE100 solution^{*11} using pure hydrogen fuel cells in Kusatsu Factory, Shiga. Moreover, Panasonic Energy (Wuxi) Co., Ltd. (PECW) in China, has been conducting demonstration experiment of pure hydrogen fuel cells that supply both electricity and heat. Panasonic Manufacturing United Kingdom (PMUK) in the United Kingdom plans to start a demonstration of power supply and demand operation in 2024^{*12} to use 100% renewable energy for energy consumed in business activities by in-house power generation using pure hydrogen fuel cells and photovoltaic cells. For the demonstration at PMUK, 21 pure hydrogen fuel cells of 5 kW type (total output: 105 kW), photovoltaic cells (300 kW), and storage batteries (1 MWh) will be newly installed, and the power supply and demand operation in Cardiff, UK will be monitored according to the changes in weather and fluctuations in electrical power demand, with the aim of achieving RE100 for the Microwave Oven manufacturing plant. By using pure hydrogen fuel cells, we will not only reduce installation space and secure a stable power source, but also further improve energy efficiency by using heat generated during hydrogen power generation for heating and hot water supply. Through the demonstration of RE100 solutions at PMUK, we will develop solutions that best suit the regional characteristics and build relationships with local partners and business customers related to the hydrogen business.



PMUK RE100 Solution

Panasonic Corporation Hikone Factory is steadily reducing CO₂ emissions by changing the production methods for shaver blades. To achieve a deep shave, the shaver's outer blade has a complex and high precision shape with two different thicknesses. For manufacturing the blade, after pressing a stainless steel plate, the plate was bent by applying heat. As bending the plate without heating causes scratches, cracks, and variation in quality, bending the plate at an ambient temperature without scratches, etc., was a challenging task. However, a new bending process method at an ambient temperature is possible now thanks to our accumulated expertise in technology and experience, and a development of pressing conditions for bending the plate that took almost 2 years. With the new method, the electricity consumed for heating has been reduced, and at the same time, one process of the conventional processes in manufacturing blades was eliminated, in other words, shortened its production time.

The Panasonic Group will continue to accelerate necessary activities to achieve Panasonic GREEN IMPACT, e.g. proactively developing and adopting environmentally low-impact energy and methods.

^{*10} METAGEJI is a coined word created by the Panasonic Group which refers to visualizing energy consumption and implementing measurable reduction measures by adopting measurement instruments, such as meters and gauges.

^{*11} Press Release (May 24, 2022)

[WEB https://news.panasonic.com/global/press/en210524-2](https://news.panasonic.com/global/press/en210524-2)

^{*12} Press Release (August 14, 2023)

[WEB https://news.panasonic.com/jp/press/jn231114-1](https://news.panasonic.com/jp/press/jn231114-1)

■ Activities at Factories

Panasonic Energy Kaizuka Co., Ltd. produces lithium-ion batteries (LIBs) used in EVs has been working on reduction of CO₂ emissions to achieve Panasonic GREEN IMPACT across organizational divisions, while improving productivity to respond to the increasing market demands for EVs in recent years. A Carbon Neutrality Promotion Committee initiated by the Facility Management Division that manages facilities such as power generators was jointly launched at 3 sites: Panasonic Energy Suminoe Factory, Wakayama Factory, and Kaizuka Factory. The committee where professionals in the fields of factory and production technologies participates, has been promoting 'activities for production with minimum energy'. Concretely, for reduction of energy consumption in basic unit through enhancing product efficiency, we established efficient drying conditions using scientific methods in the application process of electrode materials that had been a bottleneck in enhancing product efficiency in the production process of electrode substrates, so that the application speed has been increased. This method can be transferred to overseas factories such as in the U.S., where LIBs are produced on a large scale. We also achieved a reduction of the standby energy consumption of charging and discharging devices in the test process by eliminating unnecessary processes after reviewing the operational procedure. Moreover, to enhance the use ratio of renewable energy in and outside of factory premises, we started working on introducing photovoltaic power station to factory premises, while purchasing photovoltaic electricity sourced from outside of our factory through an offsite PPA.



Members from Panasonic Energy Kaizuka

■ Activities to provide supports for energy-saving in China region

The Chinese government announced its long-term state policy that includes carbon peak out and carbon neutrality, focusing on further reduction of CO₂ emissions. With many business sites in China, the Panasonic Group has been earnestly promoting a three-year energy-saving support initiative in the country since fiscal 2023 with the aim of realizing efficient energy-savings across the entire region in line with China's long-term state policy. More specifically, at our model sites we are lowering CO₂ emissions by undertaking energy-saving assessments in collaboration with experts from within and outside the Group and strengthening the training of personnel to equip them with extensive



Diagnosis of energy saving diagnosis in China region

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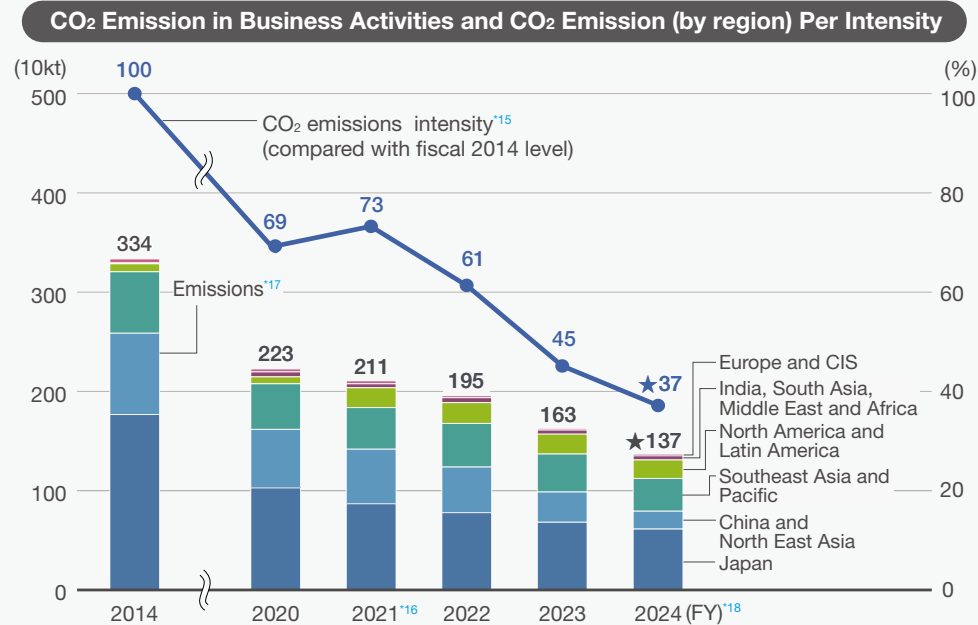
knowledge of energy saving. We select best practices from those implemented at our business sites considering commonality and roll-out of respective cases based on the information or knowledge acquired from results of the diagnoses, and distribute such information to the sites in the region, which promote thorough utilization of the information in own energy saving activities in respective business sites. We are also implementing activities for visualization of energy-saving activities and efficient dissemination of the information, by improving the infrastructure for energy efficiency such as installation of portable measurement equipment and development of a database with case examples in terms of energy efficiency. To realize even more zero-CO₂ factories, we will continue to press ahead with energy-saving efforts at high speed and at low cost in a bid to enhance the level of energy saving in global regions.

Fiscal 2024 Results

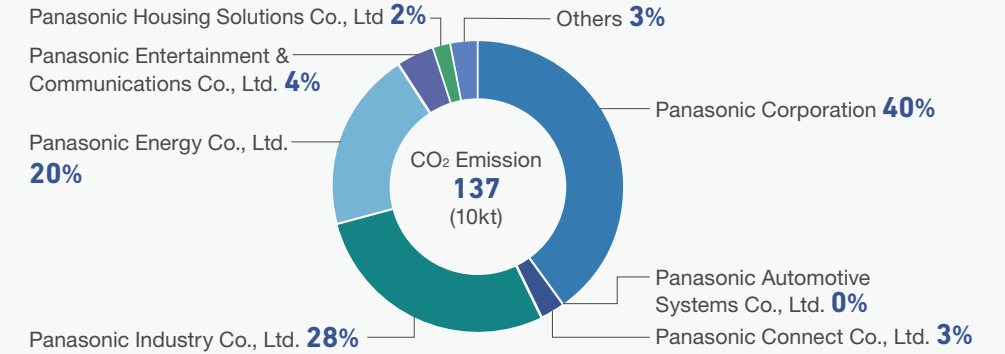
These efforts in fiscal 2024 resulted in 4.5 TWh^{*13} of the energy used in business activities, and the amount of CO₂ emissions was 1.37 Mt. The fiscal 2023 investment to reduce the amount of energy used and CO₂ emissions by the efforts was 3.7 billion yen.^{*14}

^{*13} In fiscal 2021, the unit used to measure the energy consumed in business activities was changed from TJ to TWh. The consumed power is measured in kWh and the consumed fuel is measured using its calorific value and then converted to electrical power units at 3.6MJ/kWh. These two values are then totaled.

^{*14} The total amount includes all investments concerning reduction of the amount of the energy used and CO₂ emissions. Note that differences or proportions of the investment are not calculated.



CO₂ Emission in Business Activities (by operating company)^{*19}



^{*15} We calculated the improvement rate of the 'CO₂ emissions intensity' versus that of fiscal 2014', which was obtained by dividing CO₂ emissions by the sales volume of all Group companies.

^{*16} Includes emissions of Panasonic Corporation of North America after FY2021

^{*17} The CO₂ emission relevant to fuels was obtained by calculating with the factors stated in the "Guidelines for Calculation of Greenhouse Gas Emissions" published by Japan's Ministry of Environment. The factors for purchased electricity by country per fiscal year defined in "CO₂ emissions from fuel consumption" by International Energy Agency (IEA). The FY2014 factors in the Book 2017 were used for FY2014. The FY2018-2021 factors in the Book 2019 were used for FY2018-2021. The IEA Emissions factors 2021 were used for FY2022, the IEA Emissions factors 2022 were used for FY2023, and the IEA Emissions factors 2023 were used for FY2024.

^{*18} Includes non-manufacturing sites after FY2023

^{*19} In the case that net zero CO₂ emissions is achieved in the middle of the FY, the CO₂ emissions results before the FY will remain.

Breakdown of Total GHG Emissions (CO₂-equivalent) in Business Activities (by category)^{*20}

[Unit: kt]

	FY2022	FY2023	FY2024	
Scope 2 Energy sources	1,723	1,433	★1,207	
Scope 1	CO ₂ from energy sources			
	232	224	★216	
	CO ₂ from non-energy			
	106	183	★101	
	(non-Energy Sources)	CO ₂	1	1
	HFC	101	180	97
	SF ₆	3	2	2
	NF ₃ and others	2	1	1
Carbon offset by credit	-12	-26	-57	
Total	2,048	1,812	1,465	

^{*20} The emissions of GHG other than CO₂ from energy sources by Hussmann Parent Inc. and its consolidated subsidiaries, Panasonic Corporation of North America, and non-manufacturing sites are not included.

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Promotion of Circular Economy

Alongside changes in customer lifestyles, there is now a growing global trend for customers to use only specific functions of a product, rather than using or owning the whole product. In Europe, building a circular economy for sustainable economic growth has become a major economic strategy, in a move away from continuous resource consumption. This trend is spreading around the world along with the change in customers' sense of values. Amid this development, the Panasonic Group is introducing the idea of circular economy and moving forward in efforts to promote effective utilization of resources and maximization of customer value.

The circular economy activities we promote have two aspects: 1) creation of circular economy businesses, and 2) evolution of recycling-oriented manufacturing.

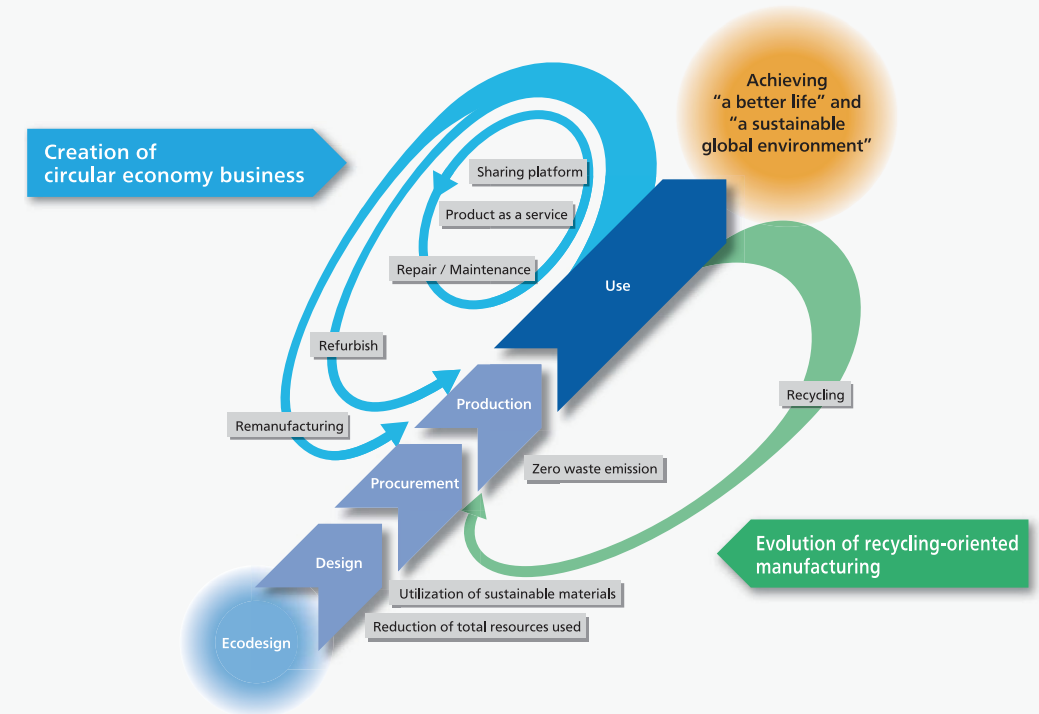
In order to realize the new value of using only product functionalities instead of using or owning the whole product, we will strive to create circular economy businesses. These include a "Sharing service", where multiple users use the same individual product, a "Product as a service" where services are fulfilled based on functions, and "Repair and Maintenance, Refurbish and Remanufacturing", where functions, values, and the lifecycle of a product are utilized in the most efficient manner by recycling or reusing the product itself or the components used in the products.

Alongside this, we continue to implement recycling-oriented manufacturing by reducing the total amount of resources used, utilizing sustainable resources, and striving towards zero waste emissions. Furthermore, we will develop recycling-oriented manufacturing to a higher level by using innovative materials and the latest digital technologies.

With all these activities, we aim to realize both "A better life" and a "Sustainable global environment" towards Panasonic GREEN IMPACT PLAN, based on an ecodesign concept which maximizes customer value in use by increasing resource efficiency at each process in design, procurement, and production.

[Concept for the Actions toward Circular Economy]

We will promote effective utilization of resources and maximization of customer value by creating circular economy business and evolving recycling-oriented manufacturing.



As specific activities, we continue to work towards achieving the resource-related targets listed in GREEN IMPACT PLAN (GIP) 2024. We plan to adjust our existing businesses along the circular economy aspects as outlined in our concept above. We are also using the same mapping with future new businesses, and aim to establish at least 13 new circular economy business models by 2024.

We plan to improve materials to meet both the characteristics requirements and environmental safety, ensure stable supplies, advance production technology to use new materials, and improve recycling technology, through which we aim to achieve a total of more than 90k tons of recycled resin (cumulative from FY2023-2025). Additionally, zero waste emissions are important

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for us as a part of efficient usage of resources and we will continue our efforts to achieve a factory waste recycling rate of 99%.

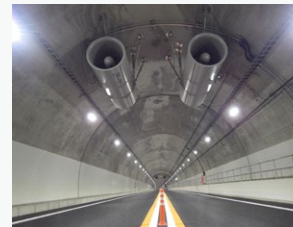
We established the Global Circular Economy Project in April 2020, led by Panasonic Europe, with the aim to accelerate conversion of the Group's business into a circular economy model. In 2023, the project was reorganized into a new system due to the increasing necessity of applying the principles of a circular economy throughout our business management, driven by a deepening understanding of such principles. Understanding of the principles of a circular economy penetrated through our businesses and established an important foundation to formulate the Circular Economy Group Policy in November 2023, as well as to integrate the Circular Economy business into Panasonic GREEN IMPACT.

Creation of Circular Economy Business

We strive to promote the efficient use of resources and to maximize customer value. Thus, we are working to create businesses based on a circular economy model. One of the business models created is "product as a service" for our display refrigerators and freezers. Instead of selling them to supermarkets and other food retailers, we offer "food refrigeration" as a service based on a monthly charge. The service also offers a refurbishment scheme for food retailer chains, through which we replace old display refrigerators and freezers in one store with newer models in use at another store after thorough inspection and refurbishment. The service package can be tailored to suit customers' particular requests and store conditions. Furthermore, this service includes a "monitoring service" that supports energy conservation in stores through digitally monitoring the operational status of displays and other types of refrigerators and freezers, and physical services, such as maintenance and repairs, and replacement suggestions for older items.

These services are expected to reduce maintenance and energy costs, and at the same time it will facilitate cheaper, low-budget store renovations by making business management more efficient.

Road tunnels are an indispensable social infrastructure in our life. We provide a total air ventilation solution to maintain a clean air flow in the tunnel environment, as well as a maintenance service¹ for such ventilation equipment. The service offers regular checks and overhauls on the air ventilation equipment, including the jet fans used as a part of the above solution, thereby minimizing functional deterioration from aging and ensuring product safety over a longer period of time.



Jet fans

We refurbish home appliances, such as washing machines, refrigerators, and TVs, collected after use, to a reusable state for reselling.² Those products that satisfy the high quality standards set by the Panasonic Group are then made available for sale. For example, TVs are inspected to ensure

they do not carry any scratches, damage, or missing parts in the main body and accessories that could cause a malfunction. They are also thoroughly cleaned, and the image quality is checked. Any failed parts are replaced, and all the products are tested for product safety. To meet the Group standards, the display output is adjusted, and performance tests are conducted. Only after all these processes have been completed, the products are finally put on sale for customers.

As another subscription model, we started a service for our rental housing, "noiful," in January 2022. Noiful³ offers a rental service for the latest home appliances pre-installed in a rental property, including support services to explain how to use the appliances, repairs and replacements, and appliance cleaning when moving in and out. In addition to the conventional home appliance package, from March 2024 we started a new full-furnishing plan that offers residences complete with furniture and home appliances.⁴ In the domestic real estate market, housing stock is on an increasing trend due to the population decrease etc. This becomes a range of social issues, such as an increase in aging buildings and more vacancies. Noiful offers "plentiful life without owning" to tenants, enabling people to move houses more easily, which should help invigorate the rental housing market. This novel solution also contributes to solving the social issue of increasing vacancies by adding a value to the rental property for owners and management companies. Noiful is also designed to be a business model offering a recurring and stable high income, and new value to the three parties usually involved in the business: property owners, management companies, and tenants. The reuse and recycling of home appliances reduces environmental impact by eliminating the necessity of disposal and contributes to building a sustainable society and life.



Subscription service "noiful"

Products containing a significant amount of recycled materials are also considered as a part of our circular economy businesses, as they contribute to efficient resource utilization. One such product example is a series of our cordless vacuum cleaners. The MC-NS10KE is a new cordless stick vacuum cleaner with the Clean Dock exclusively designed by the Panasonic Group. It was released on December 6, 2023, as a model with the use of recycled resin increased to around 40% of the entire product.⁵ In February 2024, we released another circular economy focused model, the MC-PB60J cordless stick bag-type vacuum cleaner. It contains 95% recycled resin (biomass content, etc.) and acquired the industry's first Biomass Mark as a domestic home cordless stick cleaner (by our research as of February 29, 2024).⁶



MC-PB60J

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In June 2022, we began installing collection boxes for used dry batteries at 31 local 7-Eleven stores in Thailand, in cooperation with CP ALL Plc., the operator of 7-Eleven. In March 2024, we established a scheme to recycle the collected used dry batteries manufactured by us, in partnership with UMC Metals Ltd., a Thai steelmaker. This initiative allows us to melt our dry batteries, which do not contain environmentally harmful substances, and recover reusable materials, thereby contributing to efficient resource utilization. As of June 2024, we have achieved a total of 1,000 collection box locations at 7-Eleven stores.

The Panasonic Group will participate in the 2025 Japan World Exposition (Expo 2025 Osaka, Kansai, Japan). Our pavilion, “The Land of NOMO”, was constructed under the theme of “Pavilion Born of Three Circulation” and will actively make use of recycled materials recovered from used home appliances, offcuts and waste materials from factories, and other products made from scrap developed by the Panasonic Group.⁷ Materials used during construction of the Panasonic Group Pavilion will be returned to the recycling scheme after the Expo with the aim of achieving the Japan Association for the 2025 World Exposition’s recycling rate target of 98.1% (by weight).



Conceptual image of the pavilion

As described above, we are working to create circular economy businesses. We completed mapping out the relationships between our existing businesses and a circular economy based on the analytical method that we developed in fiscal year 2020. According to this mapping, we are steadily converting our businesses to a circular economy structure and three more circular economy businesses were created this fiscal year in addition to our ten existing ones. We are continuing to expand the scale of our circular economy business.

1	Subscription services for refrigerator/freezer display cases	8	Subscription services for home appliances (noifull)
2	Subscription services for cooling box for pharmaceuticals	9	Use of factory wastes for parts
3	Akari E Support services (LED Lighting leasing service)	10	Adoption of paper-based battery packaging and used dry batteries recycling
4	Battery management business in the PC subscription services	11	Maintenance service for air ventilation systems in road tunnels
5	Effective utilization of owned buildings	12	Refurbishment of washing machines, refrigerators, TVs, etc.
6	Business development of mixed cellulose plastics	13	Vacuum cleaners made with recycled resin
7	Refurbishment services with Lawson		

*1 See [WEB](https://www2.panasonic.biz/jp/air/fan/douro/) https://www2.panasonic.biz/jp/air/fan/douro/

*2 See [WEB](https://ec-plus.panasonic.jp/store/page/product/refurbished2307/) https://ec-plus.panasonic.jp/store/page/product/refurbished2307/

*3 See [WEB](https://news.panasonic.com/jp/press/data/2022/01/jn220119-1/jn220119-1.html) https://news.panasonic.com/jp/press/data/2022/01/jn220119-1/jn220119-1.html

*4 See [WEB](https://news.panasonic.com/jp/press/jn240314-6) https://news.panasonic.com/jp/press/jn240314-6

*5 See [WEB](https://ec-plus.panasonic.jp/store/page/contents/cleaner-NS10KE-sus/) https://ec-plus.panasonic.jp/store/page/contents/cleaner-NS10KE-sus/

*6 See [WEB](https://panasonic.jp/soji/products/stick/mc-pb60j.html) https://panasonic.jp/soji/products/stick/mc-pb60j.html

*7 See [WEB](https://news.panasonic.com/jp/press/jn230712-1) https://news.panasonic.com/jp/press/jn230712-1

Evolution of Recycling-Oriented Manufacturing

We use many kinds of resources, including iron (28% of total resources used) and plastic (11% of total resources used), because of our wide range of products and businesses, from home appliances, components such as semiconductors and batteries, housing, and B2B solutions.

In recycling-oriented manufacturing, we are further working on reducing the input of virgin resources, while increasing the amount of recycled resources. And in that context, we are working to establish a circular system according to resource type and features.

Furthermore, we are clarifying recycled resource use by identifying the volume of each type of resource used across the Panasonic Group. For example, in the case of recycled resin, we used approx. 17.2 kt of recycled resin in our products in fiscal 2024. In order to achieve the respective GREEN IMPACT PLAN (GIP) 2024 target, we worked on responding to the characteristic required for components, ensuring a stable supply, devising ways to use at the manufacturing site, and developing recycling technologies.

As for the factory waste recycling rate⁸, we had traditionally set different targets for Japan and countries outside Japan according to the relevant local infrastructures. However, given increased awareness of the importance of zero waste emission activities, we have set a globally standardized target since fiscal year 2011 and are taking steps to improve the standard level of waste recycling across the entire Group. The factory waste recycling rate in fiscal year 2024 was 99.3% compared to our target of more than 99%, achieving the target (see [page 51](#)). We will continue to implement measures to achieve the zero waste emissions.

*8 Factory waste recycling rate = Amount of resources recycled/(Amount of resources recycled + Amount of landfill)

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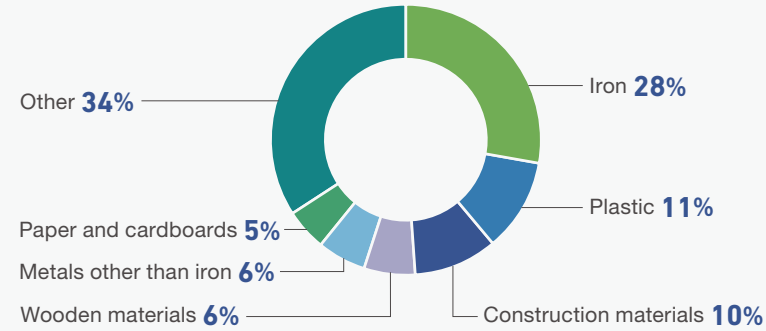
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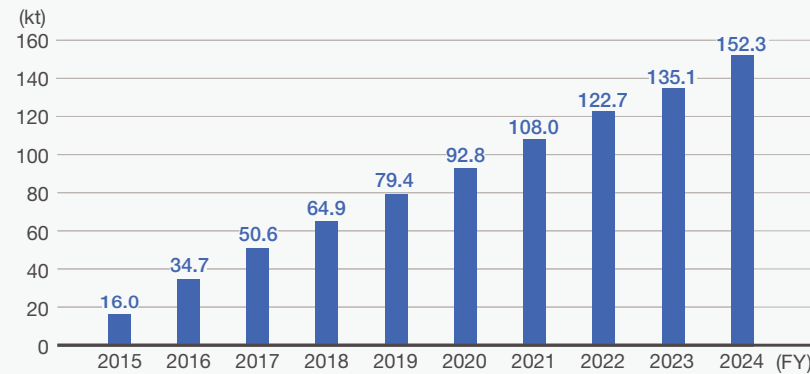
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Breakdown of Input Virgin Resources Used in Fiscal 2024 (by category)



Results of Recycled Resin Usage (Cumulative total from fiscal 2015)



■ Reduction in Resources Used

To minimize the use of resources for production, we continuously look to reduce the weight of our products. Through the Product Environmental Assessment (see [page 39](#)), we have been promoting resource saving from the product planning and design stage, such as using less resources, making our products lighter and smaller, and using less components. We also implement various measures from the standpoint of resource recycling throughout the product life cycle, such as component reuse, longer durability, use of recycled resources, easier battery removal, and labels necessary for collection/recycling.

Examples of weight reduction and recyclable product design are also introduced in the following website.

[WEB https://www.panasonic.com/global/corporate/sustainability/eco/resource/recycling_oriented_manufacturing.html](https://www.panasonic.com/global/corporate/sustainability/eco/resource/recycling_oriented_manufacturing.html)

■ Use of Sustainable Materials

Under the concept of “product-to-product”, we are enhancing our initiatives of utilizing resources recovered from used products. As for resin, we promote the reuse of resin recovered from our used home appliances (refrigerators, air conditioners, washing machines, and TVs) for our products. We also started recycling scrap iron recovered from used home appliances in our products in 2013.



Examples of “Products to Products” and inventions to streamline and automate the process of recovering resources from used products are introduced in the following website.

[WEB https://holdings.panasonic/global/corporate/sustainability/environment/resources/recycling_oriented_manufacturing.html](https://holdings.panasonic/global/corporate/sustainability/environment/resources/recycling_oriented_manufacturing.html)

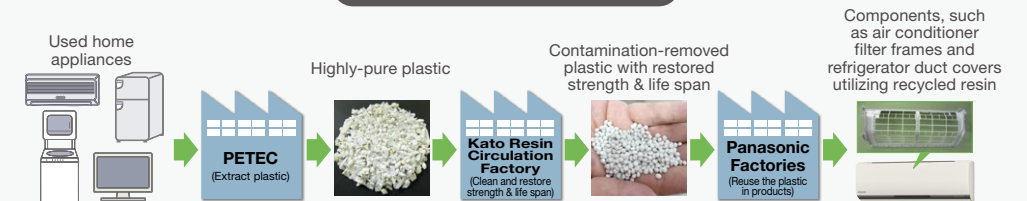
■ Our Approach to Resources Recycling

<https://holdings.panasonic/global/corporate/sustainability/environment/resources-recycling.html>

■ Enhanced Use of Recycled Resin

To efficiently utilize resin recovered from used home appliances in addition to metals such as iron, copper, and aluminum, our recycling factory, Panasonic Eco Technology Center Co., Ltd. (PETEC), and Kato Plastic Recycling Factory of the Living Appliances and Solutions Company work together for resin recycling.

Process of Resin Recycling



Using technologies such as our original near-infrared identification technology, PETEC is capable of sorting shredder residue of waste home appliances into three major types of resins with different purposes and properties—polypropylene (PP), acrylonitrile butadiene styrene (ABS), and polystyrene (PS)—at a material purity of over 99%.

The recycled single resins sorted and recovered at PETEC are then transferred to the adjacent Kato Plastic Recycling Factory to be further purified and processed to recover their chemical properties. Kato Plastic Recycling Factory is a manufacturing and development site that demonstrates promotion of use of recycled resin at our Living Appliances and Solutions Company, a home appliance manufacturer and seller. The factory plays an important role in

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enhancing recycled resin utilization by developing recycling technologies, such as a more efficient method that improves the performance of recycled resin. Generally, the strength and lifespan of resin deteriorate over time. This is why its chemical properties have to be recovered to the level of new resin to make them usable as materials and components in new products. Because of the differences in the physical properties required by different products, we have been examining the properties of recycled polypropylene, polystyrene and acrylonitrile butadiene styrene, and have developed technologies to create new formulas for resin components, adding our own proprietary antioxidant and mixing recycled resin with new resin. To increase usage of recycled plastic across Panasonic Group, we plan to find recycled plastic suppliers based on the recycled plastic development and quality assessment techniques cultivated in our Kato Plastic Recycling Factory.



Near-infrared sorting machine that can sort three types of resin simultaneously

Development and Use of New Sustainable Materials

Cellulose fiber can be derived from various natural resources, such as wood residues from forest thinning, and other organic wastes, and it is now drawing attention as a resource with low environmental impact. In fiscal 2019, we developed a composite polypropylene (PP) resin containing plant-derived cellulose fiber as an additive. Also, we developed a molding material mixed with plant-derived cellulose fiber. This new material is used in the frame parts of our cordless stick-type vacuum cleaner and contributes to its reduced weight, one of the most important features of the product. In fiscal 2020, the content of the cellulose fiber could even be increased to more than 55% while maintaining the whiteness of the material thanks to our special processing technology.

In fiscal 2021, we further advanced the technology to increase the amount of cellulose fiber, and established a process that enables 70% cellulose fiber composition, along with a technology that can smoothly mold the material into products. These technologies increase the plasticity of the material despite the high content of cellulose fiber, enabling product designs intended to feature the natural feel of the material. (The product received the MEXT Minister's Prize under the FY2021 50th Japan Industrial Grand Prize held by Nikkan Kogyo Shimbun, Ltd.) Sales of sample molding materials of kinari CeF70-PP and kinari70 started in March 2023, and kinari70 began mass production and sales as kinari70-PP.

We successfully established a commercial level of technology to mix a high density plant-based cellulose fiber into resin. We then applied the same technology to mix cellulose fiber into plant-based resin (bio-polyethylene) and successfully developed 90% high density cellulose fiber composition materials. Mixing a high density cellulose fiber into soft bio-polyethylene enabled us to achieve the same strength as our conventional kinari, but in a white color. This molding

material, made of 90% or more biomass content, was named kinari90 and sample sales started in January 2024.

To produce fully biodegradable composition materials, we combined plant-based cellulose fiber with biodegradable resins. Conventional biodegradable resins have more restricted applicability compared to generic resins, such as polypropylene, due to their lower strength and durability. When mixed with cellulose fiber, such biodegradable resins show poor fluidity, therefore their application became even narrower. We developed composition materials that offer biodegradability and high plasticity to the level of 1 mm-thick molding, by blending multiple biodegradable resins, including plant-based polylactide resin, with appropriate additives.



Cellulose fiber composition materials with a biomass content of 90% or more

Just in the same way as conventional kinari, the new material is also available as white pellets that can be colored as required.

The new material has been certified as a biodegradable biomass plastic by the Japan BioPlastics Association.

In the area of housing materials, we exclusively developed a wood-based flooring substrate that utilizes 100% recycled wooden materials (excluding glue) made from construction waste and unused materials. Thanks to our wide-ranging processing technologies, we successfully created a substrate with high density with superior solidity compared with general plywood and which offers excellent scratch and dent resistance. The starch in wooden materials can attract insects (lyctus), however, our product is insect resistant as it has a low starch content. The substrate also offers excellent scratch and dent resistance and is therefore ideal for coping with wheels on chairs and furniture. The board's tongue and groove structure is also designed to deliver easy installation. Further, a part of the sales revenue from this sustainable flooring is donated to Gunma Prefecture's forestry fund. The entire life of the floorboarding is consistent with an approach. This product can reduce the consumption of natural materials and also contributes to preserving biodiversity (see [page 57](#)).

We intend to develop more new products with this technology, focusing also on developing new recyclable resources.

[WEB](https://news.panasonic.com/jp/press/data/2019/07/jn190708-1/jn190708-1.html) **Developed a high density cellulose fiber composition material which has flexibility in design**
<https://news.panasonic.com/jp/press/data/2019/07/jn190708-1/jn190708-1.html>

[WEB](https://news.panasonic.com/jp/press/data/2021/12/jn211201-2/jn211201-2.html) **Commenced sales of samples of kinari, high density cellulose fiber composition materials**
<https://news.panasonic.com/jp/press/data/2021/12/jn211201-2/jn211201-2.html>

[WEB](https://news.panasonic.com/jp/press/data/2022/03/jn220330-2/jn220330-2.html) **Jointly developed ECOALF, the sustainable fashion brand of Sanyo Shokai Ltd.**
<https://news.panasonic.com/jp/press/data/2022/03/jn220330-2/jn220330-2.html>

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[WEB](https://news.panasonic.com/jp/press/data/2022/04/jn220419-3/jn220419-3.html) Jointly developed the K-WORLD ism products with Panasonic Production Engineering Co., Ltd.

<https://news.panasonic.com/jp/press/data/2022/04/jn220419-3/jn220419-3.html>

[WEB](https://news.panasonic.com/jp/press/data/2021/02/jn210204-1/jn210204-1.html) Developed 70% high density cellulose fiber composition materials

<https://news.panasonic.com/jp/press/data/2021/02/jn210204-1/jn210204-1.html>

[WEB](https://news.panasonic.com/jp/press/jn240116-1) Sample sales of cellulose fiber molding material kinari 90 (90% or more biomass content) and mass production sales of kinari70-PP started

<https://news.panasonic.com/jp/press/jn240116-1>

[WEB](https://news.panasonic.com/jp/press/data/2022/03/jn220318-2/jn220318-2.html) Developed 90% high density cellulose fiber composition materials.

<https://news.panasonic.com/jp/press/data/2022/03/jn220318-2/jn220318-2.html>

■ Building a Recycling Scheme for Scrap Iron

Jointly with Tokyo Steel Co., Ltd., we started a recycling scheme for scrap iron in July 2013. In this scheme, we recover the scrap iron from used home appliances and Tokyo Steel makes it into steel sheets. We then purchase the sheets back as a material for our products. Supplying scrap iron for recycling and repurchasing the recycled iron is the first scheme of its kind in the Japanese electrical manufacturing industry.

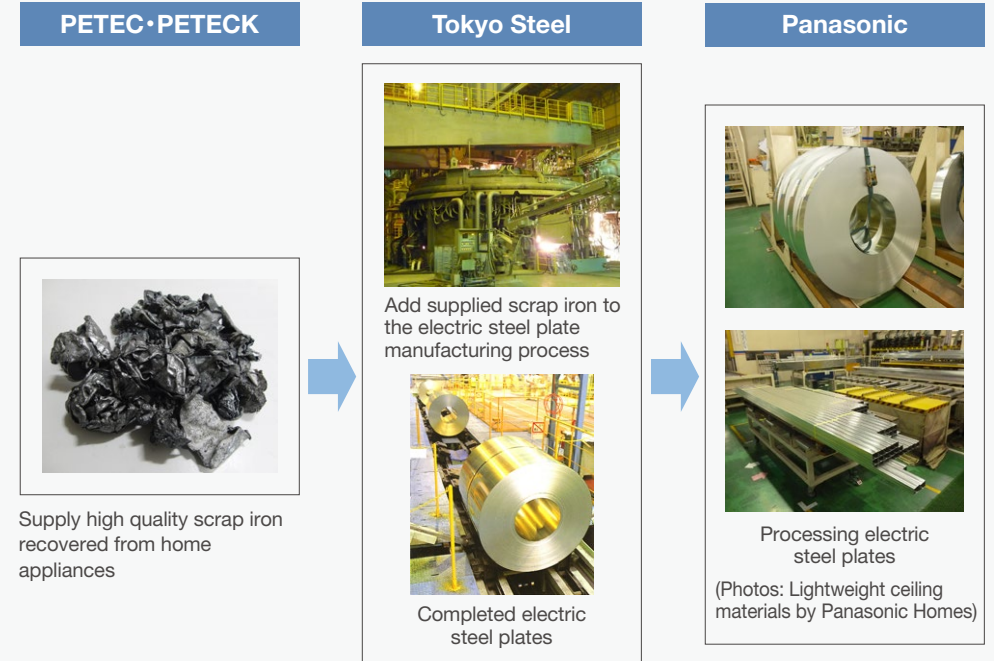


Specifically, scrap iron from home appliances collected and treated at PETEC and Panasonic Eco Technology Kanto Co., Ltd. is supplied to Tokyo Steel, where the scrap iron is processed into electrical steel plates.⁹ We procure the recycled steel plates and utilizes them in products.

Discussions with Tokyo Steel commenced in 2010, and we have worked together since then to improve the quality of recycled iron to a level sufficient for production use, as well as developing the technology to improve the applicability of the recycled iron. From this we identified the optimum application of the electrical steel plates, and refined its specific features (e.g. shape, strength, and weldability) to meet application-specific requirements. Use of thin electrical steel plates in our products was first made possible in 2011. Through this close collaboration, we materialized this recycling scheme in 2013, a scheme where a home appliance recycling company that we own supplies scrap iron to be used to make electrical steel plates.

The amount of scrap iron we initially supplied to Tokyo Steel was about 50 t per month. In fiscal 2024, it reached over 2.5 kt per year, and the recycled steel is being used in our Group products, including washing machines and ceiling materials for housing.

Self-recycling Scheme Process



The increase in electrical steel plate usage leads to an increase in the usage of scrap iron, which is one of the most important resources in Japan. In addition, producing steel plates from scrap iron emits much less CO₂ compared with producing steel plates from scratch. This scheme also stabilizes the procurement price, because the price of scrap iron supplied from PETEC and the price of electric steel plates procured from Tokyo Steel are determined by the scrap iron fluctuation rate agreed between the two companies. We will further expand this recycling scheme for more efficient resource utilization, CO₂ emissions reduction, and stabilization of procurement prices.

⁹ Steel produced from scrap iron melted and refined in an electric arc furnace.

■ Zero Waste Emissions—Improving Factory Waste Recycling Rate

From the viewpoint of effective usage of resources, we believe that generation of waste and revenue-generating waste at factories must be minimized, even if such waste could be sold as valuable commodities. Based on this belief, we identify the amount of generated waste (including both revenue-generating waste and factory generated waste) and classify it into: (1) recyclable

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waste (including those that can be sold and those which can be transferred free of charge or by paying a fee), (2) waste that can be reduced by incineration or dehydration, and (3) landfill (waste with no option other than being sent to landfills). We reduce the emission of waste by boosting yield in our production process and increasing the recycling rate of our waste materials. Accordingly, we strive globally toward achieving our Zero Waste Emissions from Factories^{*10} goal by reducing the amount of landfill to nearly zero. We have reinforced such efforts particularly in China and other Asian countries, where many of our factories are located.

With the waste plastic import control introduced in China, the volume of material being recycled has dropped, leading to an increase in landfill waste disposal. As a result of various activities, the factory waste recycling rate in fiscal 2024 was 99.3%, achieving the 99% target in our GPI 2024. In addition to the waste plastic recycling, we will introduce more recycling activities which aim to maintain and improve the factory waste recycling rate. (Example: PEW Ikeda Denki^{*11})

As a means to reduce the generation of waste, we are fostering resource-saving product design. In our production activities, we are engaging in resource loss reduction, employing our own unique material flow analysis methods. We consider materials that do not become products and excessive use of consumables as resource losses, and make the material flow and lost values for each process visible in order to resolve the issues in close collaboration with the design, manufacturing, and other relevant business divisions. In the future, we will promote further reductions in resource losses through the Resource Loss Navigation, our original system developed to automatically display information to help reduce resource losses.

As an initiative to reduce the amount of final disposal of waste and valuables, we will reduce the amount of materials that are particularly difficult to recycle, such as thermosetting resins. We are also strictly adhering to waste sorting practices in production processes to further expand the reuse of resources.

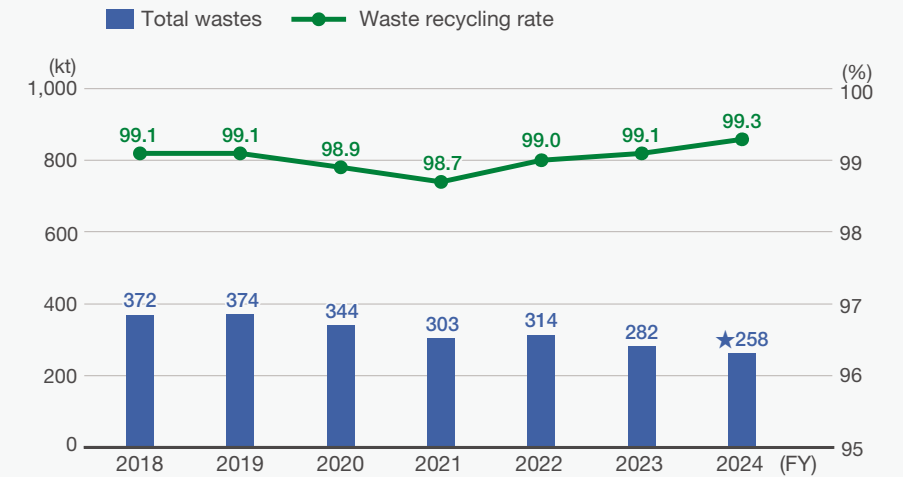
Because waste recycling rates in our overseas factories lag behind those in Japan, we have worked to improve the average level of recycling activities by sharing information within and between regions outside Japan. Specifically, in addition to accelerating the information sharing on waste recycling issues between our local factories and group companies in Japan, we also promote the sharing of excellent examples and know-how among our factories across regions by utilizing BA Charts^{*12} prepared by each region, following our long-standing approach toward CO₂ reduction activities.

*10 Definition by the Panasonic Group: Recycling rate of 99% or higher. Recycling rate = Amount of resources recycled/(amount of resources recycled + amount of landfill).

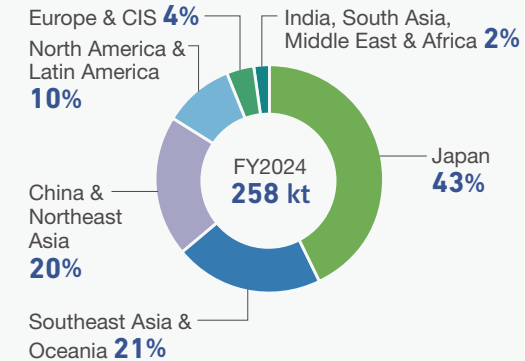
*11 [WEB https://panasonic.co.jp/ew/environment/3r_pew/](https://panasonic.co.jp/ew/environment/3r_pew/)

*12 A chart-format summary of comparisons between “before and after” implementation of waste reduction and recycling measures.

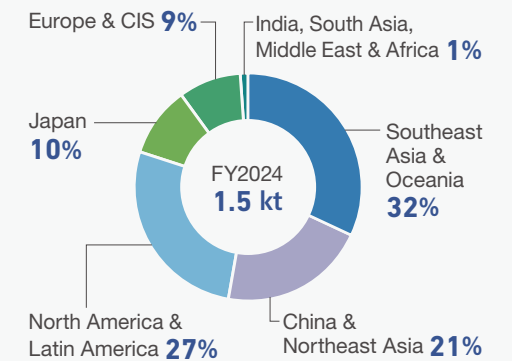
Amount and Recycling Rate of Total Wastes Including Revenue-generating Waste



Breakdown of Total Wastes Including Revenue-generating Waste (by region)



Breakdown of Landfill (by region)



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Breakdown of Total Wastes Including Revenue-generating Waste for Fiscal 2024 (by category) (kt)

Items	Total wastes	Recycled	Landfill
Metal scrap	112	111	0.2
Paper scrap	29	29	0.2
Plastics	34	33	0.7
Acids	14	9	0.05
Sludge	8	7	0.1
Wood	24	24	0.02
Glass/ceramics	3	3	0.05
Oil	9	8	0.06
Alkalis	15	13	0.02
Other ^{*13}	10	9	0.2
Total	258	246	1.5

^{*13} Combustion residue, fiber scraps, animal residue, rubber scraps, debris, ash particles, items treated for disposal, slag, infectious waste, polychlorinated biphenyls (PCBs), waste asbestos.

Global Initiatives for Used Product Recycling

For the purpose of efficient use of natural resources and prevention of environmental pollution, many countries around the world have been enacting recycling laws and developing their recycling systems. Examples include: the Law for Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Law) and the Act on the Promotion of Effective Utilization of Resources in Japan, the WEEE (Waste Electrical and Electronic Equipment) Directive in the European Union, and recycling-related laws in many states in the United States as well as in China. In addition to complying with the Basel Convention which controls the transfer of hazardous waste to non-OECD countries as well as with related laws in respective countries, the Panasonic Group strives to establish the most efficient recycling system in each country that is in line with its local recycling infrastructure, including the utilization of third parties.

Product recycling results in fiscal 2023 are as shown below. As for the situation outside Japan, with the decrease in the volume of collection and recycling due to recent reforms of business areas in various countries, the weight of collected products is on a flat or downward trend.

FY2023 Results

Japan Processed approx.	151.3 kt of four kinds of used home appliances
USA Collected approx.	77 t of used electronic products

Product Recycling Initiatives in Japan

In response to the Home Appliance Recycling Law of 2001, which covers four specified kinds of home appliances^{*14}, manufacturers were grouped into two groups, Group A and Group B, to collect and recycle the four specified kinds of used home appliances. We belong to Group A, and to work on recycling, we have established Ecology Net Co., Ltd. jointly with Toshiba Corporation to operate and manage a geographically dispersed recycling network through the effective use of existing recycling facilities nationwide. This management company supervises 326 designated collection sites (shared by Group A and Group B) and 30 recycling plants, based on consignment from Group A manufacturers (18 companies including the Panasonic Group). Additionally, we invest in Panasonic Eco Technology Center Co., Ltd. (PETEC), Panasonic Eco Technology Kanto Co., Ltd. (PETECK), and Chubu Eco Technology Co., Ltd. (CETEC)^{*15} and exchange information with product manufacturing divisions to develop easy-to-recycle designs, as well as conducts research and development to efficiently recover and supply more resources. In fiscal 2023, we recycled approx. 151.3 kt of the four specified used home appliances.



Machine to turn over air conditioner outdoor units at PETECK

Although the statutory recycling rate^{*16} is being raised in phases, our recycling plants have been achieving recycling rates higher than the legal requirement by reviewing and improving recycling equipment and processes in view of the characteristics and materials of respective products as well as higher recycling efficiency.

In the summer of 2019, PETECK automated a part of its air conditioner processing line, using an articulated robot to turn over and transfer air conditioner outdoor units during the dismantling process. The recognition device identifies the position and size of the outdoor unit, and based on the identified information the articulated robot picks up and moves the unit to the standard dismantling process or to the process for dismantling special items such as window-type units. This has enabled safe and efficient air conditioner processing, relieving workers of dangerous work that required physical strength to turn outdoor units (weighing 33 kg in average) upside down. As for PETEC, it promotes high grade single-plastic recycling using plastic recognition equipment.

See [pages 48-49](#) for more details.

^{*14} Air conditioners, TVs, refrigerators/freezers, and washing machines/clothes dryers.

^{*15} PETEC is a company fully invested by the Panasonic Group, and PETECK and CETEC are joint ventures between Mitsubishi Materials Corporation and the Panasonic Group.

^{*16} Statutory recycling rate = Recycling rate specified by law (Valuable resource weight/Total weight of used home appliances).

The statutory recycling rates were raised in 2009 and 2015, and are currently at least: 80% for air conditioners, 55% for CRT TVs, 74% for LCD and plasma TVs, 70% for refrigerators and freezers, and 82% for washing machines and clothes dryers.

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[WEB](https://holdings.panasonic/global/corporate/sustainability/environment/resources/recovery/recycling.html) Overview of Recycling of Specified Used Home Appliances (Japan)

<https://holdings.panasonic/global/corporate/sustainability/environment/resources/recovery/recycling.html>

[WEB](https://panasonic.net/eco/petec/) Panasonic Eco Technology Center Co., Ltd. (PETEC)

<https://panasonic.net/eco/petec/>

■ Efforts in the Europe / CIS Region

In 2023, we collected approx. 32.20 kt^{*17} of used products covered by the WEEE Directive across Europe.

Circular Economy is the key driving factor for future waste legislations in Europe. Recycled content becomes increasingly important in Europe and will be more and more included into national laws and tender processes. If products don't meet certain Circular Economy criteria, the recycling fees will increase. If products are easy to recycle, contain recycled material, easy to repair, etc., the recycling fees will decrease.

Panasonic is considering how to prepare our business for such new recycled material requirements. For instance, this includes ensuring stable material supplies with guaranteed quality. In addition, we intensified the internal discussion about the impacts on product design, the enhanced reuse of products and components, or how to further improve and simplify the recyclability of products.

^{*17} Calculated by multiplying the weight of collected products per collection system by our market share in terms of weight per collection system.

■ Efforts in North America

The Panasonic Group continues its leadership role in establishing and operating a recycling system for waste batteries and consumer electronic products in North America. Following the startup of a state recycling law in Minnesota in July 2007, we established the Electronic Manufacturers Recycling Management Company, LLC (MRM), jointly with Toshiba Corporation and Sharp Corporation in September of the same year, and began recycling TVs, PCs, and other electronic equipment.

With collaborative ties to several recycling companies, MRM operates collection programs on behalf of numerous companies across 20 states and the District of Columbia. The cumulative total of collection by MRM has exceeded 1.6 billion lbs. (approximately 726 kt) since its inception in 2007. With the changes in our business strategies in the US, our remaining collection obligations are de-minimis, MRM will continue operating its collection programs on behalf of the manufacturers it serves.

As for waste batteries, we established Call2Recycle in 1994 jointly with other battery manufacturers, and now provide recycling programs for rechargeable batteries throughout the US and Canada. Call2Recycle provides collection program and a robust retail collection network for over 600 companies, and collected more than 69 kt of primary and rechargeable batteries in the US and Canada since the organization's inception.

Recycling end-of-life products in Canada started in 2004 with the Alberta Government Extended Producer Responsibility (EPR) Regulation. Since then a total of ten provinces and two territories have legislated WEEE, each with their own unique parameters and requirements. In an effort to harmonize these programs, Panasonic Canada takes an active role in the governance of the Electronic Product Recycling Association, a not-for-profit management organization. The currently active provincial EPR programs have proven to be very effective in diverting e-waste as reflected in 2020 totals, where 109.41 kt in Canada were collected.

■ Efforts in China

In China, it has been announced that the collection of the Waste Electrical and Electronic Products Processing Fund, which was based on the Regulations on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products implemented since 2012, will be temporarily suspended after January 1, 2024. In the future, subsidies for waste appliance processing to recovery and disposal companies will be paid from the national general public budget (mainly from taxes).

The government is paying attention to and considering responses to related policies such as the Promotion Plan for the Extended Producer Responsibility System announced in January 2017, the Law on the Prevention and Control of Environmental Pollution by Solid Wastes enforced in September 2020, and the demonstration of the Waste Appliance Recycling Target Responsibility System involving six major local home appliance companies since 2022.

■ Efforts in Southeast Asia and Oceania Vietnam

The Law on Environmental Protection 2020 sets out requirements for a wide range of environmental issues, including the enhancement of e-waste management in Vietnam. The Government has also issued "Decree 08/2022 Detailing a Number of Articles of the Law on Environmental Protection" and "Circular 02/2022/QD-TTg Detailing the Implementation of a Number of Articles of the Law on Environmental Protection" under the Law on Environmental Protection 2020 which took effect since 10 January 2022 and requires producers/ importers to contribute financially for waste treatment of primary batteries from 1 January 2022. PSV has since made the necessary financial contribution for primary batteries placed in the market in 2022 to ensure proper waste treatment for these batteries. Moving forward, producers/ importers will also be required to contribute financially or self-manage e-waste recycling for rechargeable batteries from 1 January 2024 and electronic products from 1 January 2025.

PSV has since made the necessary financial contribution for primary batteries placed in the market to ensure proper waste treatment for these batteries. Additionally, we are working with Recycling Vendors to consider 2 options: financial contribution or self- recycling for rechargeable batteries and electronic products.

Panasonic Sales Vietnam will work closely with the Vietnamese government to take the necessary

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actions for compliance to the Law on Environmental Protection and to support the implementation of an effective waste treatment and e-waste recycling scheme.

Australia

The National Television and Computer Recycling Scheme (NTCRS) was established in Australia in 2011. Effective since 1 July 2021, the NTCRS has been superseded by the Recycling and Waste Reduction (Product Stewardship –Televisions and Computers) Rules 2021 made under the Recycling and Waste Reduction Act 2020, which will provide a new legislative framework to manage waste, recycling and product stewardship. Currently, the national framework covers televisions and computers, including printers, computer parts and peripherals.

Panasonic Australia (PAU) partnered with Ecycle Solutions, a co-regulatory arrangement approved by the Australian government to fulfill its obligation under the national scheme, since May 2021. Between January 2023 and December 2023, 22 tons of e-waste were recycled.

Since April 2021, PAU has also joined the Battery Stewardship Council (BSC) as a member. As part of obligations of a member, PAU has also been contributing to recycling costs for batteries imported, including 91 tons of batteries imported between January to December 2022.

Singapore

The Resource Sustainability Act introduced in Singapore in 2020 requires producers of regulated consumer products to join the licensed Producer Responsibility Scheme (PRS), which started in July 2021. For Compliance Year 3 (July 2023 – June 2024), a Collection Target of 60% (of weight supplied) was set for regulated Large Household Appliances (LHAs) and 20% for Portable Batteries. Panasonic Singapore has been working closely with the authorities and PRS operator to ensure the smooth implementation of the PRS. A total of 6,490 tons of regulated e-waste were collected by the PRS operator, of which LHAs comprised of a total of 90% by weight between January to December 2023.

Other Countries in Southeast Asia and Oceania

Regulators in Malaysia, Thailand, the Philippines, and New Zealand are also gearing towards the global trend of mandating end-of-life product recycling. Discussions with regulators and industry bodies are in progress. We hope to contribute to the formulation of sustainable e-waste management policy in each country through engagement with local governments and industry associations and participation in pilot recycling projects.

Efforts in India

In India, the new e-waste recycling law has been implemented by the Ministry of Environment, Forests and Climate Change (MoEFCC) from the 1st of October 2017, with Extended Producer Responsibility (EPR) targets based on end-of-life (EoL) defined in the e-waste (Management) rules 2016. To fulfill the compliance, we will collect and recycle waste home appliances through the “I

Recycle” program already established by Panasonic India (PI).

We have also been taking part in the Consumer Electronics and Appliances Manufacturers Association (CEAMA), which promotes an analysis of current recycling activities in India as well as a long-term plan for waste problem solutions.

We are having various dialogues with the Indian government, jointly with CEAMA, about the EPR target and EoL definition for recycling management.

We are also actively engaged in different active associations including the Federation of Indian Chambers of Commerce and Industry (FICCI) and Confederation of Indian Industry (CII) to establish an even more efficient and robust recycling system and to submit industry comments to the Indian government for a better governance system.

Efforts in Latin America

In response to a growing trend in stricter environmental laws in Latin American countries, discussions on the establishment of recycling laws and actual enforcement are being conducted.

In Brazil, a sectoral agreement on home appliances was concluded in October 2019, and a Federal Decree specifying a system to collect and recycle household electrical and electronic equipment was enforced in January 2021. As one of the main members of a waste home appliance management body (ABREE), we collaborated in the establishment of a reverse logistics system (a system to collect used products), and promotes efficient collection and treatment of used products.

The target for 2023 was reached by collecting and treating 46,8 tons which represents 100% of tonnage goal in accordance with sectorial agreement. For 2024, the target is double the previous year, representing 12% of the tons put in the market. As of March 2024, 20,02k tons have been collected and treated, which represents 22,12% of achievement so far.

In Peru, under the recycling law that came into force in 2016, we joined a nonprofit waste management organization (ASPAGER) as a leading member, and started a used-product recovery program.

In Colombia, a framework law for home appliance recycling was enacted in 2018. We have been a member of a used-product collection program (Red Verde/Lumina) conducted by an industry group (ANDI) since 2014, prior to the enactment of operational rules. The target for 2024 is 806 tons and at January end it was already collect 260 tons, which represents 32% of achievement.

In Mexico, a collection program is implemented under the government-approved recycling management plan.

In Chile, the legislation is being considered, and preparations for setting up a collection program are underway through continuous discussions with the government.

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Ways of Thinking about Biodiversity

Our social lives and business activities are based on various benefit provided by the natural capital (NCP: Nature's contributions to people). It has been recognized that conservation of biodiversity is as important as measures for climate change and resource recycling and they are closely linked each other in establishing a society where humans and nature coexist in harmony which is a long-term vision of the Sustainable Development Goals (SDGs) and the United Nations Convention on Biological Diversity.

In December 2022, "the Kunming-Montreal Global Biodiversity Framework (GBF)" was agreed in the UN Biodiversity Conference (COP 15) held in Montreal.

Aiming to achieve the 2050 Vision for 'a world living in harmony with nature', the framework covers the 2030 mission, which aims to 'take urgent action to halt and reverse biodiversity loss.' The international targets to achieve a nature-positive world by 2030 are 'the GBF targets' and 23 action-oriented global targets were determined in the COP15.

As the biodiversity goal in our GREEN IMPACT PLAN 2024 (GIP2024), we set targets to reduce the impact from business activities on the ecosystem for its recovery, aiming at a nature positive world as a front runner.

Three Targets in GIP2024

Targets		SDGs
Sustainable procurement of raw materials	Promote sustainable procurement of wood and paper, etc.	12,13,15,17
Utilization of greenery in business sites (land use)	Utilize greenery in business sites, considering conservation of biodiversity	13,15,17
Products and services	Offer products and services that contribute to conservation of conservation	11,12,15,17

We will continue to work on activities for biodiversity conservation while clarifying our business dependencies and impacts on nature following the standards set by the Taskforce on Nature-related Financial Disclosures (TNFD), Science Based Targets for Nature (SBTs for Nature), and the like.

The Green Impact Plan that is reviewed and revised every three years is equivalent to the Biodiversity Action Plan (BAP) under the Convention on Biological Diversity

Initiatives for Sustainable Procurement of Raw Materials

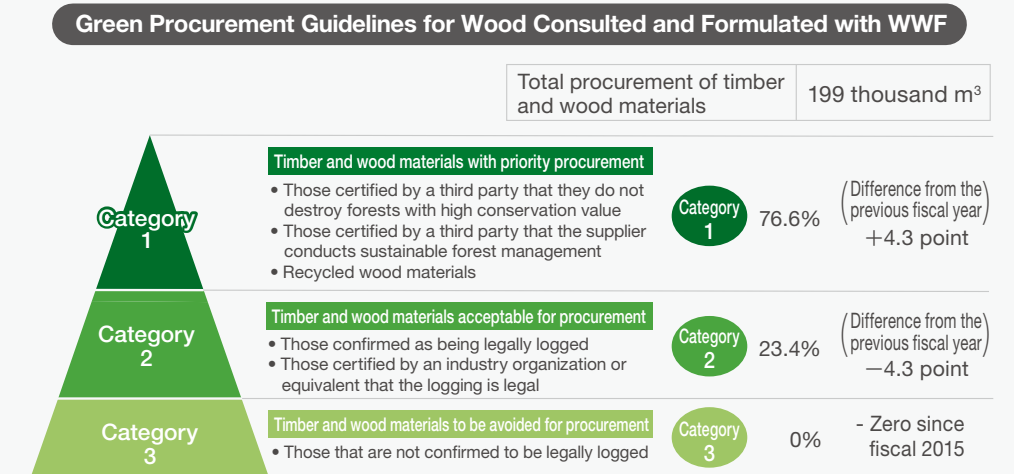
Firstly, we plan to include our consideration for biodiversity protection in Procurement Department's "Green Procurement Standards" to ensure that these practices are carried out across our whole supply chain.

In regard to procurement for wood, we discussed extensively with Worldwide Fund for Nature (WWF) Japan over our green procurement; and formulated the "Panasonic Group Green Procurement Guidelines for Wood" aiming for conservation of biodiversity and sustainable use of natural resources in 2010. Based on these guidelines, we conduct an annual survey on wood material procurement among our suppliers.

In fiscal 2022, we exchanged opinions about sustainable material procurement with WWF Japan. In the discussion with WWF Japan, we confirmed growing importance of environmental and social (human rights) considerations, in addition to importance of compliance with laws and regulations for our timber procurement. This discussion also gave us an opportunity to think about future measures.

■ Exclusion of timbers and wood materials whose regulatory compliance in their logging has not been confirmed (Category 3)

The survey results in fiscal 2024 are as follows.



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[PDF](https://holdings.panasonic.jp/corporate/about/procurement/green/pdf/green_wood_J.pdf) “Green Procurement Guidelines for Wood”

https://holdings.panasonic.jp/corporate/about/procurement/green/pdf/green_wood_J.pdf

[WEB](https://holdings.panasonic/global/corporate/about/procurement/green.html) “Green Procurement Standard”

<https://holdings.panasonic/global/corporate/about/procurement/green.html>

[WEB](https://www2.panasonic.biz/es/sumai/law/cleanwood/) How to respond to the “Act on Promoting the Distribution and Use of Legally Harvested Wood and Wood Products” (called Clean Wood Law) (Japanese)

<https://www2.panasonic.biz/es/sumai/law/cleanwood/>

Activities for Land Use

Once an ecological network that connects greenery in our business divisions, neighboring woodlands and parks is formed, living things such as birds, butterflies, and dragonflies in each area can move around wider areas for flowers and water through the ecological networks, and their habitats are expanded. Green areas in our business divisions have a lot of potential to contribute to conserving biodiversity in that area. In particular, hardly any natural environments where wild animals can live and breed remain in urban areas. Therefore, even small areas of green in corporate premises can become a precious habitat of a variety of living things if they have indigenous vegetation and a watery environment.

■ Acquisition of Eco-Certification Based on Quantitative Evaluation from external accredited body

Panasonic Corporation’s Living Appliances and Solutions Company’s (LAS) Kusatsu site in Shiga Prefecture, obtained an eco-certificate from the Association for Business Innovation in harmony with Nature and Community (ABINC)^{*1} in March 2018, as a business site for its contribution to biodiversity. In the course of assessment, we received high ratings for how we are making green corridors to be suited to diversified living creatures by appropriately conserving the natural environment, keeping invasive non-native species under proper management by continuously monitoring to understand their status, and the active use of woodland nearby the factory, in liaison with external eco-related organizations and local people, such as the local public bodies and primary school students.

In the monitoring survey we have conducted since 2011, 840 species of flora and fauna were confirmed. At the same time, the survey result has indicated that the woodland is an important biotope in the area where urbanization is taking place, which contributes to the formation of local ecological networks. In addition, our continuing implementation of the environmental learning program on acorns for elementary school students was highly evaluated; and won an Award of Excellence in the 2nd ABINC award held in January 2020, as an ‘activity contributing to the biodiversity mainstreaming’.

<External certifications and awards>

- Acquired three stars under the Shiga Biodiversity Action Certification Program (2018)^{*2}
- Acquired ABINC certification (March 2018); the first certification renewal (February 2021) and the second certification renewal (February 2024)
- Received an Award of Excellence in the 2nd ABINC Awards (January 2020)

^{*1} ABINC is a certification system by third-party evaluation on greenery improvement and management at business divisions based on the land use score (biodiversity quantitative assessment tool in environmental assessment) and Guidelines for Sustainable Business Sites developed by the Japan Business Initiative for Biodiversity (JBIB).

^{*2} Shiga Biodiversity Action Certification Program is the first system in Japan for rating wide range of activities conducted by business enterprises in the area of biodiversity conservation with 1 to 3 stars granted by governor.

<Participation in international activities 30by30 Alliance for Biodiversity>

In March 2022, we joined the 30by30 Alliance for Biodiversity which is a global efforts and initiated by Japan’s Ministry of the Environment (MoE), to conserve at least 30% of own land as natural environmental area, and at least 30% of own ocean by 2030, as we believed our natural symbiosis woods ‘Shizen Kyosei no mori’ would contribute to the 30by30. In October 2023, our ‘Shizen Kyosei no mori’ was officially certified as ‘a natural symbiosis site’ by the MoE. It will be

also listed in the international database as an ‘other effective area-based conservation measure (OECM)^{*3}’.

[WEB](https://www.env.go.jp/press/111067.html) News release by the MoE on October 6, 2023. Certification Results for ‘Natural symbiosis site’ (Shizen Kyosei Site) in the first half of fiscal 2024

<https://www.env.go.jp/press/111067.html>

^{*3} OECM: Other Effective area-based Conservation Measure Areas other than national parks and other already protected areas that would contribute to biodiversity protection, such as shrine or temple woodlands, woodlands owned by companies or which form part of company premises, rural village zones, etc. Japan’s 30by30 would include national parks and other protected areas.



[WEB](https://www.panasonic.com/global/about/sustainability/environment/ecology/kusatsu_factory.html) Biodiversity Conservation Ecological Network Concept https://www.panasonic.com/global/about/sustainability/environment/ecology/kusatsu_factory.html



ABINC Certification



Three-star rating in Shiga Biodiversity Action Certification Program SHIGA PREF. BIODIVERSITY



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■ Contributing to Biodiversity Conservation through Lighting

The Lighting Business Division of Electric Works Company, Panasonic Corporation develops and sells lighting products that care for the environment and biodiversity.

LED Insect Attractor (Product name: Mushi Keeper)

An insect attractor lures insects away from shops, warehouses, and sports fields, where they gather because of the lights, in order to reduce damage and nuisance caused by insects. Conventionally, the device attracted insects with a UV fluorescent lamp and killed them with a high voltage grid. In June 2021, the company launched an LED insect attractor (Mushi keeper). The product's UV and blue LED lights attract and retain insects, enabling reduction of insect damage and without killing them. This helps protect the ecosystem as the insects can return to nature. Conventional insect killers emitted light in all directions, attracting excessive insects. However, this newly adopted LED can emit light in the desired direction only, contributing to protecting biodiversity by its efficient insect attraction. The LED insect attractor has been confirmed to have a higher performance of insect attraction according to the insect attractiveness index.^{*4}

^{*4} The insect attractiveness index is a theoretical index and does not represent the actual number of insects attracted by the light. (Source: AOKI, S. et al. (2005) Evaluation of Insect Attractiveness by New Index. Proceedings of 2005 Annual Conference of The Illuminating Engineering Institute of Japan, 284.)



LED insect attractor (keep attracting with UV + blue lights)

Emits a directional light to attract insects efficiently

[WEB LED Insect Attractor: Mushi Keeper](https://www2.panasonic.biz/ls/lighting/outdoor/invites-insects/)

Developing IDA-certified LED Light

An LED security light and street light designed by the Lighting Business Division to minimize light pollution were approved as Dark Sky Friendly Lighting by the International Dark-Sky Association (IDA)^{*5} in February 2020. This was the first such achievement by a Japanese manufacturer^{*6}. One of the approval criteria requires that lighting must have a correlated color temperature of 3,000 kelvin and lower (warm color) not only to reduce light pollution but also to lessen any adverse impact on wildlife.

^{*5} As IDA-certified lighting made by a Japanese manufacturer (according to IDA Tokyo, as of February 20, 2020).

^{*6} The International Dark-Sky Association: The leading global organization addressing light pollution.

“Guidelines for Countermeasures against Light Pollution” (issued in March, 2021), by Japan’s Ministry of Environment. Panasonic Group cooperated to formulate the guidelines.

[PDF https://www.env.go.jp/air/hikarigai-gaido-R3.pdf](https://www.env.go.jp/air/hikarigai-gaido-R3.pdf)

Firefly-Friendly Street Lighting

Preceding our IDA-certified LED light, we had already developed an LED light with a spectrum and optical properties that had less impact on fireflies in 2016 and installed the LED lights on streets in different municipalities. According to the study made in Numama, Zushi City, Kanagawa Prefecture, the number of fireflies observed increased from 68 in the previous year to 145^{*7}.



Street lights in Zushi City are replaced with firefly-friendly LED lights

^{*7} The light was designed purely to minimize disturbance to the firefly habitat and does not guarantee for improving growth of fireflies or increase of the population.

■ Floor Boards Made from Wood 100% Recycled from Construction Waste Unused Wood Materials, and the like

Panasonic Housing Solutions Co., Ltd. is reducing its use of natural materials to preserve wood resources. ‘Sustainable Board’ is a new, eco-friendly material that uses 100% recycled wood (excluding adhesives) from construction waste and unused wood materials on a wood-based flooring substrate.

[WEB https://holdings.panasonic/global/corporate/sustainability/environment/biodiversity.html#biodiversity_04_01](https://holdings.panasonic/global/corporate/sustainability/environment/biodiversity.html#biodiversity_04_01)

[WEB Flooring: Eco-conscious material](https://sumai.panasonic.jp/interior/floor/concept/detail.php?id=eco_coordination)



IDA “Dark Sky Approved”

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■ Development of World's First Fiber Board Made from Oil Palm Waste^{*8}

In March 2022, we announced the world's first technology to produce fiber board from oil palm waste as PALM LOOP⁹ and started market testing in the domestic furniture area. In fiscal 2025, we will start activities to roll out the technology across the world, based in Malaysia where oil palm wastes are supplied

1. We can contribute to reducing methane gas and otherGHG generated by decaying oil palm waste.
2. We developed a technology to produce fiber board from oil palm waste.
3. We can prevent deforestation to create new farming areas through utilization of waste material.

We will contribute to alleviating global warming by reducing 'GHG emissions' and preventing 'deforestation'.

[WEB](https://news.panasonic.com/jp/press/data/2021/11/jn211115-1/jn211115-1.html) Development of world's first fiber board made from wastes of oil palm trees
<https://news.panasonic.com/jp/press/data/2021/11/jn211115-1/jn211115-1.html>

[WEB](https://news.panasonic.com/jp/press/data/2022/03/jn220317-1/jn220317-1.html) Launching our PALM LOOP™ technology that can produce fiber boards from wastes of oil palm trees
<https://news.panasonic.com/jp/press/data/2022/03/jn220317-1/jn220317-1.html>

[WEB](https://panasonic.co.jp/phs/technology/palmloop/) The special PALM LOOP website
<https://panasonic.co.jp/phs/technology/palmloop/>

^{*8} Based on our research as of March 2022.

^{*9} PALM LOOP™ is a trademark of Panasonic Corporation.

■ The cellulose fiber resin 'kinari' was featured as an example of the Ministry of the Environment's Transition Strategies toward a Nature Positive Economy

The MoE officially announced its Transition Strategies toward a Nature Positive Economy in March 2023. Our cellulose fiber resin 'kinari' (55 - 90% natural fiber content) was featured in the collection of reference materials titled "Case studies: Upcycling biomass (including wastes) and other materials to replace plastics." provided in the announcement. Expected business scale for this material as material is from several billions to several tens of billions of yen per year (estimated by Panasonic Group).

[PDF](https://www.env.go.jp/content/000213094.pdf) Transition Strategies toward a Nature Positive Economy & collection of reference materials
<https://www.env.go.jp/content/000213094.pdf>

'Kinari' is featured on [Page 49](#).



Mold sample of 'kinari'

Conservation of Biodiversity through Collaboration with and Support for NGOs and NPOs

■ Introduction of MSC-ASC certified sustainable seafood at employee canteens

The Panasonic Group has been involved in marine protection activities^{*10} for some 20 years through collaboration with WWF Japan. Main activity at present is continual supply of MSC and ASC-certified^{*11} sustainable seafood^{*12}



Cumulative total of sites offering the menu exceeded 50

to employees' canteens that started for the first time in Japan at Panasonic headquarters in March 2018. In this fiscal year, the situation remains difficult for the activity, e.g., some canteens had started serving sustainable seafood forced to stop serving the sustainable seafood due to the decreased number of employees using canteens as the number of employees working from home increased, and impact of price hike. As difficulties continued, sustainable seafood was newly introduced to



Deep fried oysters made in Tokura, South Sanriku; the oysters obtained Japan's first ASC certificate (Panasonic supported the activity.)

only one of the Panasonic Group sites this year, making an accumulated total of 57 sites. As for our continued support for other companies adoption of sustainable seafood into their canteens, the running total of the canteens of partner companies using sustainable seafood has exceeded 50, making more than 100 when combined with our group's accumulated total.

In addition to corporate canteens, Yokohama City University COOP has obtained the MSC-ASC certification with the Panasonic Group's support and corporation, and started serving the sustainable seafood at the university canteen for the first time in Japan's university in 2022. Sustainable seafood is now creating a new trend and is expanding its market.

By expanding availability of sustainable seafood such as serving it at corporate canteens, conducting awareness-raising activities periodically and continuously for employees and the next generation about sustainable seafood and the IUU fishing issues^{*13}, and facilitating transformation of behaviors of our employees and the public at large as consumers through communication via media, and the like, we contribute to 'SDG 14: Life below Water' and promotes to make the topic of biodiversity mainstream.

<External awards>

Champion in the Initiative Category of the 1st Japan Sustainable Seafood Awards (November 2019)

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- *10 Including supports for the conservation of the tidal flats in Ariake Sea (2001 to 2006) the Yellow Sea Ecoregion (2007 to 2015), and the reconstruction of aquaculture industry in environmentally friendly manner at Minami Sanriku, Tohoku (2014 to current).
- *11 MSC certification is certified by Marine Stewardship Council for sustainably and properly managed fisheries. ASC certification is certified by Aquaculture Stewardship Council for responsible fish farming to minimize environmental load on the environment and society.
- *12 Seafood that has been certified sustainable production with MSC and ASC certification and managed under CoC certification¹⁴
- *13 IUU fishing issues: Fishing that is illegal, unreported and unregulated. It is one of the international issues that threaten the effectiveness of resources management.
- *14 CoC is the acronym for Chain of Custody. Certification on securing management and traceability in processing, distribution, and marketing.

[WEB](https://news.panasonic.com/jp/topics/204140.html) References on sustainable seafood
<https://news.panasonic.com/jp/topics/204140.html>

■ Promotion of activities for conservation of biodiversity around the world through NGOs and NPOs

Continuing protecting satoyama and rivers through citizen networks

The Panasonic Group companies located in Japan, and their labor unions and retiree association conduct a variety of environmental protection activities as Panasonic ECO RELAY Japan (PERJ) in a one team.

Since its foundation in October 2010, PERJ has been working with a variety of stakeholders¹⁵ to conserve local environments through efforts such as Hirakata City Hotani Satoyama Conservation Activity; Tanba Sasayama City Unitopia Sasayama Satoyama Revitalization Activity; Kadoma City Eco Network Activity; and Osaka City Yodo River and Johoku Wand¹⁶ Conservation Activity. During these years, we have received the following awards in recognition of our contribution to nurturing the next generation to act for the environment under collaborations with local companies, universities, and citizen groups. In our work to contribute to a sustainable global environment and society, we will continue activities that lead to the conservation of biodiversity and satoyama focusing on 'forests', 'greenery areas' and 'water'.

<External awards>

- Hirakata City Environment Award (February 2018)
- Biodiversity Action Grand Prize (December 2018)



Activities at Yodo River

Unitopia Sasayama Satoyama Revitalization Activity

- Kadoma City Environment Award (February 2019)
- Osaka City Environment Award (February 2020)

- *15 Wand is terrain just like a small pond surrounded by river structures, although Wand is connected to a mainstream of the river. Wand provides stable habitats for fish and other aquatic life, and at the same time, it is breeding grounds for a variety of plants.
- *16 Collaborating with numerous stakeholders, including NPOs, citizen groups, universities, administrative bodies, local governments, research institutes, corporations, and local farmers.

[WEB](https://www.panasonic.com/jp/corporate/sustainability/citizenship/environment/perj.html) Panasonic ECO RELAY Japan (PERJ)
<https://www.panasonic.com/jp/corporate/sustainability/citizenship/environment/perj.html>

[WEB](https://unitopia-sasayama.pgu.or.jp/ecorelay/) Unitopia Sasayama Satoyama Revitalization Plan
<https://unitopia-sasayama.pgu.or.jp/ecorelay/>

[WEB](https://panasonic.co.jp/citizenship/activity/environment/) One of the Panasonic Group's corporate citizen activities (environment-related social contribution activities by Panasonic business sites and employees across the world).
<https://panasonic.co.jp/citizenship/activity/environment/>

Participation in Biodiversity Initiatives

The Panasonic Group has been participated in biodiversity initiatives and related industry organizations, as shown below. This is to accurately understand biodiversity policies in Japan and global trends concerning biodiversity, such as the Post-2020 Biodiversity Framework of the Convention on Biological Diversity, TNFD, and SBTN through study meetings. We feed these domestic and global policies back into Panasonic Group businesses and assess opportunities and risks. We also make an appeal about activities by Japanese corporations through the Convention on Biological Diversity under the COP.

<Participation>

- Participating in TNFD Forum.
- Keidanren Committee on Nature Conservation: Keidanren Initiative for Biodiversity Conservation. The Panasonic Group also participates in the initiative.
- Japan Business Initiative for Biodiversity (JBIB)
- Biodiversity Conservation Committee of the Japan Association of Industries and Environment
- Biodiversity Working Group of four Electrical and Electronic Industry Associations¹⁷

Additionally, Panasonic Holdings Corporation is participating in the Clean Ocean Material Alliance (CLOMA) to accelerate innovation in solving marine plastic waste issues.

- *17 Four industry associations: The Japan Electrical Manufacturers' Association (JEMA), Japan Electronics and Information Technology Industries Association (JEITA), Communications and Information Network Association of Japan (CIAJ), and Japan Business Machine and Information System Industries Association (JBMIA).



Keidanren Initiative for Biodiversity logo mark

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Ways of Thinking about Water Resource Conservation

It is said that available fresh water is only about 0.01% of the Earth's total water resources. We understand that the water crisis is one of the global risks, considering further increase in water consumption because of economic growth and population increases in near future.

As risks of extreme water shortages is becoming higher as one of social issues, the Panasonic Group has been working to conserve water resources both in its products and production activities, in order to fulfill its social responsibility and to reduce risks in the management. Our Environmental Policy (see [page 10](#)) sets that we make efforts to conserve water resources by using water efficiently and preventing water pollution. We are working hard to reduce water usage in our business activities and through our products and services by setting water resource conservation in Our GREEN IMPACT PLAN 2024 as one of the continuing efforts. As for risk management, we had conducted water conservation activities, aiming to complete our water risk assessment at all our production sites by fiscal 2019, and have completed 100% of the assessments.

Specifically, we evaluated the scale of water risk at all regions where our production sites are located, in order to identify and mitigate effects of water on our business activities. In the evaluation, we utilized evaluation tools such as Aqueduct supplied by the World Resources Institute (WRI) and the Water Risk Filter supplied by the Worldwide Fund for Nature (WWF), which can evaluate risks in various aspects; not only from physical risks such as water shortages, but also from the risks in water-related regulations as well as reputation risks in each region. We also made use of public databases available from respective national governments. In areas with higher water risks, we collected information through public local information as well as through hearings with relevant organizations, etc. By conducting detailed analyses and close examination of the local information and the site data including water use volumes, we, more specifically, identified the effects on our business activities. We steadily proceeded processes of the water risk assessments, and in fiscal 2018, completed water risk assessments at all of our production sites of the Panasonic Group and confirmed that none of our production sites is under water stress. At present, no water risks that could affect the Panasonic Group's business activities have been reported. Yet, we will continue to make efforts to reduce water consumption in our production activities in the future under the water risk assessment that had been implemented.

For promoting these activities, the Panasonic Group have established a structure for the promotion of environmental management, including water management (see [page 23](#)). We are now conducting environmental activities using PDCA cycle under the structure, and are

upgrading the environmental management level. In addition, we have organized an Environmental Risk Management Structure to continuously reduce environmental risks; under the structure, we (1) identify environmental risks and promote risk management in the whole Panasonic Group every fiscal year and (2) promptly respond to the risk when it arises (see [page 25](#)). Through these activities, we will continue to manage our environmental risks.

Moreover, the Panasonic Group has participated in the Water Project, a public-private partnership project aimed at boosting awareness of water conservation, which was launched under the initiative of Japan's Ministry of the Environment in 2014. Objectives of the project are to maintain a sound water cycle and promote its recovery. The project distributes water-related activities conducted by corporations, and water-related information including importance of water. The Panasonic Group will work in cooperation with the Japanese government and other companies to conserve water resources.

Water Resource Conservation through Products

By thoroughly analyzing the use of water through our products, we have developed functionalities that allow a considerable amount of water conservation by utilizing water at a maximum level through improvement of water flow control and cyclic use. We continue to develop products with low water usage.

Example of water-saving products are introduced in the following website.

[WEB https://www.panasonic.com/global/corporate/sustainability/eco/water.html](https://www.panasonic.com/global/corporate/sustainability/eco/water.html)

Initiatives for Water Resource Conservation through Production Activities

By collecting and reusing wastewater from our manufacturing processes and air conditioning systems, the Panasonic Group has been reducing the amount of makeup water used and wastewater effluent. Through these activities, we reduce environmental loads on water resources due to the intake and effluent of water in production activities.

As many regions around the world are threatened by water shortages, the Panasonic Group has been conducting production activities, balancing water resource conservation in focused regions.

The amount of water used at factories in fiscal 2024 resulted in 13.87 million m³, which is reduced by 9.2% versus the fiscal 2023. The water used at our factories per basic unit of production^{*1} got better year-on-year thanks to positive effects of the structural reform.

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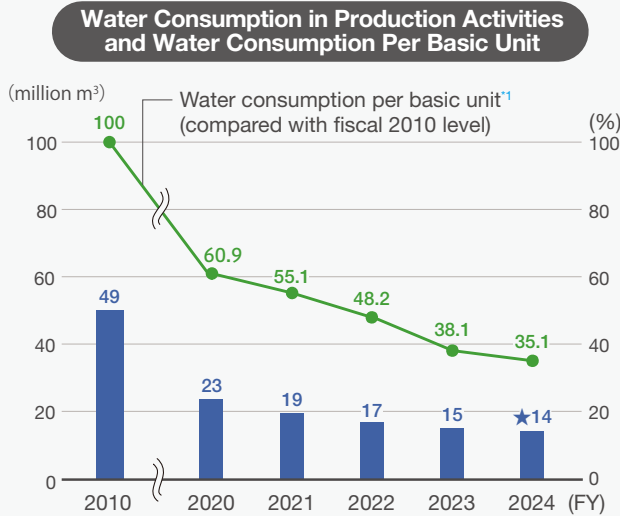
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Our use of recycled water² in fiscal 2024 was 4.73 million m³, accounting for 34.1% of the total amount of water used. The amount of discharged water in fiscal 2022, 2023 and 2024 resulted in 13.39 million m³, 11.78 million m³, 10.60 million m³, respectively.

*1 Water used at factories per basic unit of production = Water used at factories/Production volume.

*2 The calculation excludes the water circulating for a single purpose (e.g., water in a cooling tower).



Note: Then-SANYO Electric and Panasonic Liquid Crystal Display not included in fiscal 2010.

FY2024 Breakdown of Water Consumption (by region)

(10 thousand m³)

Region	Consumed	Consumption Source			Discharged		
		Municipal water/ industrial water	Groundwater	Rivers/lakes	Sewer systems	Waterways	
Japan	743	288	456	0	639	167	472
China & Northeast Asia	292	290	1	0	197	144	53
South East Asia, & Oceania	264	237	27	0	166	125	40
North America & Latin America	50	35	15	0	41	37	4
Europe & CIS	11	9	1	0	9	9	0
India, South Asia, Middle East & Africa	27	2	25	0	8	8	0
Total	★1,387	862	524	0	1,060	490	570

Panasonic Industry Co., Ltd. (52 sites), uses the highest amount of water in all operating companies in the Panasonic Group. The company managed to achieve a year-on-year decrease of 16.4% in water consumption (5.41 million m³) in fiscal 2024, thanks to their focused efforts and business restructuring. The achievement rate for reducing the amount of water used per basic unit by using recycled water in factories, etc., was 100%.

Against the backdrop of the increasing occurrence of natural disasters in recent years, such as earthquake and flood disasters, Panasonic Industry Co., Ltd. Saga site achieved a reduction of environmental risk and environmental impact, considering a possible chemical leakage from the outdoor storage site in the company premises. This was accomplished by replacing their water purification system, which used a chemical-based regeneration method for the ion-exchange resins, to a system that uses an electrical regeneration method. At the same time, the company installed a wastewater collection system that separates the wastewater generated by the water purification into concentrated wastewater and collection water. The company is now able to reduce the water consumption for the entire factory by 61.8 thousand m³ per year by reusing the collection water.

The Panasonic Group will continue our efforts to conserve water resources.



Device Solutions Business Division Saga, Panasonic Industry Co., Ltd.



Water purification system with electrical resin regenerator

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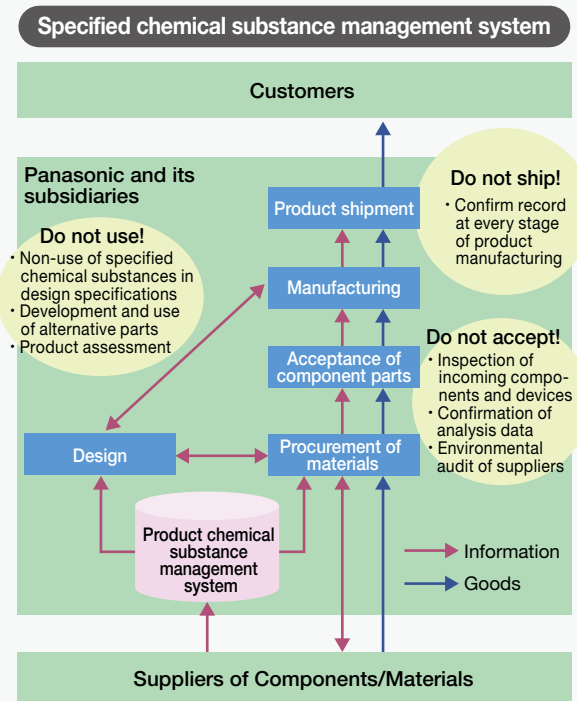
Chemical Substance Management

Approaches to Reducing the Environmental Impact of Chemical Substances

In order to prevent contents of hazardous substances prohibited under the EU RoHS Directive^{*1}, and the like in Panasonic Group's products, it is important not only to pay attention to the contents at the stage of product design, but also to ensure that specified substances are not contained in products to purchase. Therefore, the Panasonic Group has rolled out the "Do not accept! Do not use! Do not ship!" campaign throughout the each production process from designing to shipment inspection in production activities at business sites across the world since October 2005. Specifically, as for the stage of inspection for incoming components, we have established a mechanism to check and analyze whether specified chemical substances are included by introducing an analyzer.

In addition, we have supported to establish a Product Chemical Substances Management Structure, by periodically conducting environmental audits for suppliers of components/materials which may have high risks of containing specified chemical substances.

Meanwhile, as represented by the enforcement of the REACH regulation^{*2} in the European Union, the world implemented measures toward the goals agreed at the World Summit on Sustainable Development (WSSD) held in 2002, which is to produce and use all chemical substances in a manner that minimizes their impact on human health and the environment by 2020. Although the subsequent discussion was delayed as the conference could not be held due to the COVID-19 pandemic, in the fifth International Conference on Chemicals Management (ICCM5) held in Germany September 2023, a new international framework that succeeds the activities up to



2020 was discussed; concerning appropriate chemical management, a new international framework for voluntary and diverse actors to be involved was formulated. Panasonic Group has been supporting the precautionary approach proposed in the Rio Declaration at the Earth Summit in 1992, and has continued its efforts for appropriate chemical management on a global scale even after 2020 that is the final target year of the WSSD framework. Furthermore, in order to continue implementation of product manufacturing in line with our basic policy of reducing the use of chemical substances that might adversely affect human health and the environment throughout their lifecycles, we determined chemical management in our GREEN IMPACT PLAN 2024 as one of our continuing issues, and we are constantly working to reduce environmental loads of the chemicals used in our business activities and products. As for concrete activities, we have worked to comply with relevant regulations such as EU RoHS as a matter of course. In addition, we have worked to reduce adverse environmental impact originated by our group products as much as possible by (1) trying to understand hazardous substances contained in our products, (2) evaluating these substances on their environmental impact, and (3) voluntarily reducing or discontinuing their use in case of any environmental risks of the substances. We will continue to implement appropriate chemical management of such chemical substances while monitoring global environmental trends.

^{*1} Directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment The RoHS Directive currently restricts use of the following ten substances beyond the specified concentrations shown in parentheses:

- lead (0.1%), cadmium (0.01%), mercury (0.1%), hexavalent chromium (0.1%), polybrominated biphenyls and polybrominated diphenyl ethers (0.1%), four phthalates (DEHP, BBP, DBP, and DIBP) (0.1%).

However, the RoHS Directive allows exemptions from its restrictions for a limited time if substitution is technologically or scientifically impossible. Exemptions stipulate specific restrictions in details on the use, concentration limit, and time frame for each substance.

<Exemption examples>

Lead: Glass, ceramics, and high-temperature soldering used in electronic components.

Mercury: Cold-cathode tubes used in LCD backlighting and fluorescent lighting.

Note that vehicles and batteries are not subject to the restrictions under the EU RoHS Directive.

The EU End of Life Vehicles Directive details restrictions for vehicles and the EU Battery Directive (amended and promulgated as EU Battery Regulation in July 2023) details restrictions for batteries.

^{*2} Regulations on the registration, evaluation, authorization, and restriction of chemical substances.

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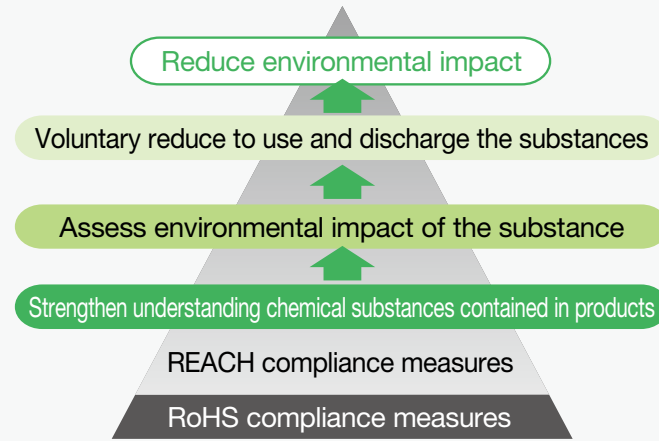
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Process to Reduce the Environmental Impact of Chemical Substances



In order to definitely implement such activities described above, we issued our Chemical Substances Management Rank Guidelines that specifies prohibited chemical substances and management substances concerning products and activities at factories. We request to take actions to the chemical substances in accordance with the guidelines, not only to Companies in the Panasonic Group, but also to our suppliers. In fiscal 2013, we added Level 3 of prohibited substances to the category of the Chemical Substances Management Rank Guidelines (For Products). We not only consider nonuse of the prohibited substances, or the substances to be prohibited under laws and regulations, but we also consider prohibiting concerned substances that may adversely affect human health and the environment in the future. Further, we are striving to comply with relevant laws and regulations, and mitigate effects of toxic substances on human health and the environment by increasing the number of globally prohibited substances (Level 1) beyond boundaries of countries subject to the applicable laws and regulations from 21 substances/groups in fiscal 2015 to 30 substances/groups in fiscal 2024.

The Chemical Substances Management Rank Guidelines (For Products) and relevant documents, which includes clear description of prohibited substances and management substances, is available in PDF file for your downloaded from the following website. (Green Procurement).

[WEB](https://holdings.panasonic/global/corporate/about/procurement/green.html) Green Procurement (Download of Chemical Substances Management Rank Guidelines (For Products)) in PDF file

<https://holdings.panasonic/global/corporate/about/procurement/green.html>

Chemical Substances Management Rank Guidelines (For Products)

Rank	Definition
Prohibit	Level 1 (1) A substance contained in products that is prohibited by existing laws and regulations; or a substance where the upper limit of concentration is specified. (2) A substance that will be prohibited in products by laws and regulations or where the upper limit of concentration will be specified within one year after the revision date of this Guidelines. Note that there is a case that a substance is specified as the Level 1 prohibited substance more than 1 year before the enforcement date, because of the enforcement dates of the law and the Rank Guidelines.
	Level 2 Substances other than those specified as Level 1 and to which either of the following criteria applies: (1) Substances to be prohibited in products after a certain period by a treaty, law, or regulation. (2) Substances that are prohibited in products by the Panasonic Group prior to the effective period specified by a treaty, law, or regulation. (3) Substances whose use is voluntarily restricted by the Panasonic Group.
	Level 3 Any substance other than those specified as a Level 1 or Level 2 Prohibited Substance that is under review for prohibition by laws, regulations, etc., and the clarification of substitution-related issues as well as the timing for prohibition will be reviewed by the Panasonic Group in light of future legislation trends.
Manage	Substances whose actual use in products needs to be understood and for which consideration needs to be given to human health, safety and hygiene, adequate treatment, etc. The intentional use of these substances is not restricted, but their use and contained concentration must be monitored.

Note: the laws, regulations and the substances subject to the above table are chemical substances specified as Class I Specified Chemical Substances under the Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc., the EU RoHS Directive, Annex XVII of the EU REACH Regulation, etc. For more details, see the chapter 6 'Specified Managed Substances' in the Chemical Substances Management Rank Guidelines (For Products).

As for the hazardous substances whose manufacturing is prohibited under the Japan's Industrial Safety and Health Act, they are managed in accordance with the Specified Managed Substances in the Chemical Substances Management Rank Guidelines (For Factories)

Chemical Substances Management Rank Guidelines (For Factories)

Rank	Definition
Prohibit	Use of the following substances should be immediately discontinued: Carcinogens for humans Ozone depleting substances Substances whose use is prohibited by Panasonic Chemical substances designated as Class I Specified Chemical Substances by the Japanese Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. Substances whose manufacture is prohibited by the Japanese Industrial Safety and Health Act Substances whose manufacture and use are prohibited by international treaties
Reduce	Substances whose use, release and transfer should be identified and reduced. Substances other than prohibited substances that might pose risks to human health and the environment.

Note: Covered legislation include: PRTR Act (chemical substances), environmental criteria under the Basic Environment Act; the Industrial Safety and Health Act; and the Stockholm Convention. For more details, see the contents on The Aim of Establishing the Chemical Substances Management Rank Guidelines (For Factories) in the Chemical Substances Management Rank Guidelines (For Factories).

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History of Panasonic Group's Initiatives to Reduce the Environmental Impact of Chemical Substances

Social trends	1989: The Montreal Protocol entered into force	1992: Earth Summit in Rio de Janeiro— Agenda 21	1996: Discontinuance of the use of specified chlorofluorocarbons by industrialized countries	2002: WSSD in Johannesburg	2004: Stockholm Convention entered into force	2006: The RoHS Directive entered into force	2007: The REACH Regulation entered into force		
Panasonic Group	1990	1995	2000	2005	2010	2015	2020		
All products		1992: Discontinued use of PVC resin in packaging materials		March 2003: Discontinued use of lead in solders globally ^{*3}	October 2005: Discontinued use of six RoHS substances globally ^{*3}	March 2009: Discontinued use of PVC in internal wiring of new products to be sold in Japan ^{*3}	March 2011: Discontinued use of PVC in internal wiring of new products globally ^{*3}	July 2018: Discontinue use of the four phthalates specified by the RoHS Directive in new products globally	July 2019: Elimination of use of PFOA globally
Individual products	1991: Released mercury-free manganese dry cells	1992: Released mercury-free alkali dry cells	1995: Discontinued use of CFC refrigerant in refrigerators globally	2002: Discontinued use of HCFC refrigerant in air conditioners (Japan)	2004: Refrigerators in Japan market became fluorocarbon-free (Japan)	2006: Released lead-free plasma display panels	2010: Released fluorocarbon-free freezers using CO ₂ refrigerant and compatible display cases	2013: Released air conditioners using new refrigerant R32 with low Global Warming Potential (GWP) (Japan)	2023: Released hot-water heater with heat pump that employs R290 natural refrigerant (on the European market)
Chemical substances used at factories		1996: Discontinued use of chlorinated organic solvents	1997: Began identification work for PRTR	1999: Launched the "33/50" reduction activity ^{*4}	2004 (Japan): Achieved Voluntary Action Plan. Reduced release and transfer amount by 75% compared to fiscal 1999 level	2010 (Global): Achieved Voluntary Action Plan. Reduced release and transfer amount of key-reduction target substances by 46% compared to fiscal 2006 level			

^{*3} Excluding applications where the quality such as safety cannot be ensured, or applications where the material is designated by laws and regulations.

^{*4} A reduction activity that promotes cutbacks in the use, release, and transfer of chemical substances by 33% in three years and by 50% in six years, compared to the fiscal 1999 level.

Management of Chemical Substances in Products

To minimize the environmental impact of chemical substances contained in products, we endeavor to identify chemical substances used in the components and materials of our products. In addition, for substances that are prohibited in products in major developed countries because of laws and regulations such as the European RoHS Directive, we manage the substances not to be used and/or contained in our products by designating them as prohibited substances except the substance for specific usage which is unavoidable to use its substitution. We will also conduct environmental impact assessments for the managed substances contained in our products. As for a substance whose impact on human health and/or the environment cannot be ignored, we plan to reduce or prohibit use of the substance.

■ Continuously updating information concerning chemical substance contents

The electrical and electric products The Panasonic Group manufactures and sells consist of various raw materials and components supplied through a long supply chain from material manufacturers to many component manufacturers.

To contribute to the achievement of the global targets set at the WSSD and the new framework adopted by ICCM5, it is important for us to disclose and communicate information on the chemical substances used in our products across the supply chain, for which we must promote cross-industrial initiatives to establish and disseminate an effective system.

The Panasonic Group is a member of the Joint Article Management Promotion consortium (JAMP). Approximately 500 major companies from various industries, such as chemical, component, and equipment manufacturers are

also members of JAMP. We are proactively formulating, utilizing, and disseminating chemical substance management standards and systems through this organization.

The Panasonic Group has started up a product chemical substance management system in fiscal 2005. From July, 2009, our 10,000 suppliers of materials and components provided us the data on chemical substances contained in their products, using JAMP's data transmission formats (JAMP_AIS and JAP_MSDSplus).

Meanwhile, in Japan alone, the workload of upstream suppliers increased, as a number of hazardous substance inspections were carried out throughout the supply chain using own company format. Having recognized the issues obtained from the inspections, 'chemSHERPA' (a new scheme for information communication for chemical substances in products) was proposed in 2015. Because the format adopted for chemSHERPA complies with IEC62474, the international standard on material declaration (a declaration of specific information about composition of the materials and chemical substances in the product) for the electrical and electronic machinery industry and their products, Panasonic Group agreed to use chemSHERPA format; and in January 2018, started full-scale use of chemSHERPA as a data gathering format. With the supply chain expanding to a global scale, it is particularly important for overseas suppliers to deepen their understanding on the handling of hazardous chemical substances. Therefore, our Group carried out education programs for persons in charge of chemical substance management and suppliers at more than 100 of our business sites in ten countries including China and other Asian countries. At the same time, the Panasonic Group completed conversion from JAMP format to chemSHERPA by June 2018.

[chemSHERPA website: https://chemsherpa.net/english](https://chemsherpa.net/english)

(The JAMP website was merged into chemSHERPA on March 15, 2019)

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While the Japanese automotive industry has been using the JAMA/JAPIA sheet^{*5} to share information on chemicals used in products in the supply chain, IMDS^{*6} is actually the de facto standard material data system used by the international automotive industry. With the backdrop of the Japanese automotive industry now shifting to IMDS from JAMA/JAPIA sheets, in October 2020 the Panasonic Group undertook a full data migration to IMDS for use in our automotive business. We held seminars to more than 200 suppliers and completed a successful data migration. This means that the Panasonic Group can now obtain data for the materials in the components received from our suppliers through IMDS into our management system for the chemical substances in our products, and, at the same time, we can deliver product chemical data to our customers. The system thus makes for easier material data communications throughout the supply chain.

Companies that procure electronic components need to fully understand the information on the substances contained in the components at the point of selection or usage in order to comply with the EU RoHS Directives and REACH regulations. Particularly, as the REACH Substances of Very High Concern (SVHC) List is updated every six months, those companies expect their suppliers to speedily provide information on the latest substance to the Panasonic Group. In order for the companies adopting our group's electric components to speedily and effectively understand the information on chemical substance contents, the Panasonic Group has published a table of RoHS and REACH compliance status on our website since November 2012. The table covers our RoHS Directive compliance information and the substances designated in the RoHS/REACH Confirmation Report for all our major generic electronic components.

^{*5} The standard material data format in the Japan's automotive industry (standardized by the Japan Automobile Manufacturers Association and the Japan Auto Parts Industries Association).

^{*6} International Material Data System: Material data system for automotive industry that is globally used.

WEB RoHS / REACH Confirmation Report for major generic electronic components

<https://industrial.panasonic.com/ww/downloads/rohs-reach>

For products covered by the Act on the Promotion of Effective Utilization of Resources of Japan, the Panasonic Group does not manufacture, import, or sell products that contain specified chemical substances which exceeds the limited value in non-exempt parts. For more details, see Information on the Content of Specified Chemical Substances below.

WEB Information on the Information on the Content of Specified Chemical Substances (Japanese)

<https://holdings.panasonic.jp/corporate/sustainability/environment/chemical/jmoss.html>

In June 2015, the Act on Preventing Environmental Pollution of Mercury was enacted to implement measures agreed in the Minamata Convention on Mercury. The act requires manufacturers of products containing mercury to provide information such as labelling as manufacturers responsibility, so that such products are appropriately sorted and discharged when being disposed of. In order to communicate information concerning the mercury used in our products to customers, the Panasonic Group opened the webpage to provide our information based on the Act on the Preventing Environmental Pollution of Mercury, in May 2017.

PDF PDF file of the Act on Preventing Environmental Pollution of Mercury

https://members.wto.org/crnattachments/2015/TBT/JPN/15_2560_00_e.pdf#search=%27Act+on+Preventing+Environmental+Pollution+of+Mercury%27

WEB Information Based on the Act on Preventing Environmental Pollution of Mercury (Japanese)

<https://holdings.panasonic.jp/corporate/sustainability/environment/chemical/jmoss/mercury.html>

■ Assessing the Impact of Chemical Substances

Scientifically identifying the impact on human health and the environment of products containing chemical substances is vital to the development of products with low environmental impact. We are engaging in activities designed to assess the

levels to which customers are exposed to substances of very high concern (SVHC), as well as safety during product usage. In 2011, we have assessed effects of ceramic fibers used in certain models of commercial microwave ovens. As part of our efforts to comply with the EU REACH regulation which requires preparing information for the safe use of products containing a certain amount of SVHC, we have created and publicized the safety assessment document. The exposure was considered to be nominal with little concern for any effects on human health. Furthermore, usage of ceramic fibers in our products was discontinued in December 2010.

PDF Product Safety Assessment Report

https://holdings.panasonic/global/corporate/sustainability/pdf/RCF_Professional_microwave_oven.pdf

Other than described above, we continue to conduct a Product Safety Assessment as a part of our responses to the U.S. State of California's Proposition 65 that aims to protect the state's citizens from chemical substances. Specifically, we conducted an exposure assessment experiment on diisononyl phthalate (DINP) in 2016, and on a brominated flame retardant (TBBPA: Tetrabromobisphenol A) in 2017, then created an exposure assessment tool based on the experiment results. As a result of the assessment, we confirmed that our products do not adversely affect users of our group products, i.e., customers. We are utilizing the exposure assessment tool to confirm product safety and to respond to relevant regulations.

■ Reduction in Use and Discharge of Chemical Substances

Fluorocarbons (CFC) used as refrigerants, insulating materials, and the like for freezers and air conditioners, have properties which are known to cause ozone layer depletion and global warming. Therefore, the Panasonic Group had devoted to developing the technology to use CO₂ as a refrigerant which has extremely low effects on ozone depletion and global warming, and has sold a home water heater using the low CO₂ refrigerant since 2001.

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Although the low CO₂ refrigerant is suitable for heating to maintain a certain degree of temperature, it was difficult to be used in refrigerators and freezers, especially in large commercial equipment due to insufficient cooling efficiency and size. However, with support from the New Energy and Industrial Technology Development Organization (NEDO), the Panasonic Group developed a refrigeration system using CO₂ refrigerant, and has delivered CFC-free freezers and refrigeration showcases to supermarkets and convenience stores with the CO₂ refrigerant in Japan since 2010. We have also commercialized high-power freezers designed for distribution warehouses and food factories, and have been expanding their market opportunities with wider scope of their usability from domestic to international.

For wall-mounted home air-conditioners (AC), we are promoting changing over from non-inverter types of AC, not only to more eco-friendly inverter types of AC with high energy-efficiency, but also to the AC with new refrigerant R32 whose Global Warming Potential (GWP) is low. In fiscal 2020, we introduced into Hong Kong's window air-conditioner market new models with the industry's first inverter system



OCU-CR2001MVF, a fluorocarbon-free freezer using CO₂ refrigerant



FPW-EV085, a display case compatible with a fluorocarbon-free freezer



Window air-conditioner unit with the new R32 refrigerant, CWHZ180YA



An air-to-water heat pump that utilizes R290 natural refrigerant for residential use

using the new R32 refrigerant, which has contributed to reduce environmental loads.

In addition, as measures against ozone depletion caused by HCFCs, a refrigerant called R410 that does not deplete the ozone layer was used in room air conditioners; however, this substance has an issue of its very high very high Global Warming Potential (GWP). Therefore, the Panasonic Group developed a model that uses a new refrigerant R32, which has a lower GWP and introduced it launched sales of the model in 2013. Furthermore, PT. The Panasonic Manufacturing Indonesia, which owns the factory for manufacturing room air conditioners in Indonesia, redesigned its production facility that used an ozone-depleting HCFC refrigerant R22 to one using R32 in fiscal 2015, and started supplying new R32-based air conditioners. Thereby, we contributed to the Indonesian government's initiative to eliminate the use of HCFCs.

In May 2023, we started manufacturing air-to-water heat pumps that utilizes R290 natural refrigerant (propane) for residential use, which has extremely low Global Warming Potential (GWP), as the first Japanes manufacture. In this fiscal year, we plan to introduce new products, and lineup expansion of our product is underway.

■ Restriction on Use of PVC Resin

Polyvinyl chloride (PVC) is a material of concerns to the generation of hazardous substances from inappropriate disposal, as well as the harmful effects of certain additive agents (phthalates) used to render PVC more pliable. In light of the significant potential for inappropriate disposal of the PVC resin used in the internal wiring of products, due mainly to difficulties associated with the sorting of this resin from used products, we have switched our new products launched from April 2011 to non-PVC.

[PDF](#) [List of Our PVC-free Products](#)

https://holdings.panasonic.jp/corporate/sustainability/pdf/eco_pvclist2023.pdf

■ Restriction on Use of Phthalates

Phthalates are often used in PVC products, and the use of four phthalates^{*7} was restricted under the EU RoHS Directive from July 22, 2019. Panasonic Group classified these substances as Level 1 Prohibited Substances in our Chemical Substances Management Rank Guidelines Ver. 11 (for products) issued in July 2018, and delivery of materials and components contain the phthalates was prohibited from July 22, 2018. We have classified other phthalates as Level 3 Prohibited Substances, and are promoting their substitution. Since phthalates have a migration characteristic (where a substance from another article migrates through contact), materials may be contaminated by migration from production facilities as well as process equipment containing the four phthalates, which are specified as Level 1 Prohibited Substances. Accordingly, we also discussed introducing preventive measures against contamination through contact. To build a structure for incoming inspection for phthalate, we amended the standard for incoming inspection and determined to conduct incoming inspections on supplied components with a high risk of containing phthalates, such as PVCs, elastomers and glues. We have already selected and assessed an analyzer for phthalates to use for these inspections, and installed the analyzer at our business division. The phthalates contained in Panasonic Group's products exported to Europe used to be as high as 10t. However, total elimination of the phthalates has been completed as of March 31, 2019.

*7 Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP), and Diisobutyl phthalate (DIBP).

Activities to Reduce Negative Environmental Impact at Factories

The Panasonic Group has been working to minimize environmental impact by identifying the hazardous substances used in our products, assessing the impact of such use, and voluntarily discontinuing the use or reducing the release of such substances. Since 1999, we have been

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conducting the 33/50 Reduction Activity to materialize reduction by 33% in three years and by 50% in six years. In Japan, we started promoting reduction of amounts to use, release, and transfer specified chemical substances at our factories in fiscal 2000. Against the target in our voluntary action plan, a reduction by 50% from the fiscal 1999 level, we achieved a 75% reduction in the chemical substance use and a 62% reduction in the release and transfer in fiscal 2005. Since then, we have been continuing the activity, focusing on substances with particularly large amounts of release and transfer, setting a voluntary action target of reduction by 30% compared to the fiscal 2006 level. As a result, we achieved a 46% reduction in the amounts of release and transfer of specified key reduction-target substances across all factories worldwide in fiscal 2011.

Reflecting international trends in chemical substance management, our reduction measures have focused increasingly on particularly hazardous substances from fiscal 2011. Our Chemical Substances Management Rank Guidelines (for Factories) was established in 1999 as a guideline to help manage the above chemical substance reduction activities. In Version 1, the guidelines specified a list of chemical substances to be managed, mainly focusing on carcinogenic substances. The guidelines were later updated to Version 2 in 2000 to include rules concerning the Japan PRTR Law. Version 3, introduced in 2004, additionally covered a list of substances specified by chemical substances management legislation in Japan. The chemical substances covered by Version 4 and later from 2009 are those specified in legislation on human health and environmental impact in Japan, the U.S., and Europe, as well as those specified under international treaties.

Under our Chemical Substances Management Rank Guidelines (For Factories), we have focused our management on select chemical substances that are hazardous to human health and the environment. Further, the Panasonic Group created a unique indicator, the Human Environment Impact,^{*8}

which is used globally in all our factories. Conventionally the chemical substances were managed by “quantity,” such as usage amount or emissions/release. However, such quantity-based management has a problem in that some highly hazardous substances do not become subject to reduction or management if the usage amount was small, and therefore would fall out of the scope of impact assessments. In addition, the toxicity criteria varied according to substance types and regional legislation, which made standardized management across the Group difficult. To address this issue, we worked together with experts from both within and outside the Group, reclassified chemical substances based on an overall assessment of their hazardousness, and specified a hazardousness factor for each classification. Specifically, we set a hazard classification to each substance by utilizing carcinogen risk assessments issued by international organizations, together with publicly available hazard information and lists of ozone depleting substances. For substances that have multiple hazard information items, the item ranked with the highest hazard risk is used for classification. We utilize this Panasonic Group internal indicator as the Human Environmental Impact indicator to promote efforts to ensure reduction of highly hazardous substances with greater environmental impacts, such as carcinogens and ozone depleting substances, according to the risk level. The Panasonic Group Chemical Substances Management Rank Guidelines is also available on the website on Panasonic Group Green Procurement activities to promote collaboration with our suppliers, encouraging them to offer materials that do not contain hazardous substances.

[WEB Green Procurement \(PDF file Download of Chemical Substances Management Rank Guidelines \(For Factories\)\)](https://holdings.panasonic/global/corporate/about/procurement/green.html)
<https://holdings.panasonic/global/corporate/about/procurement/green.html>

^{*8} Human Environment Impact = Hazardousness factor x Release and transfer amount

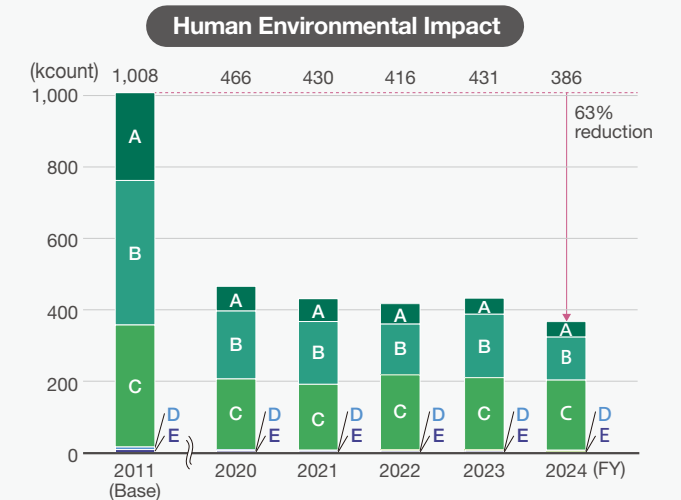
Further, we maintain our compliance in different countries by obtaining the latest information about the various chemical

regulations enforced in each country through our regional headquarters and local industrial organizations. As for the VOC regulations amended in China in 2020, we successfully completed compliance confirmation and replacement with compliant components in each business division thanks to cooperation from local suppliers.

Classification of Hazards

Classification	Hazards ^{*9}	Hazardousness factor
A	Carcinogenicity/Ozone layer depletion	x 10,000
B	Serious or direct impact	x 1,000
C	Medium impact	x 100
D	Small or indirect impact	x 10
E	Minor impact or not assessed	x 1

^{*9} In addition to carcinogenicity, hazards to human health include genetic mutation, reproductive toxicity, and acute toxicity. In addition to ozone depleting substances, hazards to/substances with impact on the environment include ecological toxicity, substances that impact global warming, and substances that generate photochemical oxidants.



Note: Overseas sites of former SANYO Electric not included in fiscal 2011.

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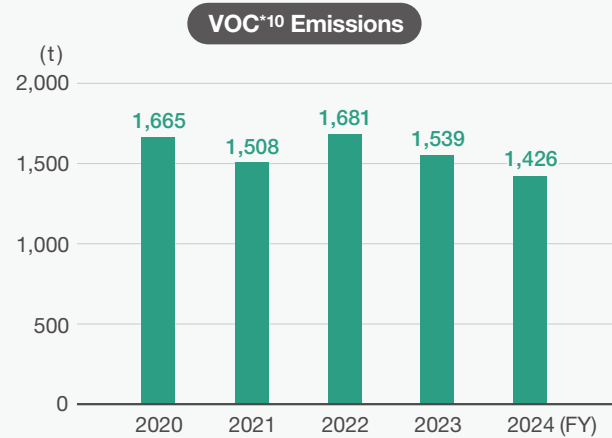
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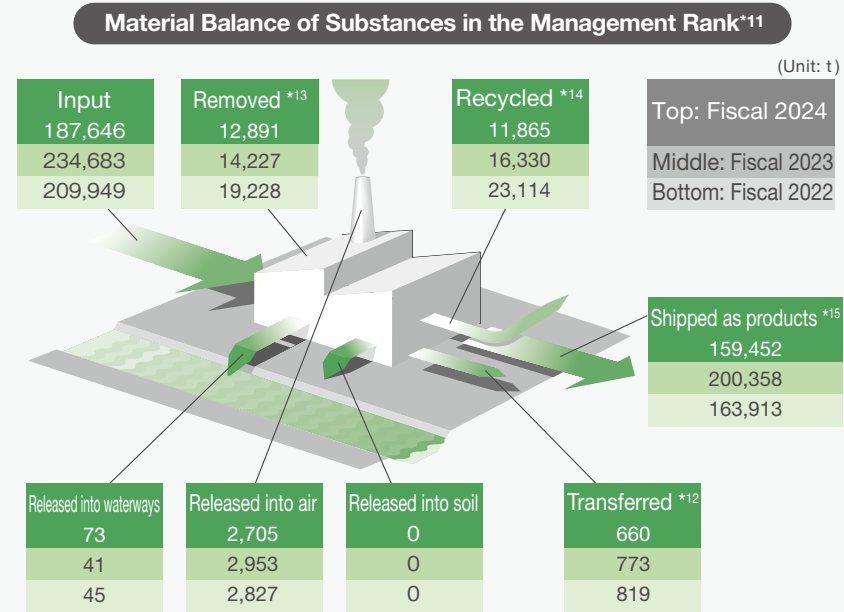
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In fiscal 2024, we were able to reduce Human Environmental Impact by 63% compared with fiscal 2011 by the following methods: improving the yields, promoting recycling, optimizing the spraying control in the coating process and reducing the number of coating failures, changing the resin materials and improving its injection volume, reducing the amount of cleaning solvent through making the cleaning automatic, and improvement in the process by introducing components/materials containing less hazardous substances, and the like. We will continue to implement our activities to minimize emissions of the substances with high environmental loads from our production activities.



*10 Emissions of Volatile Organic Compounds (VOC) into the air caused by use. The calculation covers 100 major VOC substances that Panasonic Group selected from those listed in the Air Pollution Control Act.



*11 Based on the Chemical Substances Management Rank Guidelines (for factories). Includes all the substances specified in the Pollutant Release and Transfer Register Act.

*12 Includes substances transferred as waste, as well as those discharged into the sewage system. Recycled amount which is free of charge or accompanies treatment cost under the Waste Management Law is included in "Recycled." (Different from the transferred amount reported under the PRTR Law.)

*13 The amount of substances converted into other substances through neutralization, decomposition, or other chemical treatment.

*14 The amount of substances recycled with revenue, as well as those recycled free of charge or with any payment.

*15 The amount of substances that have been changed to other substances as a result of chemical reactions, and/or those that are contained in or accompanied with products and shipped out of factories.



*16 Hussmann Parent Inc. and its consolidated subsidiaries not included.

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Collaboration with Suppliers and Transportation Partners

As the Panasonic Group backed by a number of suppliers, we must consider the environmental impacts of our entire supply chain, and not just of our own operations. Through our coordination efforts with suppliers and transportation partners, who form an integral part of our business operations, the Panasonic Group strives to minimize our environmental impact across the entire supply chain, focusing on the reduction of CO₂ emissions, resource recycling, chemical substance management, and biodiversity conservation.

Activities for Green Procurement

Activities for Green Procurement since the publication of the “Green Procurement Standards” in 1999, the Panasonic Group has been promoting the manufacture of eco-conscious products in partnership with our suppliers. In the “Green Procurement Standards”, we set up groups of suppliers who support the Panasonic Group’s Environmental Policy in supplying products and goods in order to materialize the targets in supplier collaboration with our Group. In addition to cooperation in ‘reducing environmental loads in supplier’s business operation areas’ and ‘sharing achievements through collaboration with the Panasonic Group’, we are asking our suppliers to ‘seek the cooperation of upstream business partners’ to expand the scope of activities of reducing environmental impact throughout the entire supply chain. In September 2019, we revised “the Green Procurement Standards” to deepen and widen their influence throughout the entire supply chain—beyond our Group and across society—following the Panasonic Group’s environmental action plan.

We also published “Panasonic GREEN IMPACT” in fiscal 2022, regarding information about our contribution to CO₂ emissions reduction from Panasonic Group’s business activities and from society in general, indicating our determination by setting our own targets to achieve both ‘a better life’ and ‘a sustainable global environment’ at the same time. We will expand this effort throughout the supply chain. In fiscal 2024, we submitted a letter to all of approximately 13,000 suppliers who have business with Panasonic Group across the globe to deepen understanding of our activities of ‘Panasonic GREEN IMPACT’.

In response to more stringent and expanded regulations such as EU RoHS Directive, the Panasonic Group has been engaging in continual environmental quality assurance audits of our suppliers since 2005 to improve the management level throughout the entire supply chain. In fiscal 2024, we conducted the audits at some 1,000 suppliers and have supported their efforts to upgrade their management levels for chemical substances in products.

[WEB Green Procurement Standards](https://www.panasonic.com/global/corporate/management/procurement/green.html)
<https://www.panasonic.com/global/corporate/management/procurement/green.html>

■ Estimation and Reduction of Environmental Impacts in Business Activities by Suppliers

In order to assess greenhouse gas (GHG) emissions across the entire supply chain (scope 3¹), the Panasonic Group made original calculations based on the Greenhouse Gas Protocol, the international accounting standard for GHG emissions. Since fiscal 2012, the Panasonic Group has estimated its overall GHG emissions in the upstream range by multiplying the volume of materials purchased with the resource-specific GHG emissions per basic unit based on the Input-Output Table published by the Japanese government. The estimation results based on fiscal 2024 data is 21.96 Mt, roughly 14 times the GHG emissions of our Panasonic Group’s own production activities.

^{*1} Other indirect emissions, excluding Scope 1 (direct emissions from facilities owned and controlled by the Panasonic Group) and Scope 2 (emissions from production of energy consumed at facilities owned and controlled by the Panasonic Group).

To reduce CO₂ emissions with our suppliers, Panasonic Group is actively procuring low-carbon materials for aluminum ingots, and irons/steels, such as aluminum ingots refined using hydroelectricity, and recycled irons. In fiscal 2024, we managed to reduce approximately 58,000 tons of CO₂ emissions.

Scheme to Procure and Supply Aluminum Ingots Produced using Hydroelectricity.

Our group have managed to stably procure and supply raw materials of aluminum products to be used for air conditioners, showcases, etc., utilizing a centralized purchasing system. From fiscal 2022, we have been procuring aluminum ingots refined using hydroelectricity through the centralized purchasing system and supplying it to aluminum processing manufacturers, which is an example for achieving CO₂ emissions reduction, while maintaining a stable procurement price. This is the first initiative in Japan’s electrical manufacturing industry.

More specifically, we import aluminum produced at overseas aluminum refineries using hydroelectricity, to Japan. Then, we supply the imported aluminum to multiple aluminum rolling/extrusion manufacturers in Japan to process them to aluminum plates, etc. Finally, our group procures the processed aluminum products from the manufactures to utilize them in our products.

CO₂ emissions of the aluminum ingots refined using hydroelectricity is reduced to one third of the CO₂ emissions compared to those refined using conventional thermal power. Various aluminum products processed from the aluminum ingots become one of our various products in different forms such as air conditioners fin materials, aluminum frames for housing facilities, and lithium-ion battery casings. Since fiscal 2022, we have maintained a consistent supply of more than 8,000 tons of aluminum refined using hydroelectricity in Japan, thereby reduction of CO₂ emissions by 57,000 tons per year has been achieved. Procurement of such aluminum ingots under our metal

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supply scheme utilizing a group-wide centralized purchasing system also stabilizes the price of aluminum ingots in the market.

■ Sharing Achievements through Collaboration with the Panasonic Group

Since fiscal 2010, Panasonic Group has been working together with our suppliers in ECO-VC Activity^{*2} for procurement, aiming to reduce GHG emissions and achieve Recycling-oriented Manufacturing while also streamlining costs. This activity was expanded to China and other regions in Asia where full-fledged operation started in fiscal 2013, and further extended to a global scale in fiscal 2015. On its 15th anniversary in 2024, we renamed the ECO-VC Activity as 'ECOVC' to reposition it as an activity for value creation with our suppliers.

We have stored case examples of ECOVC in a database for broader and effective use throughout the Panasonic Group. At the same time, as for outstanding activities, we provide awards in occasions such as 'ECOVC awards and information exchange meeting'. Furthermore, the Panasonic Group formulated "an Environment Vision 2050" in 2017 to achieve 'a better life' and 'a sustainable global environment' compatibly, aiming for societies where residents use clean energy and live a more comfortable lifestyle. Under the vision, through the development of products, technologies, and solutions relevant to energy creation, storage, saving, and management, the Panasonic Group has worked towards creation and more efficient utilization of energy which exceeds the amount of energy used.

We added renewable energy to conventional evaluation items such as energy conservation (CO₂ emission reduction), cost reduction, resources conservation and use of recycled materials in fiscal 2019. In addition, since fiscal 2024, we have promoted decarbonization and reduction of CO₂ emissions in conjunction with the Panasonic Green Impact, collaborating with our suppliers. We will continue this ECOVC with our suppliers aiming to achieve CO₂ emissions reduction of 110 million tons from OWN IMPACT by 2050, as described in the "Panasonic GREEN IMPACT".

^{*2} ECO-VC Activity: Value Creation Activities

Environmental Achievements Made through Proposals

Items	FY2020	FY2021	FY2022	FY2023	FY2024
Number of proposals	772	430	332	264	236
CO ₂ reductions derived from proposals	280 kt	110 kt	50 kt	80 kt	927 kt
Use of recycled resources derived from proposals	100 t	5 t	1,500 t	600 t	37,000 t
Reduction in resources used derived from proposals	19.9 kt	323 kt	255 kt	40 kt	19 kt

Collaboration with Environmental NGOs

Following the announcement of the "Panasonic GREEN IMPACT", we further enhanced collaborative work with environmental NGOs overseas and deepened our CSR efforts in the supply chain.

Particularly in China, where the number of suppliers of our group is large and there are strong demands in the society for suppliers to properly respond to environmental matters, we are continually working together with the suppliers to reduce environmental loads by from requesting corrective actions as items require improvement for the issues found in the audit, and confirming whether the items are improved, aiming at further pursuing responsible procurement activities. Through confirming these CSR and environment items on sites, we will continue to comply with new regulations, social norms, and corporate ethics, and conduct procurement activities that fulfill our social responsibilities such as for human rights, labor, safety and health, and global environmental conservation.

Main activities to date

2016	Started collaboration with a Chinese NGO. Held Panasonic Group briefings on our CSR Procurement Policy and China's environmental regulations for approximately 400 suppliers in Guangzhou, Dalian, and Shanghai, in the same year.
2018	Conducted on-site environmental audits that focused on suppliers responsiveness to environmental issues, together with CSR audits for approximately 20 suppliers per year.
2020	Continually implemented on-site and online audits for more than 20 suppliers per year.
2023	Reinforced the on-site audits at suppliers sites through the Group-wide Supply Chain Compliance Project.

In addition, we are continually improving suppliers CSR and environmental issues, collaborating with an environmental NGO in China, the Institute of Public & Environmental Affairs (IPE), through periodically sharing information on the latest laws and regulations in working group meetings, as well as requesting the suppliers with records of non-compliance for improvement every month.

In the Suppliers Green Supply Chain Evaluation ranking (CITI^{*3} and CATI^{*4}) that has been published by IPE since fiscal 2015, the Panasonic Group has consistently listed in the top rank each year. Panasonic has been ranked as the second best in the CITI and as the top in the CATI for the household appliances industry (total 37 brands) in fiscal 2024.

^{*3} CITI : The Green Supply Chain Corporate Information Transparency Index

^{*4} CATI : The Corporate Climate Action Transparency Index

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	FY2022	FY2023	FY2024
Energy	4.9 TWh	4.7 TWh	4.5 TWh
Purchased electricity	3.35 TWh	3.23 TWh	3.08 TWh
including renewable energy	0.24 TWh	0.47 TWh	0.72 TWh
Installation of renewable energy facilities in our own sites	0.04TWh	0.06 TWh	0.07 TWh
Town gas	70 million m ³	71 million m ³	68 million m ³
LNG	9.9 kt	8.8 kt	9.9 kt
LPG	6.4 kt	5.6 kt	4.5 kt
Heavy oil	7.7 MI	6.9 MI	7.0 MI
Light Oil	2.4 MI	2.0 MI	1.9 MI
Kerosene	1.9 MI	1.8 MI	1.6 MI
Volatile	0.1 MI	0.1 MI	0.1 MI
Steam	486 TJ	434 TJ	373 TJ
Hot Water	53 TJ	49 TJ	37 TJ

CO₂ Emission in Business Activities

*See Page 44

	FY2022	FY2023	FY2024
CO ₂ Emission in Business Activities	1.95 million ton	1.63 million ton	1.37 million ton
Japan	0.78 million ton	0.69 million ton	0.60 million ton
China and North East Asia	0.46 million ton	0.30 million ton	0.19 million ton
Southeast Asia and Pacific	0.44 million ton	0.38 million ton	0.33 million ton
North America and Latin America	0.21 million ton	0.20 million ton	0.19 million ton
India, South Asia, Middle East and Africa	0.005 million ton	0.04 million ton	0.04 million ton
Europe and CIS	0.02 million ton	0.01 million ton	0.01 million ton

Breakdown of Total GHG Emissions (CO₂-equivalent) in Business Activities

*See Page 44

	FY2022	FY2023	FY2024
Scope 1			
CO ₂ from energy sources	232 kt	224 kt	216 kt
CO ₂ from non-energy	106 kt	183 kt	101 kt
CO ₂	1 kt	1 kt	1 kt
HFC	101 kt	180 kt	97 kt
SF ₆	3 kt	2 kt	2 kt
NF ₃ and others	2 kt	1 kt	1 kt
Scope 2 Energy sources	1,723 kt	1,433 kt	1,207 kt
Carbon offset by credit	-12 kt	-26 kt	-57 kt
Total	2,048 kt	1,812 kt	1,465 kt

GHGs (by Scope)

*See Page 37

	FY2022	FY2023	FY2024
Scope 1	338 kt	406 kt	316 kt
Scope 2	1,723 kt	1,433 kt	1,207 kt
Scope 3	98,050 kt	127,371 kt	124,995 kt
1. Purchased goods and services	14,114 kt	21,543 kt	21,954 kt
2. Capital goods	694 kt	880 kt	1,546 kt
3. Fuel- and energy-related activities	229 kt	212 kt	243 kt
4. Upstream transportation and distribution	953 kt	887 kt	741 kt
5. Waste generated in operations	2 kt	0.1 kt	1 kt
6. Business travel	16 kt	32 kt	31 kt
7. Employee commuting	20 kt	111 kt	107 kt
8. Upstream leased assets	19 kt	—	—
9. Downstream transportation and distribution	18 kt	61 kt	146 kt
10. Processing of sold products	—	153 kt	234 kt
11. Use of sold products	81,493 kt	95,029 kt	91,027 kt
12. End-of-life treatment of sold products	496 kt	7,537 kt	7,860 kt
13. Downstream leased assets	—	—	—
14. Franchises	—	—	—
15. Investments	—	928 kt	1,108 kt
total	100,110 kt	129,209 kt	126,518 kt

GHG emissions reduction targets (SBT 1.5°C accreditation) Progress rate

*See Page 28

	FY2022	FY2023	FY2024
Emissions from Panasonic Group business activities (Scope 1 and 2)	— ¹	23 %	38 %
Emissions from use of Panasonic Group products (Scope 3)	— ¹	— ²	— ²

¹ Because the 1.5°C target has not yet been approved

² Progress rate not calculated due to increase in emissions because of expansion of products subject to calculation

RE100 Progress rate

*See Page 42

	FY2022	FY2023	FY2024
RE100 Progress rate	6.7 %	15.6 %	24.3 %

Logistics

*See Page 36 and <https://holdings.panasonic/global/corporate/sustainability/environment/logistics.html>

	FY2022	FY2023	FY2024
Energy	1.75 TWh	1.50 TWh	1.32 TWh
Biodiesel fuel	4.98 kl	9.89 kl	1.27 kl
CO ₂ Emission: global	953 kt	887 kt	741 kt
International transportation	313 kt	246 kt	215 kt
intra-region outside Japan	524 kt	518 kt	411 kt
Japan	116 kt	123 kt	115 kt
Transportation Amount by Transportation Method (Japan)	990 million tons-kilometers	850 million tons-kilometers	770 million tons-kilometers
Air	0.2 million tons-kilometers	0.3 million tons-kilometers	0.2 million tons-kilometers
Truck	924 million tons-kilometers	793 million tons-kilometers	713 million tons-kilometers
Ship	59 million tons-kilometers	57 million tons-kilometers	51 million tons-kilometers
Railroad	6 million tons-kilometers	6 million tons-kilometers	5 million tons-kilometers

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	FY2022	FY2023	FY2024
Recycled resin	14.7 kt	12.4 kt	17.2 kt
Recycled iron	93 kt	87 kt	83 kt
Total wastes including revenue-generating waste	314 kt	282 kt	258 kt
Landfill	2.9 kt	2.3 kt	1.5 kt
Factory waste recycling ratio	99.0 %	99.1 %	99.3 %

Recycling

*See Page 36

	FY2022	FY2023	FY2024
Collected products	167 kt	162 kt	151 kt
Recycled products	124 kt	123 kt	113 kt
Metals	90 kt	89 kt	83 kt
Glass	2 kt	2 kt	1 kt
Other	32 kt	32 kt	28 kt
Generated waste	43 kt	39 kt	37 kt

Water

*See Page 61

	FY2022	FY2023	FY2024
Water Consumed	17.24 million m ³	15.27 million m ³	13.87 million m ³
Municipal water/industrial water	11.22 million m ³	9.60 million m ³	8.62 million m ³
Groundwater	6.02 million m ³	5.67 million m ³	5.24 million m ³
Rivers/lakes	0 million m ³	0 million m ³	0 million m ³
recycled water	2.54 million m ³	1.55 million m ³	4.73 million m ³
Water discharged	13.39 million m ³	11.78 million m ³	10.60 million m ³
Sewer systems	5.76 million m ³	5.39 million m ³	4.90 million m ³
Waterways	7.63 million m ³	6.39 million m ³	5.70 million m ³

Chemical substances

*See Page 67-68

	FY2022	FY2023	FY2024
Input	209,949 t	234,683 t	187,646 t
Release	2,872 t	2,994 t	2,778 t
Released into waterways	45 t	41 t	73 t
Released into air	2,827 t	2,953 t	2,705 t
including VOC emissions	1,681 t	1,539 t	1,426 t
Released into soil	0 t	0 t	0 t
Transfer	819 t	773 t	660 t
Recycled	23,114 t	16,330 t	11,865 t
Shipped as products	163,913 t	200,358 t	159,452 t
Removed	19,228 t	14,227 t	12,891 t
Human Environmental Impact	416 kcount	431 kcount	386 kcount

Environmental Accounting

*See Page 38

	FY2022	FY2023	FY2024
Environmental conservation in factories			
Investments	2,006 million yen	6,590 million yen	3,791 million yen
Expenses	58 million yen	155 million yen	128 million yen
Economic benefit	889 million yen	1,655 million yen	907 million yen
Environmental Conservation Benefits (in physical terms)			
CO ₂ emissions from production activities	165 kt	320 kt	260 kt
Human Environmental Impact	14 kcount	▲15 kcount	45 kcount
Landfill of waste	0.5 kt	0.6 kt	0.8 kt
Water consumption	1.95 million m ³	1.97 million m ³	1.47 million m ³
Economic Effects for Customers (Electricity cost reduction from product usage)			
Reduced amount of electricity	32.8 TWh	30.9 TWh	46.7 TWh
Reduced electricity costs	596.2 billion yen	783.5 billion yen	1256.7 billion yen

Number of the ISO 14001 Certification

*See Page 24

	FY2022	FY2023	FY2024
Number of certifications obtained	130	149	123
Manufacturing	22	128	21
Non-manufacturing	152	21	144

Case of Violations of Laws and Ordinances

*Global (Japan) *See Page 25

	FY2022	FY2023	FY2024
Environmental pollution	1 (0)	3 (0)	4 (0)
Air	1 (0)	2 (0)	2 (0)
Water quality	0 (0)	0 (0)	0 (0)
Noise	0 (0)	0 (0)	0 (0)
Odor	0 (0)	0 (0)	0 (0)
Waste	0 (0)	0 (0)	2 (0)
Other	0 (0)	1 (0)	0 (0)

Soil and Groundwater Pollution Surveys and Remedial Measures

*Global (Japan) *See Page 26

	FY2022	FY2023	FY2024
Number of sites that completed remedial measures	2 (2)	1 (1)	4 (4)
Number of sites currently taking remedial measures	40 (35)	42 (37)	40 (35)

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~1970s	1967			• Basic Law for Environmental Pollution Control enacted
	1968			• Air Pollution Control Law enacted
	1970	• Pollution Survey Committee established		• Water Pollution Control Law enacted • Waste Disposal and Public Cleansing Law enacted
	1971			• Environment Agency established
	1972	• Environmental Management Office established	• U.N. Conference on Human Environment held in Stockholm (Declaration of Human Environment adopted)	
	1973		• First oil shock occurred	
	1975	• Environmental Management Regulations enacted		
1980s	1979		• Second oil shock occurred	• Energy Conservation Law enacted
	1985		• Vienna Convention for the Protection of the Ozone Layer adopted	
	1987		• Montreal Protocol on Substances that Deplete the Ozone Layer adopted • World Commission on Environment and Development (the Brundtland Commission) advocated the concept of sustainable development	
	1988	• CFC-reduction Committee established		• Ozone Layer Protection Law enacted
	1989	• Environmental Protection Promotion Office established		
	1990s	1991	• Matsushita Environmental Charter (Environmental Statement and Code of Conduct) enacted • Matsushita Product Assessment adopted and implemented	
1992		• Environmental Policy Committee established	• The Earth Summit held in Rio de Janeiro, Brazil; Agenda21 and Rio Declaration on Environment and Development adopted • United Nations Framework Convention on Climate Change adopted	
1993		• Matsushita Environmental Voluntary Plan (Year 2000 targets) adopted • Matsushita Group' global environmental internal audits launched		• The Basic Environment Law enacted
1995		• Acquired Environmental Management System Certification at AV Kadoma Site (first in the Matsushita Group)	• First Conference of Parties to the U.N. Framework Convention on Climate Change (COP1) held in Berlin	• Containers and Packaging Recycling Law enacted
1996			• ISO 14001 International Standard on Environmental Management Systems launched	
1997		• Corporate Environmental Affairs Division (CEAD) established • Environmental Conference established (held semi-annually)	• COP3 held in Kyoto and adopted the Kyoto Protocol	• Keidanren Appeal on the Environment announced by Japan Federation of Economic Organization

Era	Year	Panasonic Group	World	Japan
	1998	• Love the Earth Citizens' Campaign commenced • Recycling Business Promotion Office established • First environmental report (1997) published		• Home Appliance Recycling Law enacted (took effect in 2001) • Law Concerning the Promotion of the Measures to Cope with Global Warming enacted • Energy Conservation Law revised: Top Runner Approach introduced
	1999	• Green Procurement launched • Chemical Substances Management Rank Guidelines established • Acquired ISO14001 Certification in all manufacturing business units		• PRTR (Pollutant Release and Transfer Register) Law enacted
2000s	2000	• Lead-free Solder Project commenced • Held first environmental exhibition for general public in Osaka	• Global Reporting Initiative (GRI) issued The Sustainability Reporting Guidelines	• Basic Law for Establishing the Recycling-based Society enacted • Law for Promotion of Effective Utilization of Resources enacted
	2001	• Environmental Vision and Green Plan 2010 adopted • Held Environmental Forum in Tokyo and Freiburg, Germany • Panasonic Eco Technology Center launched	• Reached final agreement on the actual rules of Kyoto Protocol in COP7 held in Marrakesh	• Reorganized into the Ministry of the Environment • Law Concerning Special Measures against PCBs enacted
	2002	• Panasonic Center Tokyo opened	• Johannesburg Summit (Rio+10) held	• Kyoto Protocol ratified • Vehicle Recycling Law enacted • Law for Countermeasures against Soil Pollution enacted
	2003	• Declared 'Coexistence with the Global Environment' as one of the twin business visions • Factor X advocated as an indicator for Creating Value for a New Lifestyle • Completely introduced lead-free soldering globally • Super GP Accreditation System launched • Achieved zero waste emissions in Japanese manufacturing business sites (ongoing program) • Held Environmental Forum in Tokyo	• EU's WEEE Directive was enacted	
	2004	• Environmental Vision and Green Plan 2010 revised • PCB Management Office established • Superior GP Accreditation System launched		• Prohibited manufacturing and use of products containing asbestos in principle
2005	• Participated in Expo 2005 Aichi, Japan as an official sponsor • Green Plan 2010 revised • Continued with the nationwide Lights-out Campaign • 3R Eco Project launched • Completed the elimination of specified substances (6 substances) in products • Matsushita Group's Green Logistics Policy established • CF Accreditation System introduced	• Kyoto Protocol entered into force	• Expo 2005 Aichi, Japan held • National campaign against global warming "Team -6%" launched • Marking for the presence of the specified chemical substances for electrical and electronic equipment (J-Moss) established	

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		<ul style="list-style-type: none"> • Panasonic Center Osaka opened • Eco & Ud HOUSE opened • Installed the first commercial household fuel cell cogeneration system in the new official residence of the Japanese Prime Minister • Won the first place in Nikkei Environmental Management Survey 		
	2006	<ul style="list-style-type: none"> • Environmental specialist position established • ET Manifest introduced into all manufacturing sites of Panasonic in Japan • Realized lead-free plasma display panels and introduced them to the market • Full-fledge introduction of biodiesel fuel in logistics 	<ul style="list-style-type: none"> • Restriction of Hazardous Substances (RoHS) Directive took effect in EU 	<ul style="list-style-type: none"> • Relief Law for Asbestos Victims enacted • Energy Conservation Law revised: new cargo owner obligations, widened product scope of its application, and top runner standard revision
	2007	<ul style="list-style-type: none"> • Energy conservation activities at our factories in Malaysia approved as CDM project by the U.N. • A new environmental mark 'eco ideas' introduced • Panasonic Center Beijing opened • Environmental Forum in China held • "Declaration of Becoming an Environmentally Contributing Company in China" announced • Panasonic 'eco ideas' Strategy announced 	<ul style="list-style-type: none"> • The Fourth Assessment Report of the Intergovernment Panel on Climate Change (IPCC) released • Registration, Evaluation, Authorisation and Restriction of Chemicals entered into force in EU • Framework for CO₂ reduction agreed at Heiligendamm Summit (G8) • The Bali Road Map for the post Kyoto Protocol agreed at COP13 • Administration on the Control of Pollution Caused by Electronic Information Products (China RoHS) came into effect 	<ul style="list-style-type: none"> • 'Cool Earth 50' announced by Prime Minister Abe • '21st Century Environment Nation Strategy' formulated • 'The Third National Biodiversity Strategy of Japan' formulated • 'Ministerial ordinance partially amending the Enforcement Regulation of the Waste Management and Public Cleansing Law' promulgated • 'Domestic Emissions Trading Scheme Review Committee' established • 'The Second Fundamental Plan for Establishing a Sound Material-Cycle Society' formulated
	2008	<ul style="list-style-type: none"> • Established the Corporate CO₂ Reduction Promoting Committee • Held environmental exhibitions, 'eco ideas' World • Home Appliances Company announced environmental statement in which named its Kusatsu site as 'eco ideas' Factory • Announced 'eco ideas' Declaration in Europe • Established Environmental Strategy Research Center 	<ul style="list-style-type: none"> • G20 (conference of key countries' environmental and energy ministers) held • Hokkaido Toyako Summit held 	<ul style="list-style-type: none"> • Cool Earth Promotion Program announced by Prime Minister Fukuda • Mislabeling incident of waste paper pulp percentage • Long-term Energy Demand and Supply Outlook announced • Japan's Voluntary Emission Trading Scheme started
	2009	<ul style="list-style-type: none"> • Opened the 'eco ideas' House to demonstrate a lifestyle with virtually zero CO₂ emissions throughout the entire house • Announced the Asia Pacific 'eco ideas' Declaration • Announced 'eco ideas' factories (in Czech, Malaysia, Thailand, and Singapore) • Sanyo Electric joined the Panasonic Group 	<ul style="list-style-type: none"> • China WEEE law promulgated • New framework for countermeasures against global warming on and after 2013 (post-Kyoto Protocol), the Copenhagen Accord, was adopted at the COP15 (Copenhagen conference) • Seeking to emerge from the Lehman collapse, countries throughout the world accelerated actions for the Green New Deal 	<ul style="list-style-type: none"> • Energy Conservation Law amended: Covered area expanded from factories to commercial sector facilities • Flat-panel TV and clothes dryer added as covered products under the Home Appliance Recycling Law • 'Eco point' system started

Era	Year	Panasonic Group	World	Japan
2010s	2010	<ul style="list-style-type: none"> • Announced "Vision looking to the 100th anniversary of our founding in 2018" • Announced new midterm management plan, "Green Transformation 2012 (GT12)" • Announced 'eco ideas' Declarations (Latin America, Asia Pacific, and Russia) • Established 'eco ideas' Forum 2010 in Ariake, Tokyo • Commenced business of Factory Energy Conservation Support Service • Announcement of Green Plan 2018 • Panasonic ECO RELAY Japan (PERJ) launched. 	<ul style="list-style-type: none"> • COP10 held in Nagoya—Nagoya agreement made • APEC meeting held in Yokohama • Ruling party lost in US midterm election—changes in anti global warming policy • Cancun agreement made in COP16—Post-Kyoto framework still to be discussed 	<ul style="list-style-type: none"> • Draft legislation of Basic Law of Global Warming Countermeasures submitted but remained in deliberation • Obligatory greenhouse gas emissions reduction started as a part of Tokyo Emissions Trading Scheme • Waste Management and Public Cleansing Law amended: self treatment regulations tightened • Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (CSCL) and Law concerning Pollutant Release and Transfer Register (PRTR) amended
	2011	<ul style="list-style-type: none"> • Announced North America & Taiwan 'eco ideas' Declarations • Announced establishment of Panasonic Dadi Dowa Summit Recycling Hangzhou Co., Ltd. • Announced the Fujisawa Sustainable Smart Town Project • Established Corporate Electricity Saving Division that bridges functions across the organization 	<ul style="list-style-type: none"> • Rare earth prices soared • Revised RoHS directives enforced in EU • COP17 (Durban Climate Conference): Agreement made on long-term future of the scheme, and the second commitment period for the Kyoto Protocol (Japan announced non-commitment) 	<ul style="list-style-type: none"> • Home appliance eco-point incentive program finished • The Great East Japan Earthquake • Revised Air Pollution Control Act and Water Pollution Control Act enforced • Act on Special Measures Concerning Procurement of Renewable Electric Energy by Operators of Electric Utilities enacted (Feed-in tariff system to be enforced July 2012)
	2012	<ul style="list-style-type: none"> • Business reorganization due to full acquisition of Panasonic Electric Works and SANYO Electric • Commenced sales of Resources Recycling-oriented Product series • Terminated production of household incandescent light bulbs • Establishment of Environmental Management Group, Environment & Quality Center, Global Manufacturing Division • Communication of 'eco ideas' Declaration (Vietnam) 	<ul style="list-style-type: none"> • United Nations Conference on Sustainable Development (Rio +20) • "Doha Climate Gateway" adopted at COP 18 Doha 2012, to lay down a future legal framework in which all nations can participate by 2020 and onwards • Revised WEEE Directive implemented in Europe 	<ul style="list-style-type: none"> • The Recycle Resource Project, national campaign by Ministry of the Environment, commenced • 2012 Japan Tax Reform Bill enacted (Environment tax came into force in October 2012) • Feed-in tariff for recyclable energy put into effect
	2013	<ul style="list-style-type: none"> • Announced new midterm management plan Cross-Value Innovation 2015 • Announced new brand slogan "A Better Life, A Better World" • PETEC's home appliance recycling reached a cumulative total of 10 million units • Announced 'eco ideas' factory (Philippines) 	<ul style="list-style-type: none"> • Phase I of the Kyoto Protocol ends. Japan's target expected to be achieved in combination with forest CO₂ absorption and application of the Kyoto Protocol mechanisms. • Minamata Convention on Mercury to internationally regulate import and export of mercury adopted at UN conference • IPCC Fifth Assessment Report (Working Group 1) announced the possibility of human activity being the principal cause of global warming observed since the mid-20th century is "extremely high." Global average surface temperature is expected to rise as high as 4.8°C • COP 19 Warsaw reaffirmed participation of all nations in the future framework of the Convention for 2020 and later. Nations were asked to submit emission pledges well in advance of 2015 	<ul style="list-style-type: none"> • Home Appliance Recycling Law for small household appliances enforced • Basic Plan for Establishing a Recycling-Based Society implemented • Keidanren's "Action Plan Towards Low-Carbon Society" started (until FY 2021) • Amended Law Concerning the Rational Use of Energy and Amended Law Concerning the Promotion of the Measures to Cope with Global Warming established. Amended Act on the Rational Use and Management of Fluorocarbons promulgated (June) • Voluntary Action Plan by the electric and electronics industry terminated. Achieved improvement by 48% in CO₂ emissions per basic unit in average actual production output for fiscal 2009–2013 (compared with fiscal 1991 level) to the target of 35% • Japan announced in November its fiscal 2021 reduction target of 3.8% over fiscal 2006 and registered this with UNFCCC Office (but with a possible review of the tentative target, which does not include possible resumption of nuclear power plant operations)

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History of Environmental Activities

Era	Year	Panasonic Group	World	Japan
	2014	<ul style="list-style-type: none"> • Panasonic DADI DOWA Summit Recycling Hangzhou Co., Ltd., started operation • Opening of Fujisawa Sustainable Smart Town • Announced Eco Declaration (Southeast Asia & Pacific) • Communication of housing & town development at the International Greentech & Eco Products Exhibition & Conference (IGEM) (Malaysia) 	<ul style="list-style-type: none"> • Targets for product environmental regulations in Europe begin to shift from energy saving to resource efficiency and environmental impact • EU Parliament reelection results in the appointment of Mr. Jean-Claude Juncker as President of the European Commission. Review of the circular economy package was decided. • IPCC 5th Assessment Report analyzed that the current multiple ways to achieve control of global temperature rise to less than 2°C cannot be materialized unless the target becomes nearly zero by the end of the century. Attention to "adaptation" is growing. • COP12 Convention on Biodiversity, PyeongChang concluded the interim assessment of the Aichi Biodiversity Targets as "progress has been made but remains inadequate" • COP 20 (Peru) reached agreement on the policy of developing reduction targets based on common rules for publication of "a new legal framework beyond 2020 applicable to all Parties" 	<ul style="list-style-type: none"> • The amended Energy Conservation Act was enforced, incorporating action on power conservation during peak periods into existing qualitative reduction targets • Phase II of the Commitment to a Low Carbon Society, a voluntary program promoted by Keidanren as measures against global warming, was newly established in response to government request, setting the target year to 2030 • Toyota Motor launched fuel-cell vehicle MIRAI into the commercial market
	2015	<ul style="list-style-type: none"> • Won Zayed Future Energy Prize 2015 • Wonder Japan Solutions (Tokyo) held for the first time • Announced the introduction of indirect contributions through housing, automotive, and B2B solutions in the size of contribution in reducing CO₂ emissions • Announced the Tsunashima Sustainable Smart Town development project, together with Yokohama City and Nomura Real Estate Development Company 	<ul style="list-style-type: none"> • Paris Agreement on the international legal framework for global warming control from 2020 and later was adopted at COP21 (Paris) • 2030 Agenda for Sustainable Development was adopted at the UN Summit, focusing chiefly on sustainable development goals (SDGs) 	<ul style="list-style-type: none"> • Draft proposal to cut greenhouse gases by 26% over 2013 levels as its 2030 greenhouse gas reduction target announced by the Japanese government • COOL CHOICE, a new nationwide movement for greenhouse gas reduction, started
	2016	<ul style="list-style-type: none"> • Establishment of Environmental Management Department, Quality & Environment Division • Announced R&D 10-Year Vision • Revised Green Plan 2018 • Announced participation in Future Living Berlin, the first Smart City project in Germany • Announced collaboration with Tesla Motors for solar batteries 	<ul style="list-style-type: none"> • G7 Toyama Environment Ministers' Meeting held; ministers representing the G7 nations and the EU discussed policies on seven themes including resource efficiency and 3R, biodiversity, climate change, and related measures • UK decided to leave the EU (Brexit) in a national referendum • GRI announced "GRI Standard," the new guidelines for CSR reports • COP 22 held in Marrakesh, Morocco. Agreement reached on establishing a rulebook to make the Paris Agreement effective by 2018 • Donald Trump won the US presidential election • COP 13, the 13th meeting of the Conference of the Parties on Biological Diversity, held in Cancun, Mexico 	<ul style="list-style-type: none"> • The 2016 Kumamoto Earthquake • The Plan for Global Warming Countermeasures was decided by the Cabinet. Direction of Japan's global warming countermeasures to achieve the Intended Nationally Determined Contributions under COP 21 was clarified. Long-term goal of reducing greenhouse gas emissions by 80% by 2050 was set • Act on Promotion of Global Warming Countermeasures was amended; focuses on promoting the enhancement of Cool Choice, the reinforcement of international cooperation, and regional global warming countermeasures

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	2017	<ul style="list-style-type: none"> • Announcement of Panasonic Environment Vision 2050 • Opening of Tsunashima Sustainable Smart Town 	<ul style="list-style-type: none"> • France, UK, and China announced the prohibition of sales of gas and diesel cars and the conversion to EVs in the future 	<ul style="list-style-type: none"> • Revision of the Charter of Corporate Behavior delivering on the SDGs through the realization of Keidanren Society 5.0
	2018	<ul style="list-style-type: none"> • Announcement of Monozukuri (Manufacturing) Vision • Achievement of zero-CO₂ factories at Panasonic Eco Technology Center Co., Ltd. (PETEC), Panasonic Energy Belgium N.V. (PECBE), and Panasonic do Brazil (PANABRAS) 	<ul style="list-style-type: none"> • COP24 was held. The policy based on the Paris Agreements to be uniformly applied to all member countries was adopted 	<ul style="list-style-type: none"> • The fifth Basic Environment Plan was decided by the Cabinet. Set up six cross-field strategies utilizing the concepts of SDGs
	2019	<ul style="list-style-type: none"> • Announcement of Green Plan 2021 • Participation in "RE100", an international initiative for the use of 100% renewable energy as electricity used in business operations 	<ul style="list-style-type: none"> • UN Climate Action Summit was held. Rising trend of achieving net zero greenhouse gas emissions, with a target of limiting global temperature rise to 1.5°C • COP25 was held in Spain. The statement urging governments to increase the GHG reduction targets was adopted 	<ul style="list-style-type: none"> • G20 Osaka Summit was held. "Osaka Blue Ocean Vision", which aims to further reduce pollution caused by marine plastic wastes, was shared
2020s	2020	<ul style="list-style-type: none"> • Launched a Global Circular Economy Project to accelerate corporate-wide activities to build a circular economy • Started Sustainable Management Promotion Consortium where internal members who are interested in sustainability get together to discuss related topics. • Achieved zero-CO₂ factory in PEC (Wuxi) in China. 	<ul style="list-style-type: none"> • Countries accelerated their decarbonization efforts and subsequently announced carbon neutrality statements. • EU released a new battery regulation proposal. 	<ul style="list-style-type: none"> • Announced carbon neutrality by 2050. • Formulated "Green Growth Strategy Through Achieving Carbon Neutrality in 2050."
	2021	<ul style="list-style-type: none"> • Environment Vision transformed to GREEN IMPACT. • Set up Sustainability Management Committee led by the Group CEO. 	<ul style="list-style-type: none"> • COP26 was held in UK. Countries agreed to aim for 1.5°C target for global warming. 	<ul style="list-style-type: none"> • Announced reduction of GHG emissions by 46% below FY2013 levels by FY2030 and continuing strenuous effort in its challenge toward a 50% reduction as Nationally Determined Contributions (NDCs). • Formulated the Sixth Strategic Energy Plan.
	2022	<ul style="list-style-type: none"> • Announced impact targets to reduce CO₂ emissions in the world by 2050 that is the target year set in the Panasonic Green Impact. • Announced the Green Impact Plan 2024. • Automotive Systems Co., Ltd. achieved zero carbon at all its sites worldwide. 	<ul style="list-style-type: none"> • COP 27 was held in Egypt. • COP 15 in Canada; the Kunming-Montreal Global Biodiversity Framework (GBF) was adopted. • IPCC announced its Sixth Assessment Report. 	<ul style="list-style-type: none"> • The Japan's government announced "its basic policy toward achieving GX (Green Transformation)". • METI announced "its Growth-Oriented, Resource-Autonomous Circular Economy strategy". • Keidanren announced "Towards Green Transformation (GX)".
	2023	<ul style="list-style-type: none"> • Group CEO talked in a seminar at the Japan Pavilion in COP28 (Dubai), about significance of the avoided emissions and necessity of its global standardization. • Sustainable Forest in the Kusatsu site was certified as "Shizen Kyosei Site" by Japan's MoE. • Panasonic Group Circular Economy (CE) Policy was formulated. 	<ul style="list-style-type: none"> • Importance of recognition of the avoided emissions is mentioned explicitly in the respective outcome documents of G7 Ministers' Meeting on Climate, Energy, and Environment in the G7 summits in Sapporo and Hiroshima. • TNFD published its final recommendations such as information disclosure on biodiversity. • ISSB published its final sustainability disclosure standards. 	<ul style="list-style-type: none"> • Japan's MoE launched Decokatsu (National Movement for New and Valuable Lifestyles leading to Decarbonization). • Japan's MoE started to certifying sites where biodiversity has been conserved by private sector's initiatives, etc., as "Shizen Kyosei Site".