

Environmental Report 2016



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Environment

Taking definitive action today, to create a greener world tomorrow.

Looking ahead to our 100th anniversary in the year 2021, we aim to become a global, leading green company. We're working toward the creation of a low-carbon, recycling-based society by applying our wide-ranging and advanced technologies, as well as through ongoing actions by our employees.

From the President



True Dedication to Environmental Management

Chinese language version of the above page:

- 中文

Overview

From various angles we introduce special features of the Mitsubishi Electric Group that are creating value in the environmental field, including Corporate Mission and Business Lines, Management Objectives, Environmental Vision and Key Issues, Opportunities for Growth, and Strengthening the Environmental Management Foundation.

Basic Policy and Approach to Environmental Management

Learn more about our policies, vision and management initiatives as we strive to be a global, leading green company.

- Group Environmental Policy
- Environmental Statement: Eco Changes
- Environmental Vision 2021
- Aiming to Become a Global Leading Green Company
- Environmental Management
- Environmental Plan
- Environmental Considerations for Products
- Environmental Considerations for Procurement
- Creating a Society in Tune with Nature

Environmental Report 2016

- Targets and Achievements of the 8th Environmental Plan (Fiscal 2016-2018)
- Long-term Perspective and Management Approach towards Solutions for Environmental Issues
- Environmental Considerations for Value Chain Management
- Fiscal 2016 Environmental Data
- Initiatives toward Creating a Low-Carbon Society
- Initiatives toward Creating a Recycling-Based Society
- Managing Chemical Substances
- Environmental Communication

Chinese language version of Targets and Achievements of the 8th Environmental Plan:

- 第8次环境计划（2015-2017年度）目标与成果

The Environment and Business

Read about the activities and priority environmental issues of each business group, including key policies, initiatives and the contributions that our long-term strategic products are making to the environment and society.

Environmental Topics



We've highlighted some outstanding examples of leading environmental initiatives for a sustainable society.

- A New Dimension in Water Recycling
- Plastic Recycling Comes of Age
- New Energy Potential — A Wireless Sensor Powered by Small Vibrations
- Tapping into Hidden Deposits of Rare Earth Elements Found in Cities
- Kyoto Works Becomes Home to a Family of Ducks
- Archives

Environment Site Map

Use this sitemap for an overall view of our extensive environmental activities.

Environmental Sustainability Report

- Environmental Sustainability Report 2016
- 环境行动报告 2016

CSR Related Information

- About the Report
- Back Issues

Topics

Bringing water back to life through the powers of electricity, bubbles, and ozone



Here we present entirely new water recycling technology that utilizes the power of electricity to break down substances in water that were previously difficult to manage. We discuss the features of this technology and give some examples of its applications, including "microbubbles" that remove grime with the power of bubbles, and ozone generators called "ozonizers" that produce delicious, safe, clear water with the power of ozone.

- ▶ A New Dimension in Water Recycling

A Model Business for a Sustainable Future



Until now, it was considered difficult to recirculate plastics, or recycle them from home electronics appliances for reuse in new home electronics appliances, as only 6% of the material could be recycled. However, Japan's first large-scale, high-purity plastics recycling system has raised that rate to 70%, more than 10 times the previous level. We will introduce the secret behind this technology, and how it evolved.

- ▶ Plastic Recycling Comes of Age

Eco Changes: An Introduction



An overview of Eco Changes and how we're helping create a greener tomorrow.

- ▶ Watch Video

Features

Our Activities Environmental Spotlight



The information hub for environment-related activities of the Mitsubishi Electric Group.

What's changing in your area? Eco Changes



Discover some of the ways we're changing the environment for the better.

Environmental Sustainability Report



A report detailing Mitsubishi Electric's environmental performance and policies in the past fiscal year. (PDF: 9.67MB)

CSR – About the Report

This report provides information about corporate social responsibility (CSR) initiatives by the Mitsubishi Electric Group to help realize a sustainable society. It primarily reports on significant activities, events, and changes that occurred in fiscal 2016 (year ending March 31, 2016). Based on the PDCA (plan-do-check-act) approach, in reporting our activities we tried to go beyond just presenting our principles and the results of activities to date in order to also refer to future policies and issues.

We endeavor to fulfill our responsibility of presenting information to the public in order to broaden our range of communication with stakeholders. We appreciate any and all frank and honest feedback intended to further improve the report.

Structure of the Report

Aiming to fulfill our responsibility of presenting information to the public, the report discloses information on our various activities and initiatives from the aspects of governance, the environment, and society.

Period Covered by the Report

April 1, 2015 – March 31, 2016

*Also includes some information on policies, targets, and plans for fiscal 2017 and thereafter.

Scope of the Report

Social Aspects	Primarily covers activities of Mitsubishi Electric Corporation *The range of data compiled is noted individually.
Environmental Aspects	Covers the activities of Mitsubishi Electric Corporation, 112 domestic affiliates, and 79 overseas affiliates (total of 192 companies). *Click here for details.
Economic Aspects	Primarily covers performance of Mitsubishi Electric Corporation, consolidated subsidiaries, and equity method affiliates *Detailed information on economic performance is provided in the Investor Relations section of our website.

References

- ISO26000
- Sustainability Reporting Guidelines Version4, Global Reporting Initiative
- Environmental Reporting Guidelines (2012), Ministry of the Environment
- Business Owner Environmental Performance Indicator Guideline (2002), Ministry of the Environment
- Environmental Accounting Guidelines (2005), Ministry of the Environment

Reporting Medium

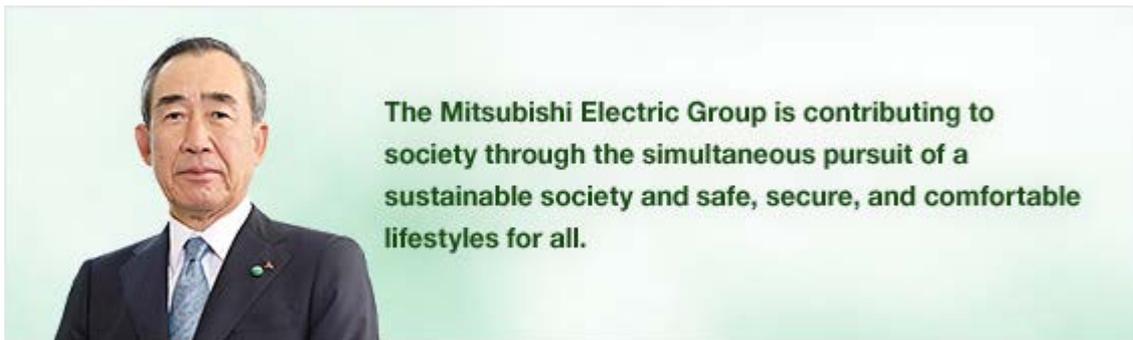
Non-financial information about the Mitsubishi Electric Group is disclosed in the CSR Report (PDF) provided in the CSR section of our website. Among this information, environmental information is introduced in detail in the Environment section of the website. The CSR Report is available in PDF format in two versions—a detailed version and digest version—via the Mitsubishi Electric Group website.

Regarding Future Projections, Plans, and Targets

This report contains not only statements of past and present facts related to Mitsubishi Electric Corporation and its affiliates (Mitsubishi Electric Group), but also future projections, plans, targets, and other forward-looking statements. Such projections, plans, and targets constitute suppositions or judgments based on information available as of the time they are stated. Future business activities and conditions may differ from projections, plans, and targets due to changes in various external factors.

The Mitsubishi Electric Group conducts business in the form of development, manufacturing, and sales in a broad range of areas, and these activities take place both in Japan and overseas. Therefore, the group's financial standing and business performance may be affected by a variety of factors, including trends in the global economy, social conditions, laws, tax codes, litigation, and other legal procedures. We would ask readers to keep these points in mind when reviewing this report.

Environment – From the President



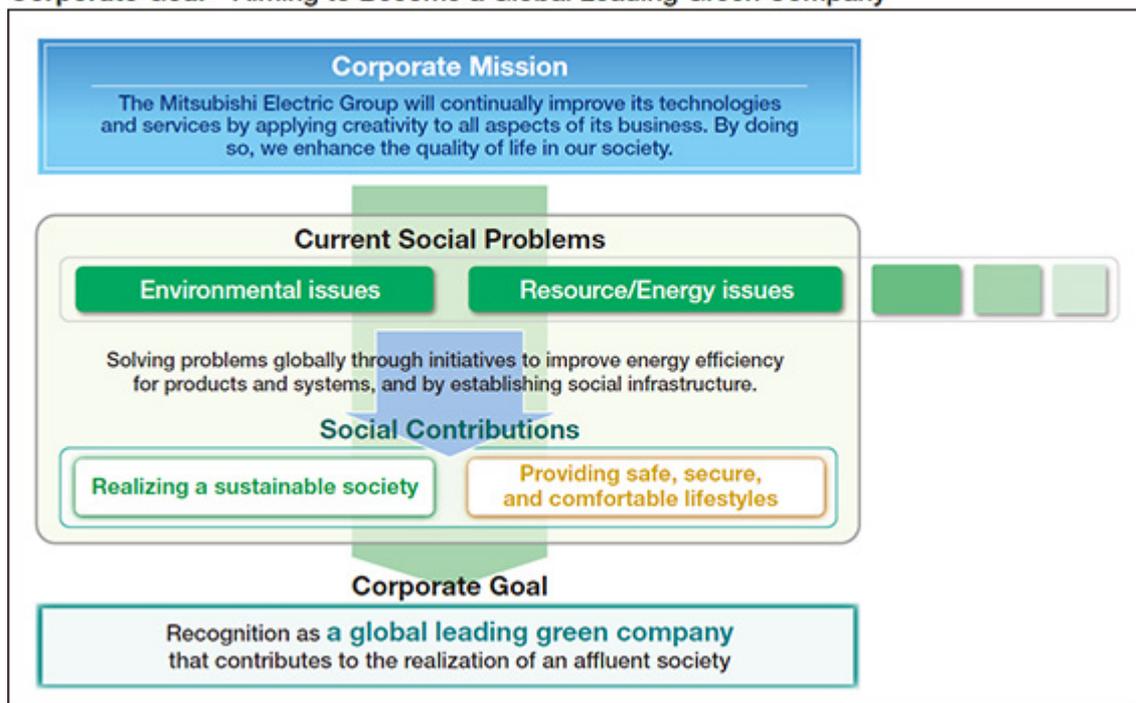
Simultaneously pursuing a sustainable society and safe, secure, and comfortable lifestyles

We have declared the following in our corporate mission: "The Mitsubishi Electric Group will continue to improve its technologies and services by applying creativity to all aspects of its business. By doing so, we enhance the quality of life in our society." Under this mission, we operate in a wide range of areas, from products for the home to equipment and systems for use in outer space.

Today, climate change is one of the major issues that must be addressed to realize a sustainable global environment. In the 2015 Paris Climate Conference (COP21), the Paris Agreement was adopted, listing climate change as a key issue to be addressed in the United Nation's Sustainable Development Goals (SDGs*1). This demonstrates a strong need for a low-carbon society.

The Mitsubishi Electric Group defines a "global leading green company" to be one that fully utilizes its advanced technologies in business activities around the world—including environmental issues—in order to contribute to creating an affluent society where both a "sustainable society" and "safe, secure, and comfortable lifestyles" are simultaneously achieved. Our aim is to be recognized as such a company. While making efforts to realize a low-carbon society through our products and services in the course of satisfying individual customers' needs, we will also try to reduce the environmental load at our business sites.

Corporate Goal – Aiming to Become a Global Leading Green Company



Contributing to the realization of a low-carbon society through energy-saving products and systems

The Mitsubishi Electric Group is carrying out initiatives to reduce the volume of CO₂ emitted during production activities at its business sites as well as suppress the volume that is generated during product

and system use. This is being accomplished by making production processes and product and systems performance more energy efficient. The volume of CO₂ emissions suppressed by improving product and system energy efficiency (i.e., contribution to reducing CO₂ emissions*2) is tens of times that of the CO₂ emitted during activities at business sites. We therefore believe that our "energy-saving products and systems" will make a significant contribution to realizing a low-carbon society.

We have been pressing forward with energy savings through two effective ways: improving the energy efficiency of individual products and appropriately controlling systems that combine multiple products.

The Mitsubishi Electric Group has been contributing to energy savings by incorporating the use of power semiconductors, which is the key to achieving a higher level of energy-saving performance in individual products. We have developed power semiconductors that are produced using silicon carbide (SiC), which results in less power loss compared to traditional semiconductors that use silicon, and we have been expanding the application of these advanced devices in recent years.

Additionally, leveraging our strengths in the development and manufacture of many products, such as in the area of social infrastructure, we are combining the use of our power devices for various applications. For example, we offer solutions for overall systems that deliver high energy-saving performance, such as net zero-energy buildings (ZEBs*3) and net zero-energy houses (ZEHs*4).

We will continue to simultaneously pursue the realization of a "sustainable society" and "safe, secure, and comfortable lifestyles," and prove ourselves worthy of stakeholders' trust by delivering safety, security, and comfort to customers while using less energy. We believe that this will lead to achieving our management targets of ¥5 trillion or more in consolidated sales and operating margins of 8% or more by FY2021.

Promoting resource savings and recycling, and reducing environmental load at business bases around the world

The Mitsubishi Electric Group has been working to reduce environmental load associated with its business activities at all business sites around the world. From the perspective of the entire value chain, as well as production and sales activities, we are carrying out initiatives that increase the effective use of resources while pressing forward with resource savings and recycling.

There are countries and regions in the world where environmental laws and regulations are still inadequate. Instead of using the absence of regulations as an excuse for the lack of environmental initiatives, we are working to reduce environmental load at all business sites, taking the circumstances of each country into consideration.

We will continue offering energy-saving products and systems, and reducing environmental load at business sites from the long-term perspective so that future generations will be able to inherit an abundant global environment.

June 30, 2016



Masaki Sakuyama
President & CEO

- *1 SDGs: Sustainable Development Goals, as defined by the United Nations in September 2015.
- *2 Contribution to reducing CO₂ emitted: Amount of CO₂ deemed to be reduced as a result of switching from older products (those equivalent to products sold in fiscal 2001) to new, more energy-efficient products. Estimated using in-house calculation standards.
- *3 ZEB (net Zero Energy Building): A building where the net consumption of fossil fuel energy is zero or roughly zero, offset by the use of renewable energy resources or other means.
- *4 ZEH (net Zero Energy House): A house where the net consumption of fossil fuel energy is zero or roughly zero, offset by the use of renewable energy resources or other means.

Environment – Overview: Creating Value in the Environmental Field – Special Features of the Mitsubishi Electric Group



Corporate Mission and Business Lines

Comprehensive electrical and electronics manufacturer contributing to solutions for environmental issues

Our corporate mission specifies, “The Mitsubishi Electric Group will continually improve its technologies and services by applying creativity to all aspects of its business. By doing so, we enhance the quality of life in our society.” Based on this statement, we are expanding business in a wide range of areas. Our aim is to simultaneously ensure a sustainable global environment and safe, secure, and comfortable lifestyles while meeting the individual needs of our customers.





Management Objectives

Consolidated sales of at least ¥5 trillion and an operating margin of at least 8%

In FY2015, the Mitsubishi Electric Group set the following growth targets as management objectives to achieve by FY2021, the year in which Mitsubishi Electric will celebrate its 100th anniversary: consolidated sales of at least ¥5 trillion and an operating margin of at least 8%. By realizing safe, secure, and comfortable lifestyles for our customers, our aim is to improve our reputation among stakeholders and increase the value of the Mitsubishi Electric brand.

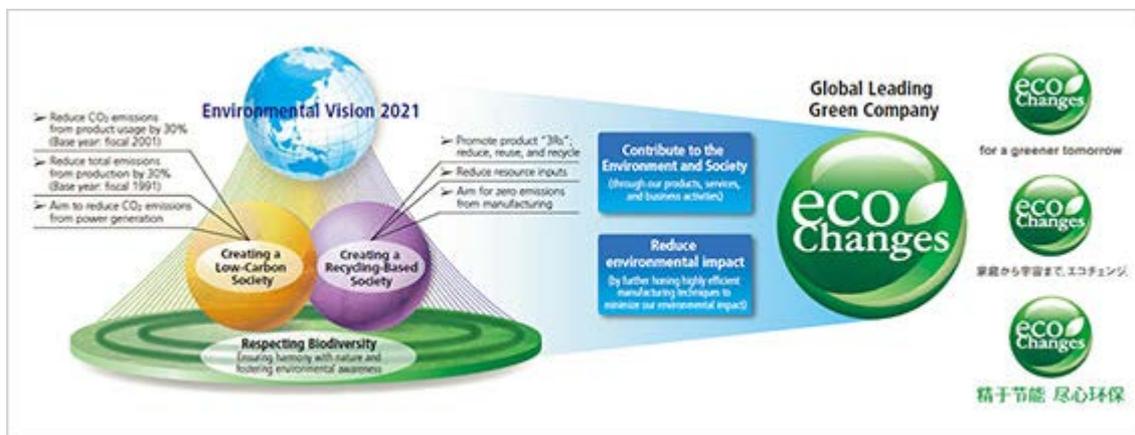




Environmental Vision and Key Issues

Contributing to people and the global environment through technologies and action

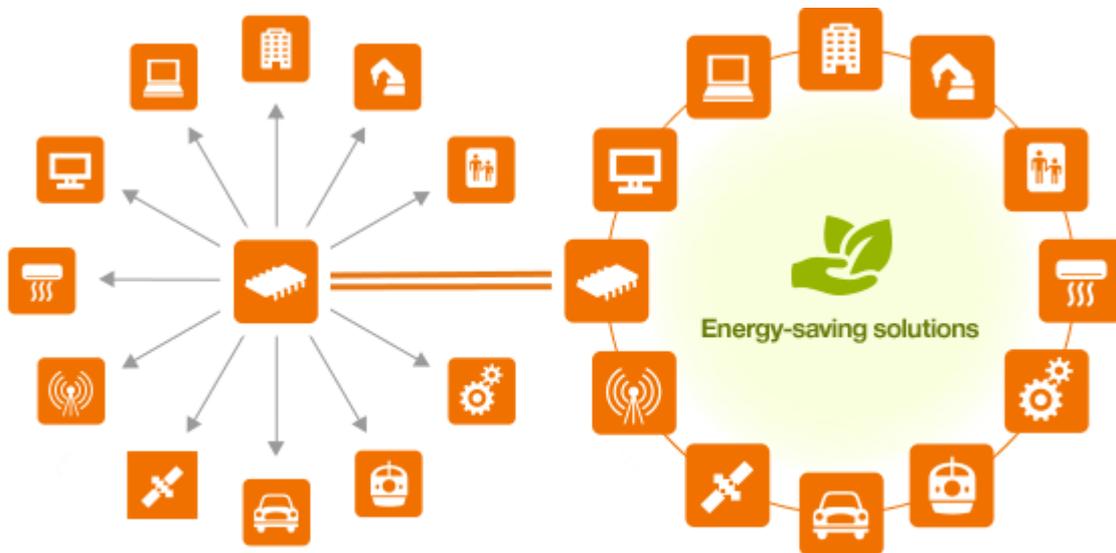
The three pillars of Environmental Vision 2021 are a low-carbon society, a recycling-based society, and respecting biodiversity. We are currently implementing the 8th Environmental Plan (FY2016 - 2018), which prioritizes realizing a low-carbon society in order to realize our vision.



Opportunities for Growth

Reducing CO² from product usage

In order to realize a sustainable society, the world is working to reduce CO₂ emissions, which are a particularly important element in the issue of climate change. While producing our own power semiconductors—which hold the key for achieving energy savings—and utilizing them in an array of businesses and products, the Mitsubishi Electric Group is at the same time providing energy-saving solutions by combining individual businesses and products. We believe that this two-pronged approach is a unique advantage of our Group and will lead to opportunities for growth.



Develop power semiconductors that hold the key to energy savings for various products

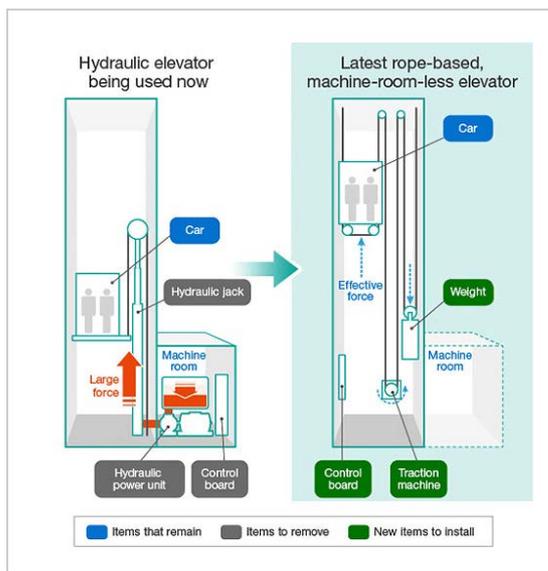
Provide energy-saving solutions by combining individual businesses

Other Opportunities for Growth

Expanding Environment-Related Business

Environmental initiatives other than reducing the emission of CO₂ are underway as well. We have implemented the renewal of elevators and the large-scale, high-purity recycling of plastics, an initiative that has improved the recycling ratio of self-circulation recyclable plastics to 70%. Other efforts include rebuilding electric automotive components, renewing electrical-discharge machines, and rewinding power generator coils. Our aim is to expand our environment-related business by strengthening collaboration between businesses involved in recycling resources.

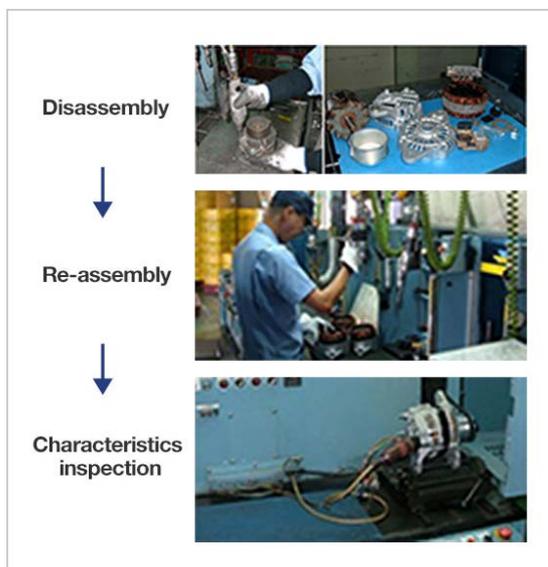
Elevator renewal



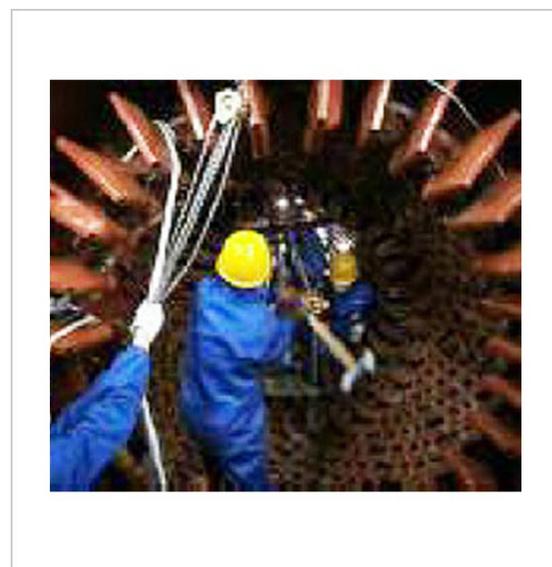
Large-scale, high-purity plastics recycling



Rebuilding electric automotive components



Rewinding power generator coils

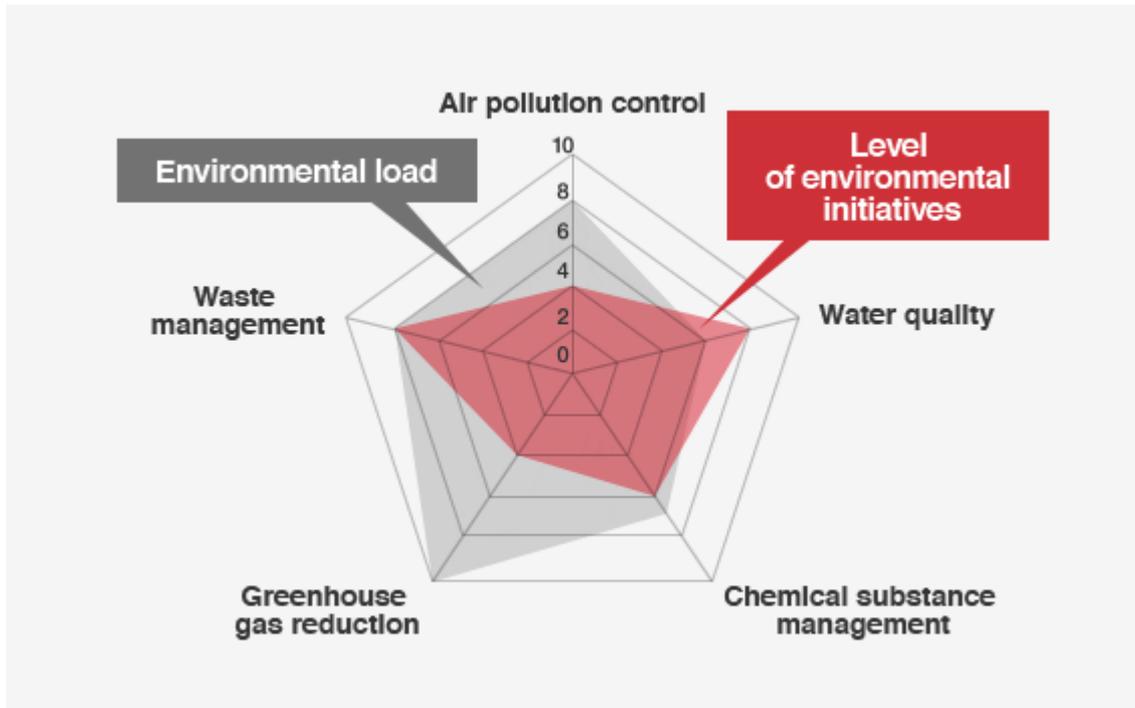


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Strengthening the Environmental Management Foundation

Visualizing the level of environmental initiatives at manufacturing bases using uniform standards

The Mitsubishi Electric Group visualizes environmental load and the level of environmental initiatives in five areas: air pollution, water pollution, chemical substances, climate change, and waste under uniform standards, and evaluates them in order to realize improvement at 90 manufacturing bases inside and outside Japan.



▶ **Targets and Achievements of the 8th Environmental Plan (Fiscal 2016-2018)**

An overview and self-evaluation of progress and achievements made by the Mitsubishi Electric Group in fiscal 2016 in comparison to the targets set out in the 8th Environmental Plan.

Chinese language version of the above page:

- ▶ 第8次环境计划（2015-2017年度）目标与成果

▶ **Long-term Perspective and Management Approach towards Solutions for Environmental Issues**

Report on Mitsubishi Electric Group's long-term perspective for resolving environmental issues, importance evaluations, and management approach for each environmental aspect.

▶ **Environmental Considerations for Value Chain Management**

A list of initiatives for each process in the value chain.

▶ **Fiscal 2016 Environmental Data**

- ▶ Period and Scope of the Report
- ▶ Material Balance
- ▶ Environmental Accounting
- ▶ Environmental Performance Data
- ▶ Awards

Chinese language version of two of the above pages:

- ▶ 关于报告期间与范围
- ▶ 物料衡算

▶ **Initiatives toward Creating a Low-Carbon Society**

- ▶ Reducing Greenhouse Gases Emitted in the Value Chain
- ▶ Reducing CO₂ from Production
- ▶ Contribution to Reducing CO₂ from Product Usage
- ▶ Reducing CO₂ from Logistics

▶ **Initiatives toward Creating a Recycling-Based Society**

- ▶ Effective Utilization of Resources
- ▶ Reducing Resource Inputs
- ▶ Strengthening Collaboration for Resource Recycling Business
- ▶ Recycling End-of-Life Products
- ▶ Reducing the Use of Disposable Packaging Materials
- ▶ Using Water Effectively

▶ **Managing Chemical Substances**

Report on the status of chemical substance management under our own Chemical Substance Management System.

▶ **Environmental Communication**

A look at the various communications published in fiscal 2015, including disclosures on the results of our environmental initiatives, promotion of Eco Changes, participation in environmental exhibitions, and environment-related advertisements.

Environment – Targets and Achievements of the 8th Environmental Plan (Fiscal 2016–2018)

► For a general overview of the first fiscal year of the 8th Environmental Plan, click here.

 Very good
  Good
  Almost there
  More effort needed

Initiatives Toward Creating a Low-Carbon Society

Reducing CO ₂ from Production			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Annual emission of greenhouse gases (CO ₂ conversion): 1.37 million tons	1.4 million tons	1.28 million tons	

Reducing CO ₂ Emissions from Product Usage by Improving Product Performance			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Average reduction rate in 107 product groups: 35% (compared to FY2001)	34%	34%	

Increasing Contribution to Reducing CO ₂ Emissions from Product Usage			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Contribute to reducing 92 million tons from more than 127 product groups	74 million tons from 124 product groups	67 million tons from 124 product groups	

Initiatives Toward Creating a Recycling-Based Society

Effective Utilization of Resources			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Mitsubishi Electric	Final disposal rate: 0.1% or less 0.1%	0.002%	
Affiliates (Japan)	Final disposal rate: 0.1% or less 0.1%	0.05%	
Affiliates (Overseas)	Final disposal rate: 0.5% or less 0.8%	0.67%	

Reducing Resource Inputs			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Average reduction rate in 64 product groups: 40% (comparing to FY2001)	39%	39%	

Initiatives to Create a Society in Tune with Nature

Ongoing Mitsubishi Electric Outdoor School and Satoyama Woodlands Project			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Total participants: 30,000 people	3,500 people	4,700 people	

Fostering environmental awareness through global e-learning			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Expand participation to 140 affiliated companies in Japan and overseas (including Mitsubishi Electric)	Implemented in 98 companies	Implemented in 98 companies	

Preserving Biodiversity at Business Sites			
Targets of 8th Environmental Plan (FY2016–2018)	FY2016 Targets	FY2016 Results	Self-evaluation
Promote protection of regional endemic species at all business sites in Japan	Implemented survey of onsite biodiversity at nine business sites	Implemented survey of onsite biodiversity at seven business sites	

Strengthening Our Environmental Management Foundation

Improving Environmental Initiatives				
Targets of 8th Environmental Plan (FY2016–2018)		FY2016 Targets	FY2016 Results	Self-evaluation
Mitsubishi Electric	Environmental initiatives level of completion: 100 points	Avg. of 90 points	Avg. of 95 points	
Affiliates (Japan)	Environmental initiatives level of completion: avg. of 90 points	Avg. of 80 points	Avg. of 84 points	
Affiliates (Overseas)	Environmental initiatives level of completion: avg. of 80points	Avg. of 70 points	Avg. of 87 points	

General overview of first fiscal year of 8th Environmental Plan

Due to the impact of the economic slowdown, the amount contributed to reducing CO₂ emissions while products are in use failed to reach the volume targeted; however, the result of initiatives introduced to realize a low-carbon society— such as reducing CO₂ emissions during production and reducing CO₂ emissions during product use—were mostly good. Initiatives for creating a circulation-based society and realizing a society capable of co-existing with nature are progressing as planned.

Regarding the new activities to increase the level of environmental initiatives for strengthening the foundation of environmental management, we found that visualizing the environmental initiatives at the level of individual business sites is effective for achieving overall improvement. Based on these results, we will go through the PDCA cycle and introduce more initiatives to achieve the 8th Environmental Plan.

Environment – Long-term Perspective and Management Approach towards Solutions for Environmental Issues

Long-term Perspective Contributing to Sustainable Development Goals

Today, climate change has become a major issue for sustaining the global environment. In September 2015, Sustainable Development Goals (SDGs), which include responding to climate change, were added. The Mitsubishi Electric Group is contributing to the realization of a low-carbon society by providing total energy-saving solutions that utilize the strengths offered by the diverse businesses and products of member companies. Described below are the environment-related SDGs that organizations around the world have agreed to resolve by 2030, and the environmental activities of the Mitsubishi Electric Group in response to those goals.



* SDGs denote objectives declared in the action plan, "Transforming our World - The 2030 Agenda for Sustainable Development," which was adopted at the United Nation's Sustainable Development Summit in September 2015. There are 17 goals in three areas—economy, society and environment—to be achieved by 2030.



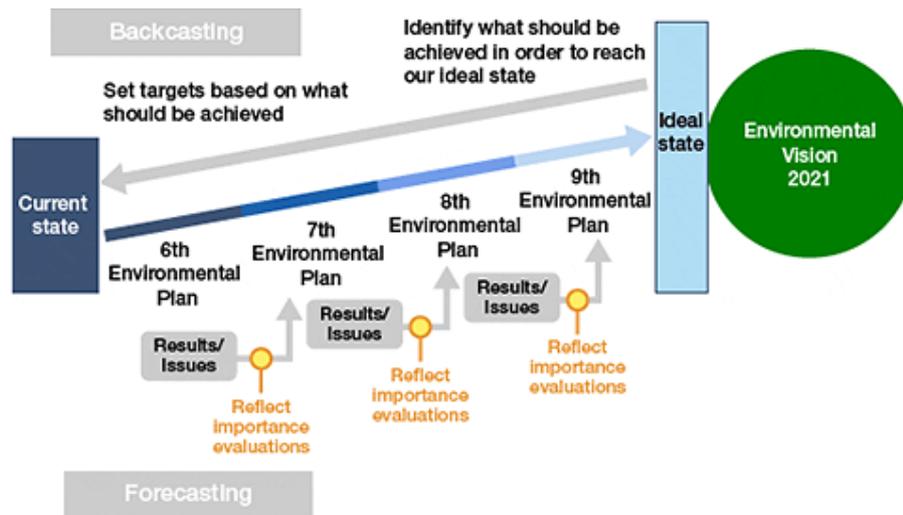
▀ Examples of Environmental Activities by the Mitsubishi Electric Group Pertaining to SDGs

Mid-term Perspective Aiming to Achieve Environmental Vision 2021

The environmental goals to be achieved by the Mitsubishi Electric Group before the end of fiscal 2021 are defined in Environmental Vision 2021. This policy is based on three pillars: "creating a low-carbon society," "creating a recycling-based society," and "respecting biodiversity and fostering environmental awareness." To effectively realize those goals, we prepare an environmental plan every three years and proactively implement it in order to achieve the vision.



Targets are set using both back-casting and forecasting. Back-casting is applied to analyze and identify specific targets that need to be achieved in order for the Group to reach the point where it should be in the future. At the same time, based on the achievements and issues of the previous environmental plan, forecasting is applied to analyze initiatives that are to be implemented in the future, thereby determining the direction of our approach. Repeating these processes effectively enhances the initiatives we introduce in effort to achieve Environmental Vision 2021.



Key Issues and Management Approach

The 8th Environmental Plan (fiscal 2016~2018) sets forth 11 activities in four areas: “creating a low-carbon society,” “creating a resource recycling society,” “creating a society in harmony with nature,” and “strengthening our environmental management foundation.” Of these items, numerical targets are set for eight of them based on the perspectives of management and environmental impact. We view creating a low-carbon society as the most important environmental issue, and quantitative indicators are set for all of the items in this area.

Our management approach for each environmental aspect of the Global Reporting Initiative (GRI) Guidelines Ver. 4 (G4) and explanations corresponding to each aspect (details page) are shown in the table below.

* Management approach denotes the methods applied in corporate decision making and progress management for specific aspects of initiatives related to sustainability. GRI, an NPO aiming to establish an international standard for sustainability, announced this concept in the G4 Guidelines published in 2013.

G4 environmental aspect and management approach	Indicators	
Materials	G4-EN1	MATERIALS USED BY WEIGHT OR VOLUME
	G4-EN2	PERCENTAGE OF MATERIALS USED THAT ARE RECYCLED
<p>In business activities and shipments at factories and offices, the Mitsubishi Electric Group procures and uses various common/rare metals, petroleum-derived resins, electric energy, fuel, water, and wood resources. For effective utilization towards preventing the depletion of limited resources, high priority is given to the effective use of resources (maximum reuse of waste generated from production) and reducing resource inputs, as well as managing these initiatives with respective numerical targets.</p>		
Energy	G4-EN3	ENERGY CONSUMPTION WITHIN THE ORGANIZATION
	G4-EN4	ENERGY CONSUMPTION OUTSIDE OF THE ORGANIZATION
	G4-EN5	ENERGY INTENSITY
	G4-EN6	REDUCTION OF ENERGY CONSUMPTION
	G4-EN7	REDUCTIONS IN ENERGY REQUIREMENTS OF PRODUCTS AND SERVICES
<p>Electricity is the main form of energy used in the production activities of the Mitsubishi Electric Group. In processes that directly use heat energy, we also use fuels such as gas and petroleum. To prevent the depletion of energy resources, efforts are underway to improve the energy consumption efficiency of production lines and utilities. We're also expanding the introduction of demand management and photovoltaic power generation in order to reduce consumption.</p> <p>To reduce energy consumption during product usage, we're developing products high in energy efficiency and focusing on increasing their use throughout society. In area of transportation (i.e., sales distribution), by improving loading ratios that enable us to reduce the number of trucks on the road, we are making progress in reducing energy consumption.</p> <ul style="list-style-type: none"> • Through improving energy consumption efficiency and reducing consumption, we are working to reduce CO₂ emissions. The Mitsubishi Electric Group uses "CO₂ emissions per unit of sales" as an important indicator. For details, please see "Emissions." 		
Water	G4-EN8	TOTAL WATER WITHDRAWAL BY SOURCE
	G4-EN9	WATER SOURCES SIGNIFICANTLY AFFECTED BY WITHDRAWAL OF WATER
	G4-EN10	PERCENTAGE AND TOTAL VOLUME OF WATER RECYCLED AND REUSED
<p>Management Approach The water used by the Mitsubishi Electric Group is mainly tap water, industrial-use water and</p>		

groundwater. As well as understanding the usage status at all sites, we practice the 3Rs (reduce, reuse, recycle) for water and are promoting greater awareness of water stress (i.e., strained water supply/demand conditions) at production sites in Japan and overseas. Regarding the water footprint of products, including the stages of procurement, production and product usage, the possibility of excessive use of water in regions in Japan and overseas has not been verified by the Mitsubishi Electric Group.

Biodiversity	G4-EN11	OPERATIONAL SITES OWNED, LEASED, MANAGED IN, OR ADJACENT TO, PROTECTED AREAS AND AREAS OF HIGH BIODIVERSITY VALUE OUTSIDE PROTECTED AREAS
	G4-EN12	DESCRIPTION OF SIGNIFICANT IMPACT OF ACTIVITIES, PRODUCTS, AND SERVICES ON BIODIVERSITY IN PROTECTED AREAS AND AREAS OF HIGH BIODIVERSITY VALUE OUTSIDE PROTECTED AREAS
	G4-EN13	HABITATS PROTECTED OR RESTORED
	G4-EN14	TOTAL NUMBER OF IUCN RED LIST SPECIES AND NATIONAL CONSERVATION LIST SPECIES WITH HABITATS IN AREAS AFFECTED BY OPERATIONS, BY LEVEL OF EXTINCTION RISK

The Mitsubishi Electric Group does not mine, harvest, cultivate, or produce raw materials, and therefore does not directly destroy forests or ecosystems. Our production sites have not been verified to have any significant influence in terms of either scale or frequency. This is because our long-standing factory operations in Japan have been coexisting harmoniously with the natural environment for several decades, and because none of our factories in urban areas are in close proximity to areas of high biodiversity value. Production sites overseas are located in industrial complexes, and there are no plans to newly develop production sites requiring large areas.

We have taken action by preparing the Biodiversity Action Guidelines. To ensure that biodiversity is considered in all of our business activities, these guidelines include the pledge of every Mitsubishi Electric Group employee to understand the relationship between business activities and biodiversity. In addition, at individual business sites, we are studying the biology of animals and plants on the premises, while communicating with outside experts on the basis of our findings in order to better understand the situation. These activities are incorporated into the planning of our efforts to conserve biodiversity.

Emissions	G4-EN15	DIRECT GREENHOUSE GAS (GHG) EMISSIONS (SCOPE 1)
	G4-EN16	ENERGY INDIRECT GREENHOUSE GAS (GHG) EMISSIONS (SCOPE 2)
	G4-EN17	OTHER INDIRECT GREENHOUSE GAS (GHG) EMISSIONS (SCOPE 3)
	G4-EN18	GREENHOUSE GAS (GHG) EMISSIONS INTENSITY
	G4-EN19	REDUCTION OF GREENHOUSE GAS (GHG) EMISSIONS
	G4-EN20	EMISSIONS OF OZONE-DEPLETING SUBSTANCES (ODS)
	G4-EN21	NO _x , SO _x AND OTHER SIGNIFICANT AIR EMISSIONS

Operations of the Mitsubishi Electric Group emit four types of greenhouse gases through business activities: CO₂, sulfur hexafluoride (SF₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Reducing the emission of these gases is managed through the use of numerical targets. For CO₂ in particular, we are working to reduce emissions through energy-saving activities for production lines and utilities, and increasing the use of renewable energy systems in the form of photovoltaic power generation. Here, "CO₂ emissions per unit of sales" is used as an important indicator. The Mitsubishi Electric Group invests 0.15% of its sales every fiscal year to reduce CO₂ emissions generated during production.

For greenhouse gases emitted upstream and downstream outside of business activities, we are working to reduce emissions generated at the time of product usage and during transportation (sales distribution). The CO₂ emitted when products are being used is dozens to hundreds of times greater than that emitted during production processes. Therefore, developing and disseminating products high in energy efficiency generates a mitigating effect.

This is also part of the Mitsubishi Electric Group's growth strategy, where we are using the "average reduction ratio of CO₂ from product usage" as an important indicator. In the area of sales distribution, we are reducing the number of trucks used by improving loading capacity and moving ahead with modal shift initiatives.

Substances that cause atmospheric pollution, including nitrogen oxide (NO_x), sulfur oxide (SO_x), volatile organic compounds (VOCs), and dust/soot, are being managed on the basis of legal compliance.

Effluents and Waste	G4-EN22	TOTAL WATER DISCHARGE BY QUALITY AND DESTINATION
	G4-EN23	TOTAL WEIGHT OF WASTE BY TYPE AND DISPOSAL METHOD
	G4-EN24	TOTAL NUMBER AND VOLUME OF SIGNIFICANT SPILLS
	G4-EN25	WEIGHT OF TRANSPORTED, IMPORTED, EXPORTED OR TREATED WASTE DEEMED HAZARDOUS UNDER THE TERMS OF THE BASEL CONVENTION 2ND MEETING ANNEX I, II, III, AND VII, AND PERCENTAGE OF TRANSPORTED WASTE SHIPPED INTERNATIONALLY
	G4-EN26	IDENTITY, SIZE, PROTECTED STATUS AND BIODIVERSITY VALUE OF WATER BODIES AND RELATED HABITATS SIGNIFICANTLY AFFECTED BY THE ORGANIZATION'S DISCHARGE OF WATER AND RUNOFF

The Mitsubishi Electric Group conducts thorough management in accordance with local laws and regulations in Japan and overseas to ensure that the water it discharges doesn't cause pollution or damage to the ecosystem and people's lives and cultures due to chemical substances, chemical/nutritional load or suspended solids. If an individual improvement issue arises at a business site, the site is subjected to continual improvement measures within an individual environmental management program. The total volume of water discharged is being minimized by increasing the water recycling ratio.

In order to minimize the final disposal volume of waste, the Mitsubishi Electric Group conducts thorough waste analysis and separation (conversion to valuable resources), exploits waste disposal contractors, works to improve waste transportation efficiency, and has set "final disposal ratio" as an important indicator. Furthermore, in order to prevent waste-based pollution and end-of-life home appliance disposal issues, we ensure strict legal compliance and are taking steps to introduce an electronic manifest system.

Products and Services	G4-EN27	EXTENT OF IMPACT MITIGATION OF ENVIRONMENTAL IMPACTS OF PRODUCTS AND SERVICES
	G4-EN28	PERCENTAGE OF PRODUCTS SOLD AND THEIR PACKAGING MATERIALS THAT ARE RECLAIMED BY CATEGORY

To reduce the environmental impact of its product and services, the Mitsubishi Electric Group promotes Design for Environment activities based on product assessments derived from three perspectives: "effective use of resources," "efficient use of energy" and "avoidance of substances that are particularly harmful to the environment."

Effective use of resources is an initiative linked to reducing the amount of resources introduced (see "[Materials](#)" aspect). Efficient use of energy is an initiative linked to reducing CO₂ emissions resulting from product usage (see "[Energy](#)" and "[Emissions](#)" aspects). Avoidance of substances that are particularly harmful to the environment is an initiative linked to preventing atmospheric, water and soil pollution and preserving biodiversity (see "[Biodiversity](#)," "[Emissions](#)" and "[Effluents and Waste](#)" aspects).

Regarding products, in order to design easily recyclable products, we hold Design for Environment technical seminars, which provide an opportunity for feedback on product design. We also develop technologies for recovering and sorting materials, as well as technologies for utilizing recycled materials. End-of-life products recovered under Japan's Home Appliance Recycling Law are processed appropriately and recycled at a Group company.

Regarding packaging, to reduce transportation packaging, we're promoting the use of simpler packaging, expanding the application of returnable containers and packaging, and recycling used packaging.

		MONETARY VALUE OF SIGNIFICANT FINES AND TOTAL NUMBER OF NON-MONETARY
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Compliance	G4-EN29	SANCTIONS FOR NON-COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS
<p>To ensure there are no environmental accidents or violations of environmental laws and regulations, we aim to ensure that employees understand and are aware of related laws and regulations. This includes sharing information about recent trends as well as about causes and countermeasures for even the smallest of mistakes. We also conduct regular equipment inspections. At all sites where PCB waste is stored or devices containing PCB are used, inspection/verification of storage/usage conditions is carried out at least once a year together with planning for disposal.</p>		
Transport	G4-EN30	SIGNIFICANT ENVIRONMENTAL IMPACT OF TRANSPORTING PRODUCTS AND OTHER GOODS AND MATERIALS FOR THE ORGANIZATION'S OPERATIONS, AND TRANSPORTING MEMBERS OF THE WORKFORCE
<p>The Mitsubishi Electric Group procures raw materials globally, but has not formed a large-scale supply/distribution network for products. Therefore, significant environmental impact as the result of transportation (distribution) has not been verified.</p> <ul style="list-style-type: none"> For energy consumption and CO₂ emissions from transportation (distribution) and reducing the use of packaging materials, please see "Energy," "Emissions" and "Products and Services." 		
Overall	G4-EN31	TOTAL ENVIRONMENTAL PROTECTION EXPENDITURES AND INVESTMENTS BY TYPE
<p>Regarding total environmental protection expenditures, based on the "Environmental Accounting Guidelines 2005" produced by the Japanese Ministry of the Environment, a summary of environmental conservation costs, environmental conservation effects (environmental performance), and the economic impact accompanying environmental conservation measures (actual effects of revenue/expense cuts) are calculated and announced each year.</p>		
Supplier Environmental Assessment	G4-EN32	PERCENTAGE OF NEW SUPPLIERS THAT WERE SCREENED USING ENVIRONMENTAL CRITERIA
	G4-EN33	SIGNIFICANT ACTUAL AND POTENTIAL NEGATIVE ENVIRONMENTAL IMPACT IN THE SUPPLY CHAIN AND ACTIONS TAKEN
<p>To prevent and mitigate negative environmental impact in supply chains, based on the Green Procurement Standards Guide, the Green Accreditation system was implemented in April 2006 to evaluate our suppliers. A green accreditation rate of 100% is being maintained.</p>		
Environmental Grievance Mechanisms	G4-EN34	NUMBER OF GRIEVANCES ABOUT ENVIRONMENTAL IMPACT FILED, ADDRESSED, AND RESOLVED THROUGH FORMAL GRIEVANCE MECHANISMS
<p>Environmental grievances are processed through the Corporate Environmental Sustainability Group.</p>		

Environment – Examples of Environmental Activities by the Mitsubishi Electric Group Pertaining to SDGs



Securing Sustainable Energy and Expanding Its Use

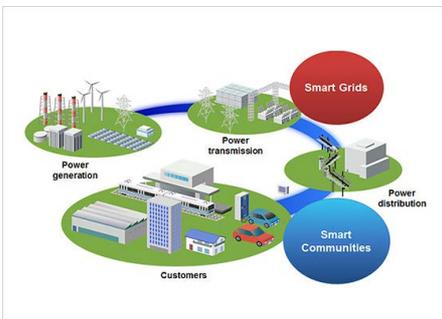
The Mitsubishi Electric Group has a wide range of technologies related to supplying and efficiently utilizing energy. Those technologies are being applied to develop advanced technologies and systems that contribute to more efficient energy generation, greater energy savings, and the realization of smart societies. We are also pursuing the most efficient use of energy by each of our products. The wide-spread application of our technologies and products enables us to contribute to the sustainable use of energy.

Power Generation, Transmission, and Distribution Business



We manufacture products related to all stages of electricity supply, from generation to delivery to the end user, including transmission, transformation, and distribution. We contribute to increasing the efficiency of the electric power infrastructure by providing highly efficient power generators and various devices and systems that help reduce the loss of power in transmission and transformation processes.

Smart Grids and Smart Communities



We are involved in initiatives to develop and commercialize smart grids and smart communities, including the construction and use of our own testing facilities. While working towards the realization of smart societies, we are collaborating with external organizations in various ways, such as the delivery of storage batteries that enable electric utilities companies to conduct testing and demonstrations on remote islands.

Photovoltaic Power Generation



We manufacture photovoltaic power generation systems designed for high output and high efficiency, and that can be applied for various purposes—from household use to large-scale solar projects. We have also developed technologies to help improve system stability, including the isolation of faulty circuits should a problem occur.

Energy-Saving Products



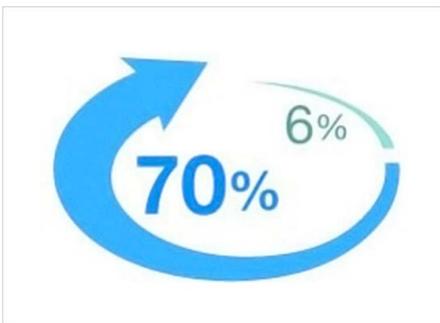
The products of the Mitsubishi Electric Group require power to operate. Products that operate with higher energy efficiency contribute to reducing the emission of CO₂ during use. Accordingly, we have set targets to achieve through the development of energy-saving products.



Securing a Sustainable Production and Consumption Format

In addition to reducing the volume of resources used during manufacturing processes and collecting and recycling used products, we are involved in the business of recycling plastics used in home electric appliances. Furthermore, we are attempting to minimize environmental load during production by reducing final waste disposal and promoting green procurement.

Reuse/Recycling Business



We conduct large-scale, high-purity recycling of the plastics used in home electrical appliances and collect the rare earth elements used in air conditioners. Our rebuilding business also takes faulty automotive electrical parts and reconditions them rather than replacing them.

Zero Final Waste Disposal Ratio

Primarily focusing on our production bases, we analyze and separate wastes in an attempt to transform all waste into valuable items that can be utilized, thereby minimizing the final waste disposal ratio. We have maintained a final waste disposal ratio of less than 0.1% for 12 years at Mitsubishi Electric and for 6 years at affiliate companies in Japan.

Green Procurement



We published the “Green Procurement Standards Guide,” which is based on various laws and regulations, and conduct eco-conscious materials procurement. The contents of the guide are revised as needed. In recent years, an appendix has added to explain the link between preservation of biodiversity and procurement activities.

Climate Change and Mitigating Its Effects

In order to suppress the emission of greenhouse gases—including CO₂, which is regarded to be a major cause of sudden climate change—we are contributing to the creation of a low-carbon society by reducing CO₂ generated during the Group's production activities and that produced during product use.

Energy-Saving Products



In order to reduce the CO₂ generated during product use, we continuously strive to design and develop products while keeping energy savings in mind, and focus on improving the performance of existing energy-saving products.

Reducing Greenhouse Gas Emissions

We are committed to reducing greenhouse gas emissions such as CO₂ by assessing emissions throughout the value chain as a whole and setting targets. We take every opportunity to use ingenuity in production lines, including the introduction of high-efficiency production equipment at the time of facility renewal.

Protecting and Restoring Ecosystems, and Preventing the Loss of Biodiversity

We are contributing to the protection and recovery of local ecosystems around the world by developing and providing observation satellites that report the status of oceans and woodlands. We are also proactively promoting coexistence with the surrounding environments at each business site.

Satellites



The Advanced Land Observing Satellite-2 (ALOS-2 or Daichi-2) was developed for a mission to create maps, observe lands, assess the impact of disasters, and explore resources. It is currently contributing to the collection of various data that will help to protect ecosystems by observing the degree of forest degradation in rainforest areas.

Studying Nature



As part of the activities designed for coexisting with nature in local communities, we are studying the conditions of animal and plant habitats at our business sites. The findings are used in discussions that focus on how we will approach the preservation of biodiversity in the future.

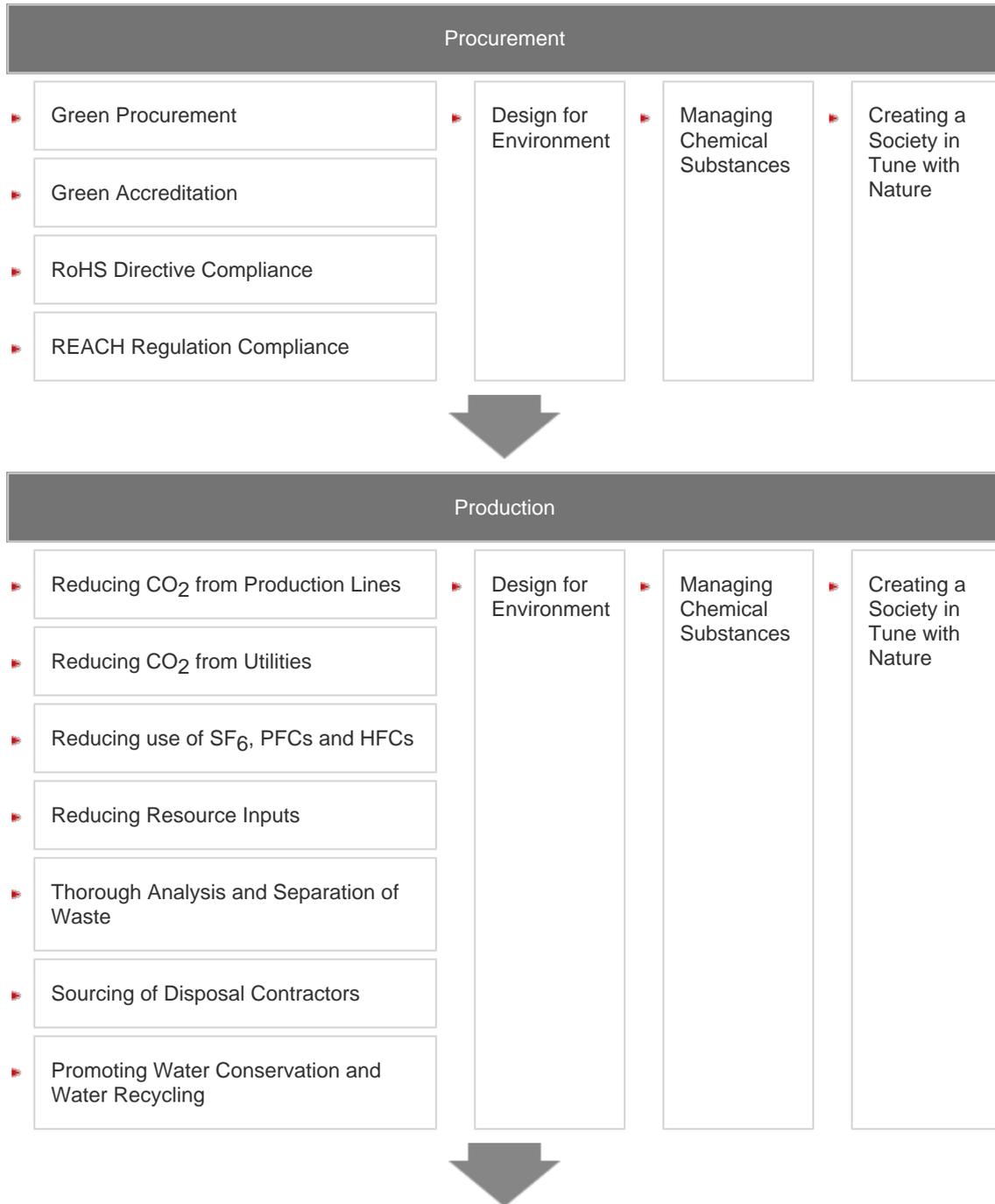
Satoyama Woodland Preservation Activities

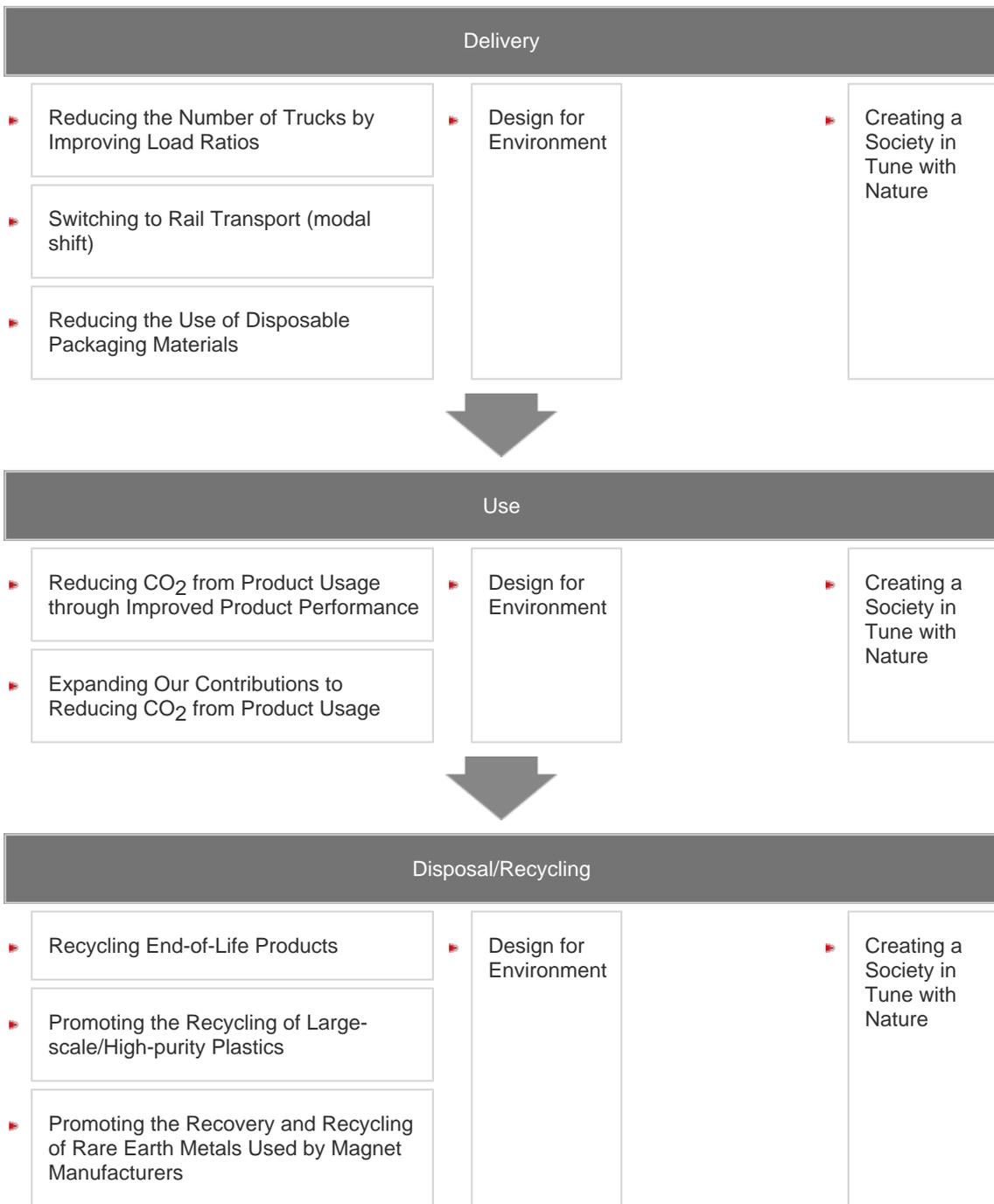


The Satoyama Woodland Preservation Project is a successful project that began in 2007. Its aim is to restore the surrounding natural environment near our business sites. Cooperating with communities and NPOs, we are conducting activities with the goal of improving wilderness park environments, and protecting and restoring forestlands and rivers.

Environment – Environmental Considerations for Value Chain Management

The Mitsubishi Electric Group promotes various countermeasures that are contributing to the realization of a sustainable society. Examples include initiatives such as reducing greenhouse gas emissions, efficiently using resources, preventing environmental pollution and tuning with nature in each process of the value chain, from procurement, manufacturing and delivery to use and disposal/recycling. For a more detailed explanation, click on one of the initiatives listed below.





The following page lists the materials balance for the value chain:

[🔍 Environment: Material Balance](#)

The following page lists the greenhouse gas emissions for the value chain:

[🔍 Environment: Value Chain Greenhouse Gas Emissions](#)

Environment – Fiscal 2016 Environmental Data

▶ Period and Scope of the Report

Overview of reporting period and scope.

Chinese language version of the above page:

▶ 关于报告期间与范围

▶ Material Balance

Report on the environment burden resulting from our business activities, according to the "manufacture, transport, use, and recycle" product lifecycle.

Chinese language version of the above page:

▶ 物料衡算

▶ Environmental Accounting

Report on fiscal 2015 totals, calculated under the Environmental Accounting Guidelines (fiscal 2006 edition).

▶ Environmental Performance Data

Performance data for various activities in fiscal 2016.

▶ Awards

List of awards received in Japan and overseas in fiscal 2016.

Environment – Period and Scope of the Report

Period Covered by the Report

April 1, 2015 – March 31, 2016

* Also includes some information on policies, targets, and plans occurring after the close of fiscal 2017.

Scope of the Report

Covers the activities of Mitsubishi Electric Corporation, 112 affiliates in Japan, and 79 overseas affiliates (total of 192 companies).

* Up to fiscal 2009, the scope of our report was limited to those companies that had drawn up an environmental plan for governance from an environmental conservation perspective. However, under the policy of expanding global environmental management, we have broadened the scope of the report to cover Mitsubishi Electric Corporation and its major affiliated companies.

* Data posted to our website on June 30, 2016 was calculated based on aggregate estimates for the semiconductor business, which was affected by the Kumamoto earthquakes. Current data reflects recalculation conducted later on based on actual results.

Contact Us About the Report

We endeavor to fulfill our responsibility of presenting information to the public in order to broaden our range of communication with stakeholders. We appreciate any and all frank and honest feedback intended to further improve the report.

Inquiries: [Click here](#) to send an inquiry

Environment – Material Balance

Overall Environmental Impact

Period: April 1, 2015 - March 31, 2016

Scope of Data Compilation: Mitsubishi Electric Corporation, 112 affiliates in Japan, and 79 overseas affiliates (total of 192 companies)

* Up to fiscal 2009, the scope of our report was limited to those companies that had drawn up an environmental plan for governance from an environmental conservation perspective. However, under the policy of expanding global environmental management, we have broadened the scope of the report to cover Mitsubishi Electric, its consolidated subsidiaries, and its affiliated companies.



IN

Materials for Manufacturing			
	Mitsubishi Electric	Affiliates (Japan)	Affiliates (Overseas)
Materials *1	1,130,000 tons	270,000 tons	1,150,000 tons
Manufacturing			
Electricity	1,100 million kWh	310 million kWh	370 million kWh
Natural gas	25,170,000 m3	2,330,000 m3	11,000,000 m3
LPG	1,125 tons	2,118 tons	672 tons
Oil (crude oil equivalent)	2,101 kl	2,604 kl	627 kl
Water	7,540,000 m3	1,420,000 m3	1,820,000 m3
Public water	1,270,000 m3	460,000 m3	610,000 m3
Industrial water	2,310,000 m3	96,000 m3	1,060,000 m3
Groundwater	3,890,000 m3	870,000 m3	20,000 m3
Others	0 m3	0 m3	4,000 m3
Reuse of water	3,260,000 m3	1,000,000 m3	140,000 m3
Controlled chemical substances (amounts handled)	4,962 tons	1,471 tons	5,142 tons
Ozone depleting substances (amounts handled)	1.4 tons	0.2 tons	802 tons
Greenhouse gases (amounts handled)	2,901 tons	44 tons	3,671 tons
Volatile organic compounds (amounts handled)	1,294 tons	1,288 tons	245 tons

*1 Materials: Total value for shipping weight of products, plus amount of product packaging materials used, plus total amount of waste.



OUT

Emissions (From Manufacturing)				
		Mitsubishi Electric	Affiliates (Japan)	Affiliates (Overseas)
Discharge into water	Water	6,460,000 m3	1,220,000 m3	1,330,000 m3
	Controlled chemical substances	5.4 tons	0.0 tons	10 tons
	BOD (biological oxygen demand)	46 tons	4.7 tons	14 tons
	COD (chemical oxygen demand)	11 tons	4.5 tons	34 tons
	Nitrogen	18 tons	15 tons	6.4 tons
	Phosphorus	2.0 tons	0.2 tons	0.2 tons
	Suspended solids	35 tons	7.0 tons	16 tons
	n-hexane extracts (mineral)	0.7 tons	0.2 tons	6.5 tons
	n-hexane extracts (active)	1.9 tons	0.2 tons	0.2 tons
	Total emissions of zinc	0.1 tons	0.0 tons	0.1 tons
Emissions into the atmosphere	Carbon dioxide(CO ₂)	580,000 tons-CO ₂	170,000 tons-CO ₂	300,000 tons-CO ₂
	Controlled chemical substances (excluding amounts contained in other waste)	329 tons	164 tons	282 tons
	Ozone depleting substances	0.0 ODP tons	0.0 ODP tons	0.7 ODP tons
	Greenhouse gases	62,000 tons-CO ₂	38,000 tons-CO ₂	140,000 tons-CO ₂
	Volatile organic compounds	456 tons	257 tons	26 tons
	Sulfur oxide (SOx)	1.2 tons	0.5 tons	0.0 tons
	Nitrogen oxide (NOx)	15 tons	2.7 tons	4.4 tons
	Fly ash	0.7 tons	0.1 tons	6.0 tons
Waste				
Total waste emissions		84,606 tons	62,301 tons	65,174 tons
Amount recycled		82,592 tons	53,008 tons	63,691 tons
Waste treatment subcontracted out		20,243 tons	50,939 tons	64,129 tons
Final disposal		1.4 tons	30 tons	438 tons
In-house weight reduction		876 tons	0.0 tons	52 tons
Products				
Weight of all products sold *2		1,000,000 tons	210,000 tons	950,000 tons
Weight of packaging materials		51,000 tons	6,000 tons	140,000 tons

*2 Products sold: Shipping weight of products.

IN

Sales and Logistics *3			
	Mitsubishi Electric	Affiliates (Japan)	Affiliates (Overseas)
Fuel for trucks (gasoline)	10,599 kl	1,680 kl	60 kl
Fuel for trucks (diesel)	27,155 kl	4,351 kl	11,227 kl
Fuel for rail (electricity)	1,593 MWh	434 MWh	0.0 MWh
Fuel for marine transport (bunker oil)	325 kl	0.0 kl	77,519 kl
Fuel for air transport (jet fuel)	717 kl	110 kl	33,845 kl

*3 Sales and logistics: Figures for overseas affiliated companies include transportation between countries.



OUT

Emissions *4			
	Mitsubishi Electric	Affiliates (Japan)	Affiliates (Overseas)
Carbon dioxide (CO ₂)	98,000 tons-CO ₂	16,000 tons-CO ₂	340,000 tons-CO ₂

*4 Emissions: Includes one sales company in Japan. Figures for overseas affiliated companies include transportation between countries.

IN

Energy Consumption			
	Mitsubishi Electric	Affiliates (Japan)	Affiliates (Overseas)
Energy consumed during product use *5	39,800 million kWh	4,100 million kWh	24,300 million kWh

- *5 Energy consumed during product use: Total energy consumed (estimated value) when using 89 finished products targeted for CO₂ reduction. The length of use (operating time) is set for each product according to statutory useful life, designed service life, statistical values, etc.



OUT

Emissions			
	Mitsubishi Electric	Affiliates (Japan)	Affiliates (Overseas)
Amount of CO ₂ emitted during product use (converted value) *6	20,250,000 tons-CO ₂	2,090,000 tons-CO ₂	12,200,000 tons-CO ₂
Amount of SF ₆ emitted during product use (corresponding value) *7	100,000 tons-CO ₂	—	—

- *6 Amount of CO₂ emitted during product use (converted value): Sum of CO₂ emitted when using 89 finished products targeted for CO₂ reduction. The amount of CO₂ emitted is equal to the energy consumed multiplied by the CO₂ emissions coefficient, for which the value shown in CO₂ Emissions from Fuel Combustion Highlights (2013 Edition) is used.
- *7 Amount of SF₆ emitted during product use (corresponding value): Sum of SF₆ gas naturally leaked during the operation of products (6) that use SF₆ gas for insulation. Leakage rate used is the value from JEAC5001-2000. Global warming potential value used is from the 2nd Revised Guidelines of the IPCC.



IN

End-of-Life Products *8	
	Mitsubishi Electric
Air conditioners	13,082 tons
Televisions	3,779 tons
Refrigerators	20,150 tons
Washing machines / Clothes dryers	6,773 tons
Personal computers	55 tons

*8 End-of-Life Products: Weight of products recovered from four types of appliances subject to Japan's Home Appliance Recycling Law, plus personal computers.



OUT

Resources Recovered *9	
	Mitsubishi Electric
Metals	25,761 tons
Glass	1,190 tons
CFCs	269 tons
Others	8,420 tons

*9 Resources recovered: Weight of resources recovered from four types of appliances subject to Japan's Home Appliance Recycling Law, plus personal computers.

Environment – Environmental Accounting

Scope and Period of Data Compilation and Basis of Calculation

Scope and Period of Data Compilation

- Period: April 1, 2015 - March 31, 2016
- Scope of Data Compilation: Mitsubishi Electric Corporation, 112 affiliates in Japan, and 79 overseas affiliates (total of 192 companies)

* The scope of data compilation is the same as the scope covered in this Environmental Report.

Basis of Calculation

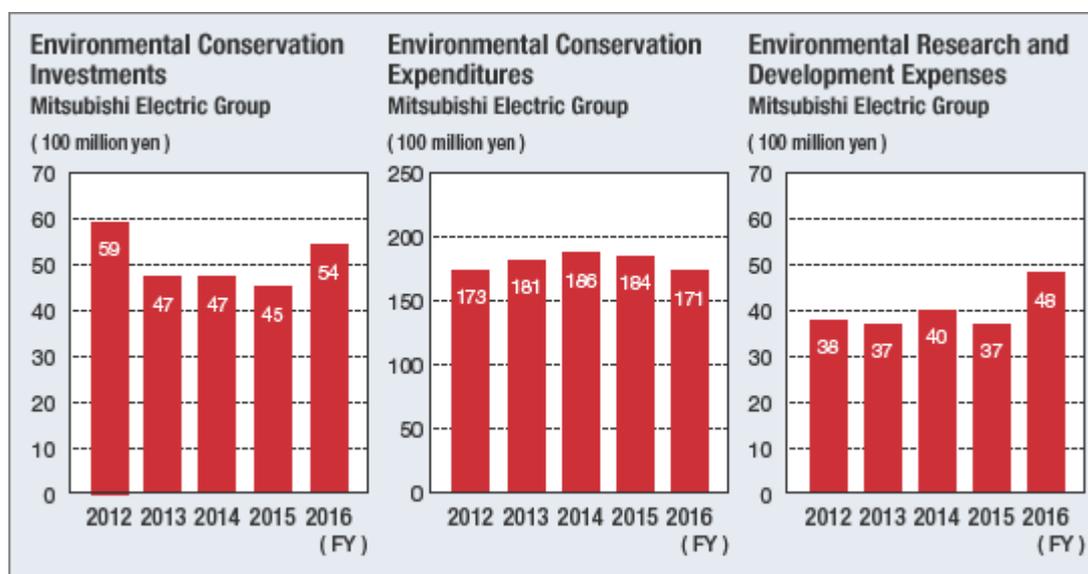
Data is calculated for environmental conservation costs, environmental conservation benefits (environmental performance), and economic benefits from environmental conservation activities (actual profit or cost-saving benefits) in accordance with the Environmental Accounting Guidelines (fiscal 2006 edition) issued by Japan's Ministry of the Environment. Economic benefits are ascertained in terms of real benefits, which consist of earnings and savings, and estimated benefits. Estimated benefits include the economic benefits to customers of using our products, such as lower electricity bills, and environmental improvements produced outside our business sites.

* Environmental conservation costs reflect straight-line depreciation for capital investments made over the past five years and assumed to have useful lives of five years. The annual benefits of earnings and savings attributable to capital investments, too, are assumed to have resulted from investments over the past five years.

* For comparisons to the previous year, the previous year's data has also been revised to reflect changes in the scope/range of data.

Summary of Fiscal 2016

Environmental Conservation Costs



Environmental Conservation Costs

Top figure: Mitsubishi Electric Group / Bottom figure: Mitsubishi Electric / Unit: 100 million yen

Item	Capital Investment	Costs	Year-on-Year Change	Main Costs
Business area activities	52.0	100.1	(7.8)	-
	34.9	70.0	(0.0)	
Pollution prevention	5.3	13.8	(13.4)	Emission purification equipment overseas Facility management, wastewater treatment, pollution measurement, soil investigation/treatment
	3.1	10.5	(8.2)	
Global environmental conservation	45.7	57.3	9.8	Updating of utilities, such as air conditioners, lighting, and compressors to high-efficiency models, introduction of residual heat recovery systems, updating of production facilities
	31.4	42.3	9.1	
Resource recycling	1.0	28.9	(4.3)	Outsourcing of industrial waste disposal, waste management, PCB-related treatment
	0.3	17.2	(0.8)	
Upstream and downstream from production	0.0	2.4	(3.2)	Packaging improvement activities, contained material investigation/analysis
	0.0	2.2	(2.0)	
Management activities	0.1	15.1	(16.1)	Environment Bureau, beautification/afforestation, ISO assessment, education
	0.0	11.8	(12.8)	
R&D activities	1.5	47.9	11.3	Development of SiC devices, development of air-conditioning devices compliant with refrigerant regulations, development of energy-saving products, development of C-GIS for offshore wind power generation, development of high-productivity technologies
	1.4	47.2	11.7	
Community activities	0.0	0.3	(0.0)	Beautification/clean-up activities around business sites, Satoyama Woodland Preservation activities, regional volunteer activities
	0.0	0.2	(0.0)	
Environmental damage	0.0	2.0	0.2	Air pollution load tax
	0.0	2.0	0.2	
Consolidated total	53.7	170.5	(13.0)	
Non-consolidated total	36.3	135.5	(0.7)	-

Environmental Conservation Benefits (Environmental Performance)

Top figure: Mitsubishi Electric Group / Bottom figure: Mitsubishi Electric

Item	Unit	Fiscal 2016	Year-on-Year Change	Year-on-Year Per Net Sales
Total energy used	10,000 GJ	1,911	(8)	98%
		1,154	(3)	100%
Total water used	10,000 m3	1,078	(44)	95%
		754	(16)	98%
Total greenhouse gas emissions	10,000 tons-CO ₂	128	4	102%
		64	6	110%
CO ₂ (energy consumption)	10,000 tons-CO ₂	104	9	108%
		58	7	113%
HFC, PFC, SF ₆	10,000 tons-CO ₂	24	(5)	81%
		6.2	(0.8)	89%
Total releases and transfers of chemical substances into the atmosphere	Tons	740	(137)	83%
		456	(60)	88%
Total wastewater discharged	10,000 m3	901	(35)	95%
		646	(32)	95%
Total releases and transfers of chemical substances into the water and soil	Tons	15	(29)	34%
		5.4	(4.6)	54%
Total waste discharged	Tons	212,081	(11,787)	93%
		84,606	(5,437)	94%
Final disposal	Tons	470	(184)	71%
		1.4	0.4	140%

Environmental Conservation Benefits

Economic Benefits from Environmental Conservation Activities (Actual Benefits)

Top figure: Mitsubishi Electric Group / Bottom figure: Mitsubishi Electric / Unit: 100 million yen

Item	FY2016	Year-on-Year Change	Main Benefits
Earnings	31.8	(6.0)	Profits from sale of valuable resources (scrap metals, waste plastics, paper, cardboard, and wooden boards)
	20.4	1.4	
Savings	29.4	(1.0)	Savings in electricity bills through improving energy efficiency, reduction in package cushioning
	17.9	3.2	
Consolidated total	61.1	(7.0)	–
Non-consolidated total	38.2	4.7	–

Economic Benefits from Environmental Consideration in Products and Services (Estimated Benefits)

Top figure: Mitsubishi Electric Group / Bottom figure: Mitsubishi Electric / Unit: 100 million yen

Item	Amount	Main Benefits
Consolidated total	34,420	Reduced electricity costs owing to lower energy consumption of 124 finished products that are targeted for reducing CO ₂ from product usage.*
Non-consolidated total	27,071	

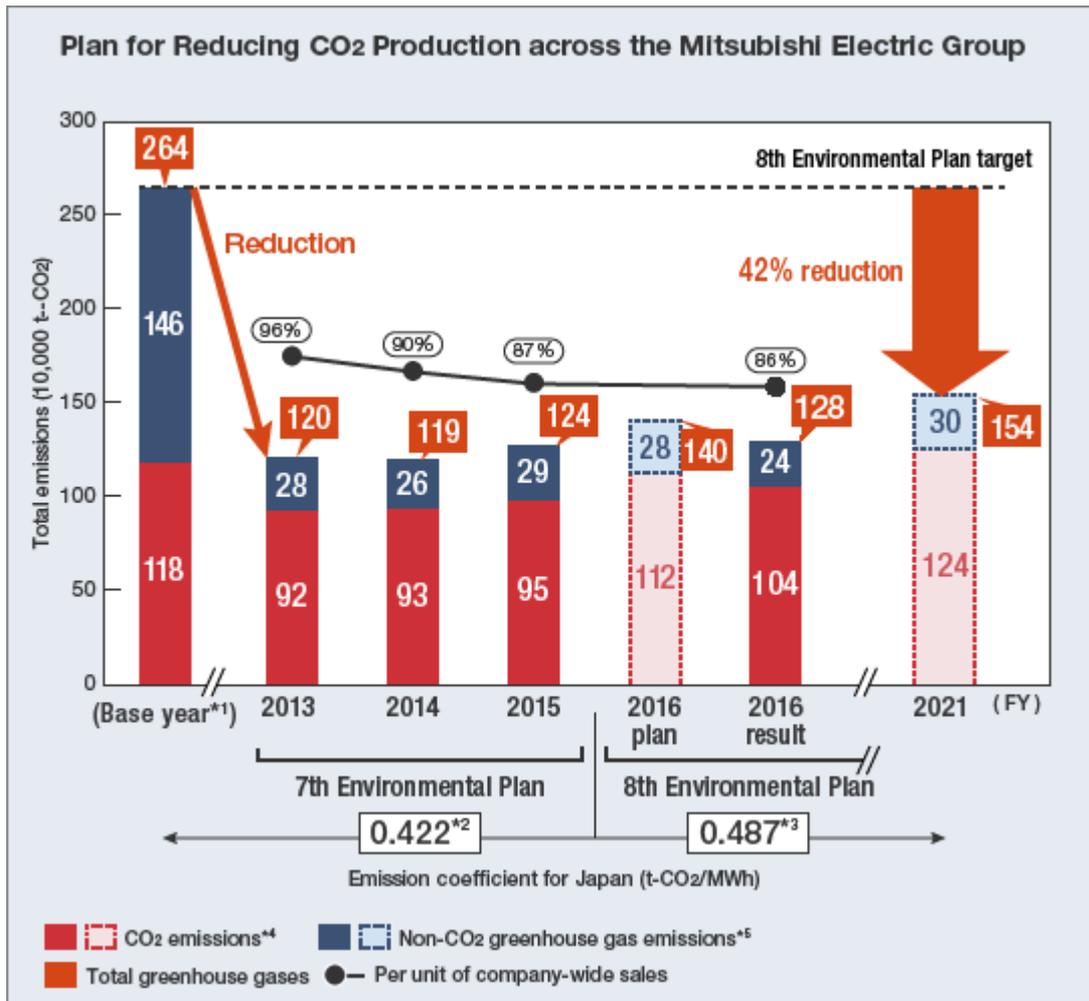
* Base products for reducing energy consumption are those products sold in FY2001. The energy prices appearing in IEA Energy prices and taxes were referred to when calculating the amount of benefit.

Environment – Environmental Performance Data

Results of Activities in Fiscal 2016

- ▶ Plan for Reducing CO₂ from Production across the Mitsubishi Electric Group
- ▶ Plan for Reducing CO₂ from Product Usage through Improving Energy Efficiency
- ▶ Contribution to reducing CO₂ from product usage
- ▶ Total CO₂ Emissions in Distribution
- ▶ Fiscal 2016 Composition Ratio of Transport Volume by Transport Means
- ▶ Total Waste Output [Mitsubishi Electric]
- ▶ Total Waste Output [Affiliates in Japan]
- ▶ Total Waste Output [Overseas affiliates]
- ▶ Plan for Reducing Resource Inputs
- ▶ Japan-wide Recycling of Four Kinds of Mitsubishi Electric Home Appliances
- ▶ Packaging Materials Usage and Per Net Shipping Weight
- ▶ Fiscal 2016 Trend in Water Usage and Water Recycling Volume
- ▶ Fiscal 2016 Breakdown of Water Usage
- ▶ Fiscal 2016 Breakdown of Water Usage by Region Overseas
- ▶ Material Balance of Chemical Substances Subject to Regulation
- ▶ Environmental Accounting
- ▶ Result of fostering leaders for Outdoor Classroom (cumulative total)
- ▶ Numbers of Mitsubishi Electric Outdoor Classrooms through FY2016
- ▶ Plan for increasing number of people participating in Mitsubishi Electric Outdoor Classroom and Satoyama Woodland Preservation Project

Reducing CO2 from Production



*1 Base year for CO₂: Mitsubishi Electric parent company, fiscal 1991; affiliates in Japan, fiscal 2001; and overseas affiliates, fiscal 2006.

Base year for non-CO₂ greenhouse gasses: Mitsubishi Electric parent company and affiliates in Japan, fiscal 2001; overseas affiliates, fiscal 2006.

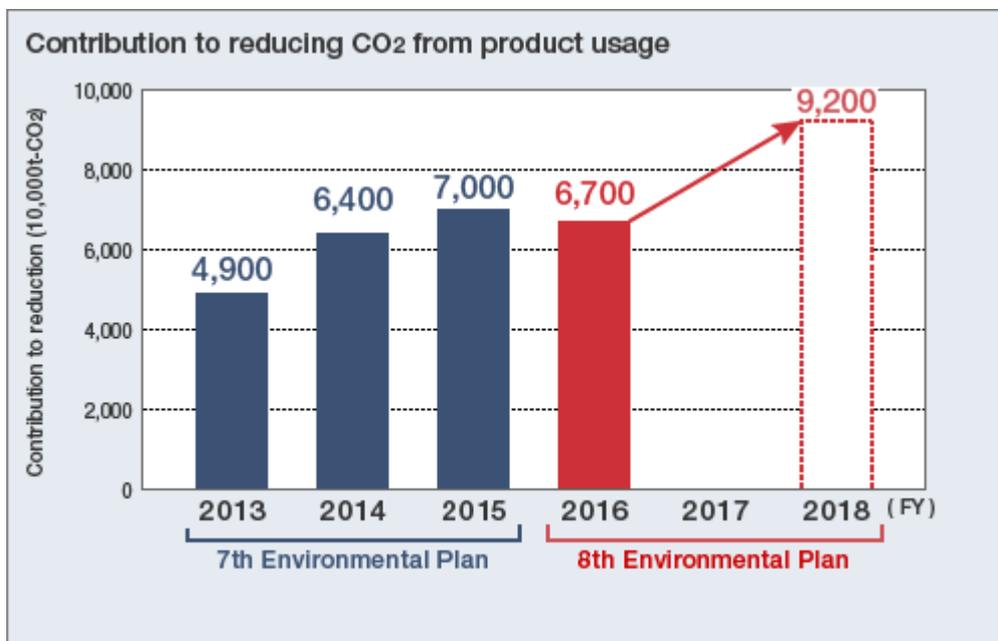
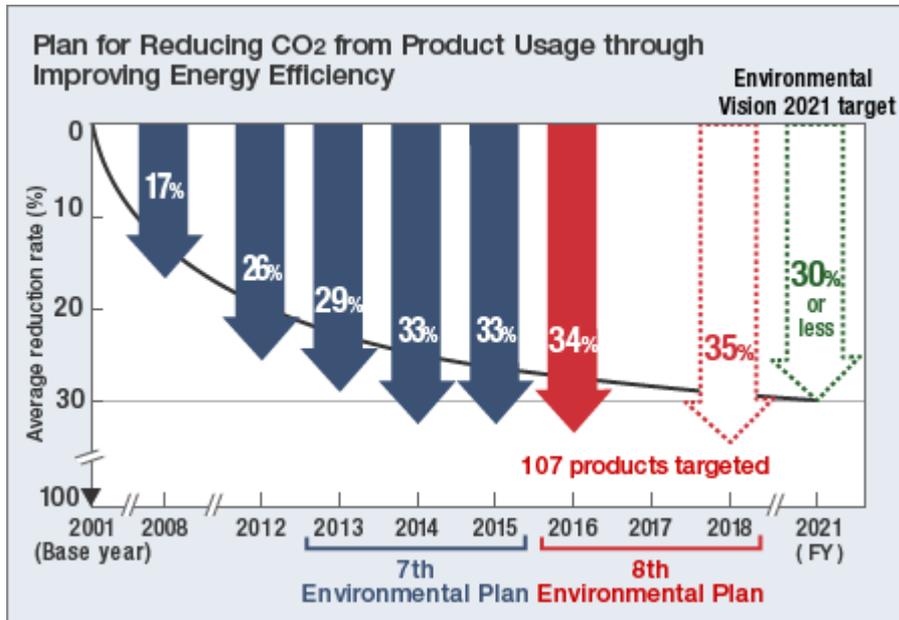
*2 Figure published by the Japan Electrical Manufacturers' Association (JEMA) in 1997

*3 Figure published by the Federation of Electric Power Companies of Japan at the time of drawing up the 8th Environmental Plan (in 2013, when two nuclear power stations were operational)

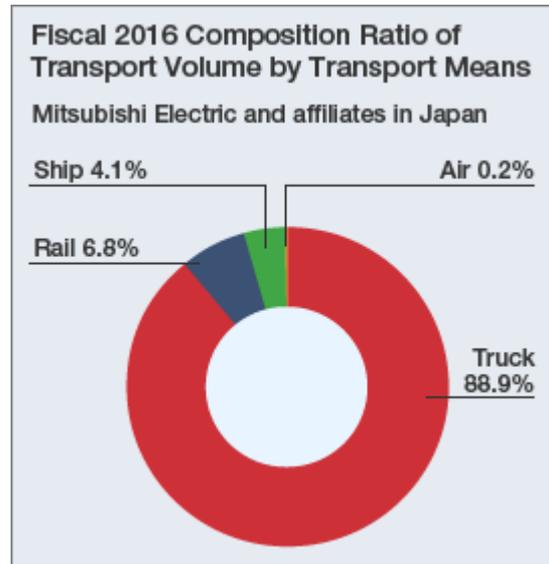
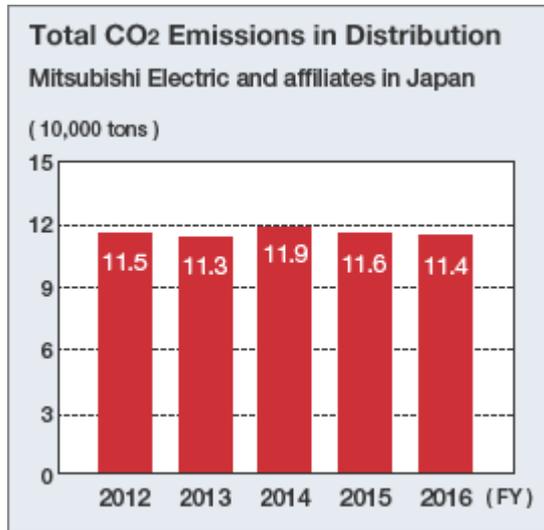
*4 Figure published by JEMA in 2006 has been referred to for calculating the overseas emission coefficient.

*5 Figure published in IPCC's Second Assessment Report was referred to for calculating the Global Warming Potential (GWP) for non-CO₂ greenhouse gases.

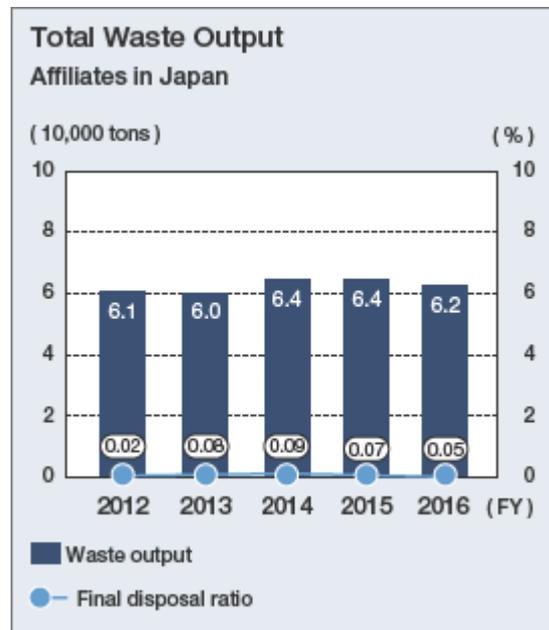
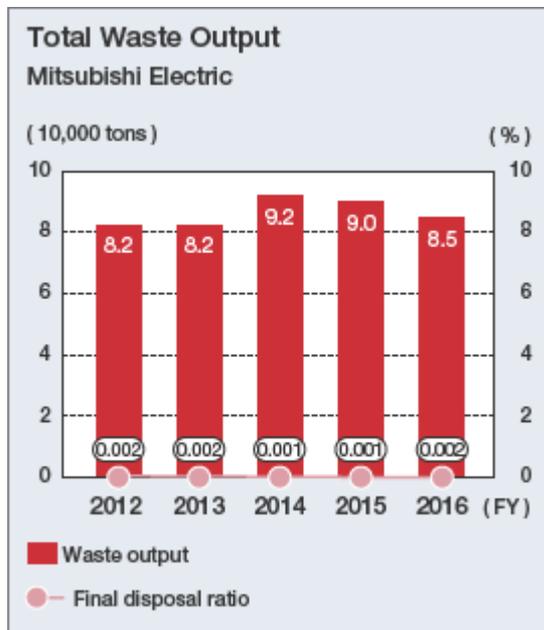
Contribution to Reducing CO2 from Product Usage



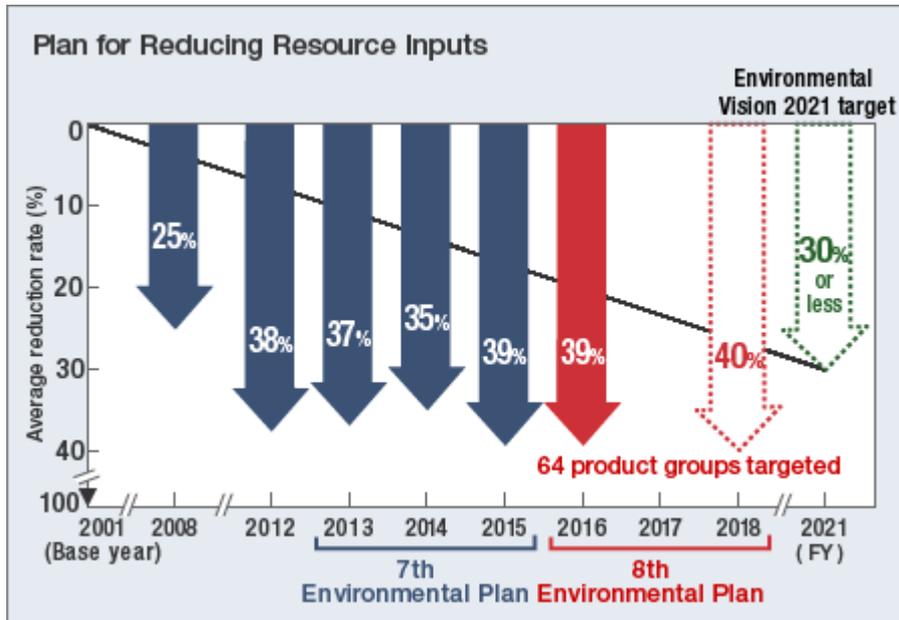
Reducing CO2 from Logistics



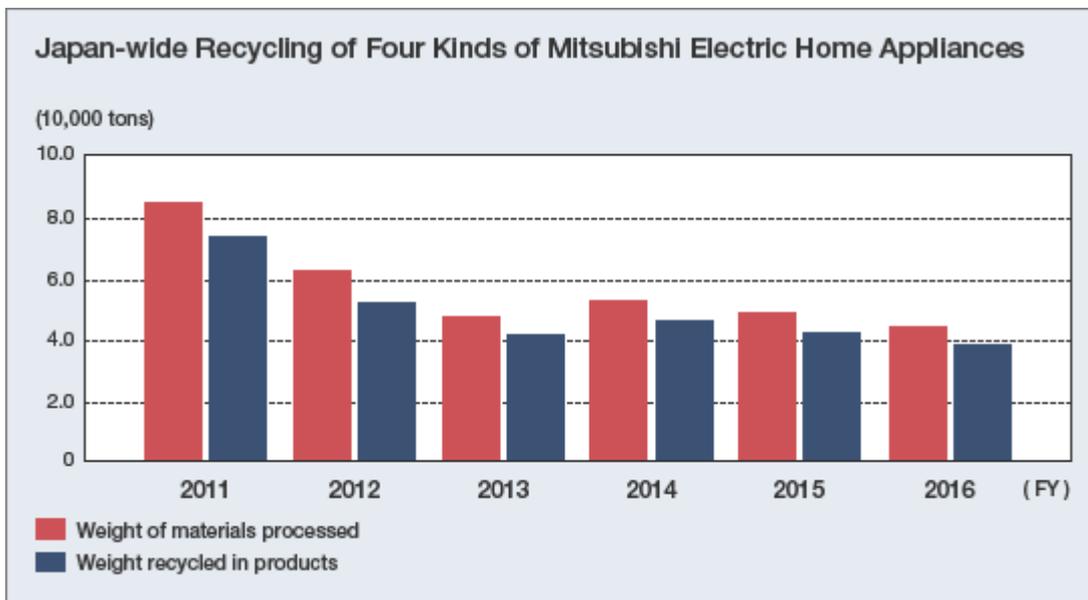
Effective Utilization of Resources



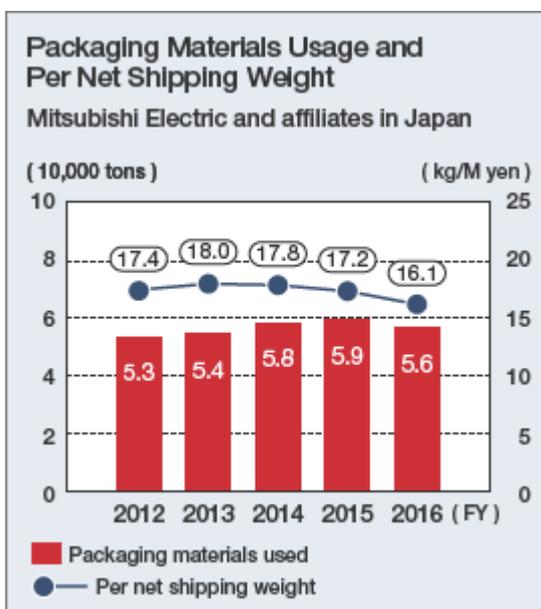
Reducing Resource Inputs



Recycling End-of-Life Products

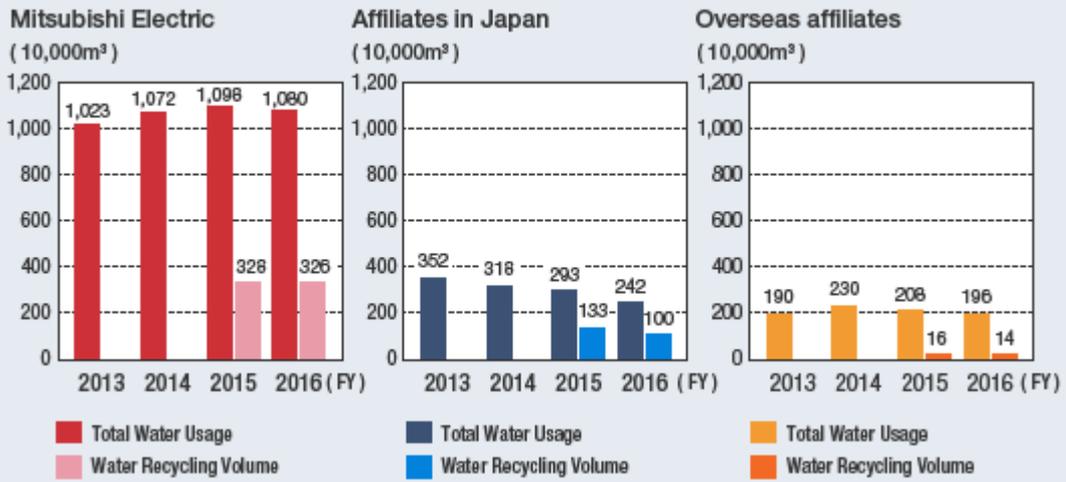


Reducing the Use of Disposable Packaging Materials

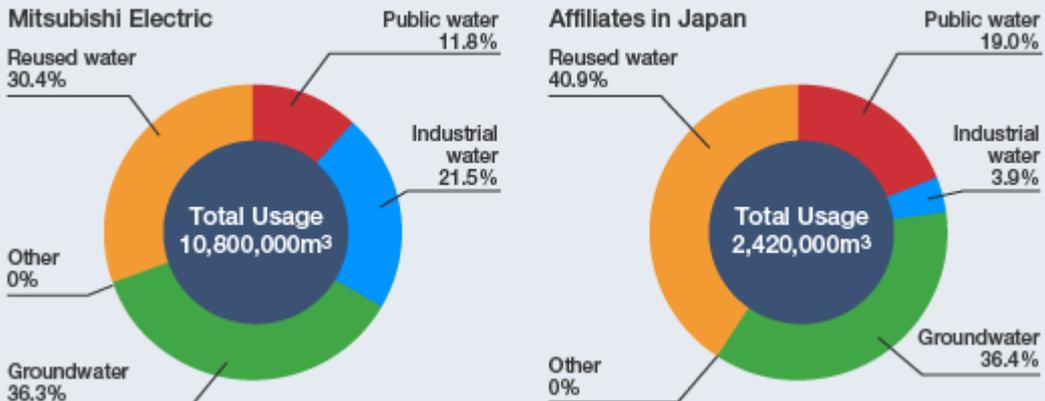


Using Water Effectively

Fiscal 2016 Trend in Water Usage and Water Recycling Volume



Fiscal 2016 Breakdown of Water Usage



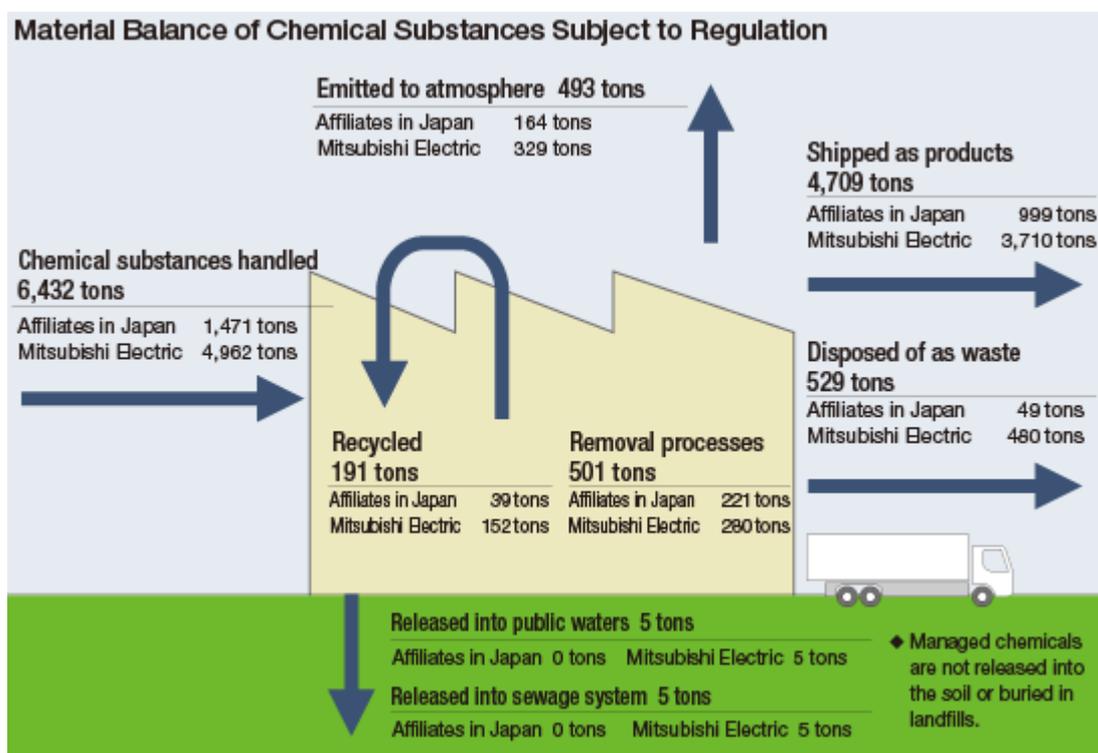
Fiscal 2016 Breakdown of Water Usage by Region Overseas

(units : m3)

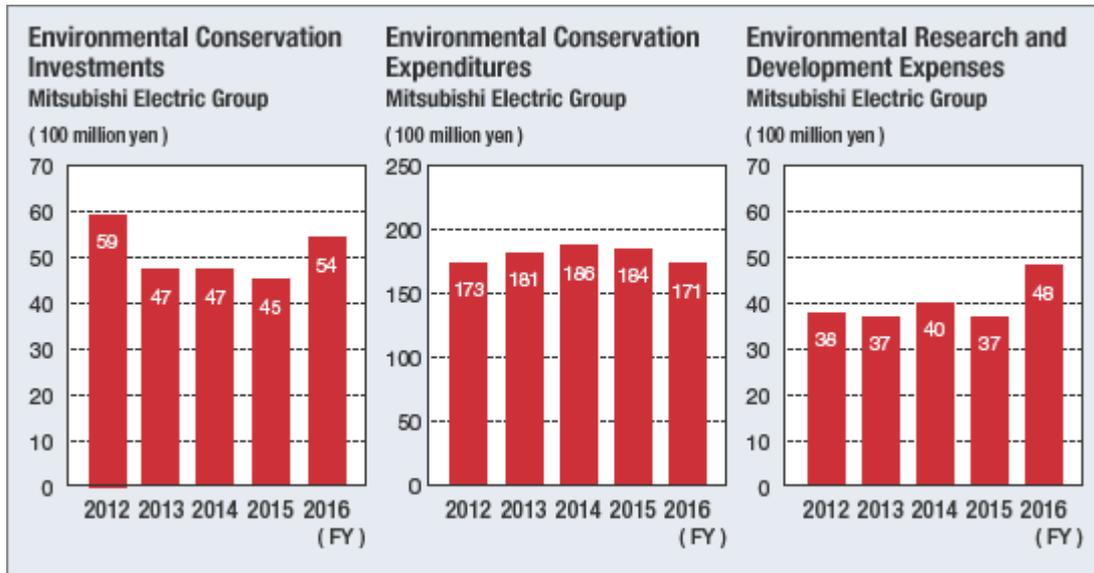
	Water Usage				Water Discharged		
	Total Usage	Public Water / Industrial Water	Groundwater	Rivers / Spring Water	Total Amount	Sewage	Public Water
China	774,407	773,032	0	1,375	639,076	630,107	0
Southeast Asia	854,669	978,411	0	0	647,526	404,918	242,608
Europe	17,026	17,026	0	0	5,147	5,147	0
North America	32,108	29,489	0	2,619	26,079	26,079	0
Central & South America	19,443	30	19,413	0	6,202	6,202	0
Total	1,821,396	1,797,989	19,413	3,994	1,324,031	1,072,454	242,608

Managing Chemical Substances

Material Balance of Chemical Substances Subject to Regulation

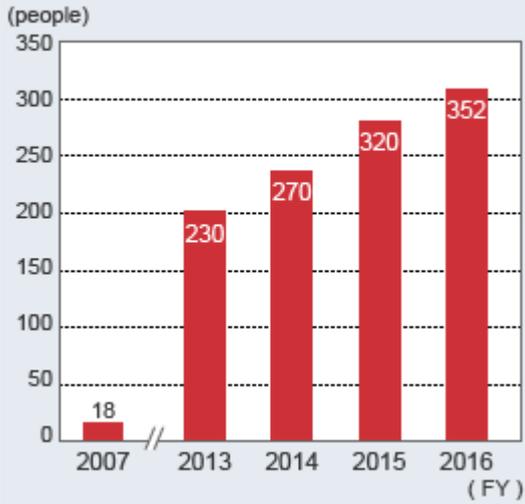


Environmental Accounting

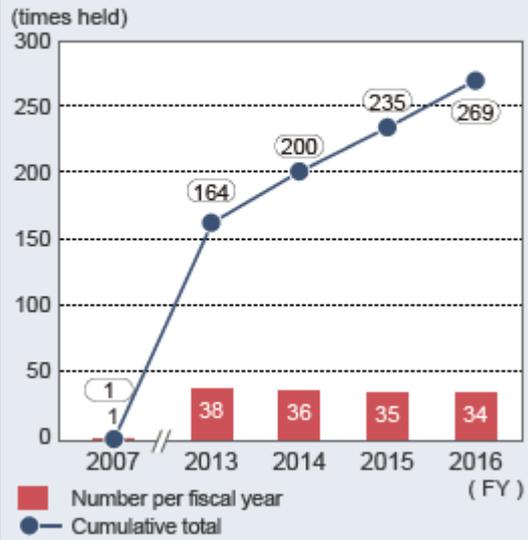


Mitsubishi Electric Outdoor Classroom

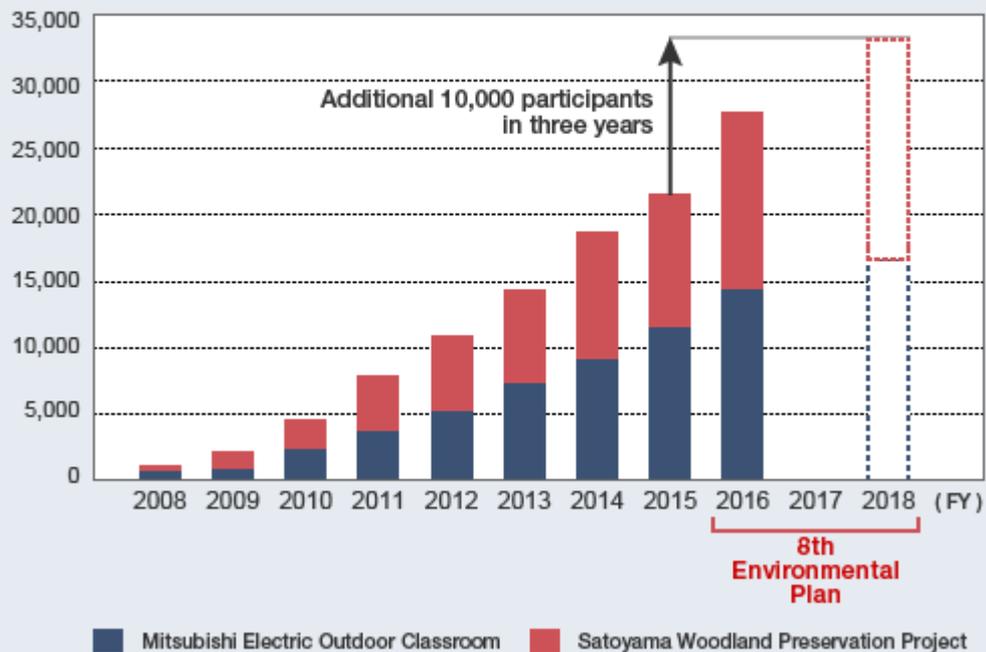
Result of fostering leaders for Outdoor Classroom (cumulative total)



Numbers of Mitsubishi Electric Outdoor Classrooms through FY2016



Plan for increasing number of people participating in Mitsubishi Electric Outdoor Classroom and Satoyama Woodland Preservation Project



Environment – Awards

Awards

Award	Sponsor	Accomplishment / Product	Recipient Company (Site)
Prize of the Director-General of Kansai Bureau of Economy, Trade and Industry Fiscal 2014 Leading Factory for Rationalization of Electric Power Use	Ministry of Economy, Trade and Industry	Implementation of energy-saving activities through improvement in energy utilization technologies at the works	Mitsubishi Electric Corporation Air Conditioning & Refrigeration Systems Works
12th Eco-Products Awards Chairperson's Award	Eco-Products Awards Steering Committee	Introduction of Model 1000 renewed railcar equipped with VVVF inverter using full SiC power modules	Odakyu Electric Railway Co. Ltd., Mitsubishi Electric Corporation
Fiscal 2015 Excellence in Energy-Conservation Equipment Awards METI Minister's Award	The Japan Machinery Federation (JMF)	Electric power regeneration and harmonic loss reduction system using full SiC power modules for railcars	Mitsubishi Electric Corporation
Fiscal 2015 New Energy Award Chairman of the New Energy Foundation Prize	New Energy Foundation	High-efficiency power conditioner for photovoltaic power generation system	Mitsubishi Electric Corporation
2015 Energy Conservation Grand Prize Products and business models category METI Minister's Award (Product category: Households)	The Energy Conservation Center, Japan (ECCJ)	FZ/FZV Series Kirigamine room air conditioners	Mitsubishi Electric Corporation
2015 Energy Conservation Grand Prize Products and Business Models Category ECCJ Chairman's Prize	The Energy Conservation Center, Japan (ECCJ)	HID-type LED lamp system	Mitsubishi Electric Lighting Corporation
Fiscal 2015 Kanto Region Invention Awards Education, Culture, Sports, Science and Technology Minister's Encouragement Prize for Invention	Japan Institute for Promoting Invention and Innovation	Hybrid energy-saving technology for air conditioners (Patent No. 5585556)	Mitsubishi Electric Corporation Shizuoka Works

Fiscal 2015 Kanto Region Invention Awards Shizuoka Governor's Award	Japan Institute for Promoting Invention and Innovation	Package air conditioner with built-in low standby power control (Patent No. 5264871)	Mitsubishi Electric Corporation Shizuoka Works, Mitsubishi Electric Consumer Products (Thailand) Co., Ltd., Mitsubishi Electric Air Conditioning Systems Europe
Fiscal 2015 Kanto Region Invention Awards Encouragement Award	Japan Institute for Promoting Invention and Innovation	Hot-water supply system that prevents operation with no hot water left in the storage tank (Patent No. 5556728)	Mitsubishi Electric Corporation Gunma Works
Fiscal 2015 Kanto Region Invention Awards Encouragement Award	Japan Institute for Promoting Invention and Innovation	Hot water storage-type hot water heater with improved energy-saving performance (Patent No. 5604966)	Mitsubishi Electric Corporation Gunma Works
Fiscal 2015 Kanto Region Invention Awards Japan Patent Attorneys Association President's Encouragement Award	Japan Institute for Promoting Invention and Innovation	Mirror that improves the quality of laser processing (Patent No. 4552848)	Mitsubishi Electric Corporation Manufacturing Engineering Center
Fiscal 2015 Kanto Region Invention Awards Kyoto Institute of Invention and Innovation Award	Japan Institute for Promoting Invention and Innovation	LCD using a laser light source with a wide range of color reproduction (Patent No. 5132819)	Mitsubishi Electric Corporation Advanced Technology R&D Center, Information Technology Center, Air Conditioning & Refrigeration Systems Works, Itami Region, Design Center, Mitsubishi Electric Lighting Corporation
Fiscal 2015 Chubu Region Invention Awards Gifu Governor's Prize	Japan Institute for Promoting Invention and Innovation	Eccentric estimation system for rotating electrical machinery (Patent No. 5592688)	Mitsubishi Electric Corporation Advanced Technology R&D Center, Nakatsugawa Works
2015 (64th) Electrical Industry Technology Achievement Awards Excellence Award	The Japan Electrical Manufacturers' Association (JEMA)	Development of Kirigamine Z Series air conditioners with enhanced heating performance and improved energy-saving performance by cutting cold air	Mitsubishi Electric Shizuoka Works, Manufacturing Systems Division
2015 (64th) Electrical Industry Technology Achievement Awards Excellence Award	The Japan Electrical Manufacturers' Association (JEMA)	Development of MELSEC iQ-R next-generation programmable controllers	Mitsubishi Electric Corporation Nagoya Works

2015 (64th) Electrical Industry Technology Achievement Awards Encouragement Award	The Japan Electrical Manufacturers' Association (JEMA)	Development of DC switching equipment that does not specify current- carrying directions and ensures high reliability	Mitsubishi Electric Corporation Advanced Technology R&D Center, Fukuyama Works
Fiscal 2015 (64th) Electrical Industry Technology Achievement Awards Encouragement Award	The Japan Electrical Manufacturers' Association (JEMA)	Development and commercialization of shut- off switch mechanism that does not require re- adjustment during manufacturing	Mitsubishi Electric Corporation Advanced Technology R&D Center, Grid Power Systems Works
Japan Packaging Contest 2015 Appropriate Packaging Awards	Japan Packaging Institute	Optimized package for straight sirocco fan using cardboard shock absorber	Mitsubishi Electric Corporation Nakatsugawa Works, Mitsubishi Electric Engineering Co., Ltd.
JECA FAIR 2015 Product Contest JECA Encouragement Award	Japan Electrical Construction Association	MS-T Series electromagnetic switching equipment	Mitsubishi Electric Corporation Nagoya Works
IDEA 2015 Finalist	Industrial Designers Society of America	GOT2000 Series	Mitsubishi Electric Corporation Nagoya Works
Fiscal 2016 Good Design Award	Japan Institute of Design Promotion	MELSEC iQ-R Series programmable controller	Mitsubishi Electric Corporation Nagoya Works
iF Design Award 2016	iF International Forum Design GmbH	MELSEC iQ-R programmable controller	Mitsubishi Electric Corporation Nagoya Works
58th Best 10 New Products Awards Grand Award	Nikkan Kogyo Shinbun	ML605GTF3—5350UM laser-processing machine for substrate drilling ,	Mitsubishi Electric Corporation Nagoya Works
2015 R&D 100 Awards	R&D Magazine	Highly reliable, superior economic switch for HVDC system	Mitsubishi Electric Corporation Advanced Technology R&D Center, Fukuyama Works
2015 (42nd) "Environmental Awards" Minister of the Environment Award/Excellence Award	Hitachi Foundation	Radioactivity analysis technology that enables rapid measurement	Mitsubishi Electric Corporation Advanced Technology R&D Center, Kyushu University Graduate School
Fiscal 2014IPSJ Kiyasu Special Industrial Achievement Award	Information Processing Society of Japan	Complete automation of factory parts supply	Mitsubishi Electric Corporation Advanced Technology R&D Center, Nagoya Works
Fiscal 2015 Hyogo Prefecture Awards Hyogo Invention Award	Hyogo Prefecture	Elevator group control system	Mitsubishi Electric Corporation Advanced Technology R&D Center

Fiscal 2015 Hyogo Prefecture Awards Hyogo Invention Award	Hyogo Prefecture	Semiconductor device	Mitsubishi Electric Corporation High Frequency & Optical Device Works
Fiscal 2015 Hyogo Prefecture Awards Hyogo Invention Award	Hyogo Prefecture	High-frequency attenuator	Mitsubishi Electric Corporation Communication Systems Works
18th Japan Ozone Layer Protection and Global Warming Prevention Awards Excellence Award	Nikkan Kogyo Shinbun	Dissemination of CFC leak testing systems	Mitsubishi Electric Building Techno-Service Co., Ltd.
Special Awards Commemorating 90th Anniversary of Foundation Contribution Award	Japan Society of Refrigerating and Air Conditioning Engineers	Contribution to the Society through corporate activities, including dissemination of refrigeration and air conditioning technologies, engineer training, and R&D.	Mitsubishi Electric Corporation, Mitsubishi Electric Building Techno-Service Co., Ltd.
Fiscal 2016 Kanagawa Environmental Conservation Association Awards President's Award	Kanagawa Environmental Conservation Association	Efforts for environmental conservation over many years	Mitsubishi Electric TOKKI System Corporation
Green Curtain Contest Group/Corporate category Excellence Prize	Isahaya City Nagasaki Prefecture	Green curtains using goya (bitter gourds)	Melco Advanced Device Corporation
8th Kids Design Awards Category: Individuals and Households Excellence Award: Best in Category	Kids Design Association	"iNSTICK", cordless stick vacuum cleaner equipped with air purifier	Mitsubishi Electric Corporation, Mitsubishi Electric Home Appliance Co., Ltd.
9th Kids Design Award Category: General	Kids Design Association	Mitsubishi personal humidifier	Mitsubishi Electric Corporation, Mitsubishi Electric Home Appliance Co., Ltd.
9th Kids Design Award Category: General	Kids Design Association	Efforts to promote Kids Design through "Raku Raku Assist"	Mitsubishi Electric Corporation
9th Kids Design Award Category: Designs for Consumers Who Will Lead the Future	Kids Design Association	Mitsubishi HEMS HEMS controller application	Mitsubishi Electric Corporation
9th Kids Design Award Category: Designs for Consumers Who Will Lead the Future	Kids Design Association	Mitsubishi Electric Outdoor Classrooms	Mitsubishi Electric Corporation
9th Kids Design Award Category: Communities and Society	Kids Design Association	"Diamond Kids Shonan," nursery at business site	Mitsubishi Electric Corporation, Mitsubishi Electric Life Service Corporation, Ryoei Technica Corporation

Environment – Initiatives toward Creating a Low-Carbon Society

▶ Reducing Greenhouse Gases Emitted in the Value Chain

International standards such as the Greenhouse Gas (GHG) Protocol and the Basic Guidelines on Accounting for Greenhouse Gas Emissions Throughout the Supply Chain, prepared by Japan's Ministry of the Environment, were referenced to calculate and report the amount of greenhouse gases emitted in fiscal 2016.

▶ Reducing CO₂ from Production

A report on our targets to reduce CO₂ from energy sources and greenhouse gases excluding CO₂ (SF₆, HFC and PFC), and information regarding fiscal 2016 initiatives and achievements.

▶ Contribution to Reducing CO₂ from Product Usage

A report on objectives and initiatives achieved in promoting energy savings in our products, and the results of reducing CO₂ by replacing old products with new highly energy-efficient products.

▶ Reducing CO₂ from Logistics

Overview of the Mitsubishi Electric Group's fiscal 2016 achievements in reducing CO₂ emissions through just-in-time improvements to boost logistics efficiency.

Environment – Reducing Greenhouse Gases Emitted in the Value Chain

Measures to Comply with GHG Protocol Scope 3

The Mitsubishi Electric Group refers to regulations such as the Greenhouse Gas (GHG) Protocol—international standards relating to the calculation of greenhouse gas emissions—and the Basic Guidelines on Accounting for Greenhouse Gas Emissions Throughout the Supply Chain, published by Japan’s Ministry of the Environment, to determine how to assess and calculate emissions from business activities (Scope 1 and 2) and indirect emissions from outside the range of its business activities (Scope 3).

Owing to the fact that over 80% of CO₂ emissions in the value chain are associated with the use of sold products, the Mitsubishi Electric Group focuses on developing highly energy-efficient products that are linked to reducing CO₂ emissions during product usage. At the same time, we strive to continuously reduce CO₂ emissions from production, as well as the emission of other greenhouse gases with greater global warming potential than CO₂.

Fiscal 2016 Greenhouse Gas Emissions

Scope	Accounting (10,000 tons-CO ₂) (Below: Total emission ratio)	Accounting summary *1
Scope 1 All direct GHG emissions	37 (0.9%)	Direct emissions from using fuel and industrial processes at our company *2
Scope 2 Indirect GHG emissions from consumption of purchased electricity, heat, or steam	93 (2.1%)	Indirect emissions associated with using electricity and heat purchased by our company *3
Scope 3 All indirect emissions not covered in Scope		
Category 1 Purchased goods and services	534 (12.5%)	Emissions associated with activities until material, etc. is manufactured concerning raw ingredients, parts, purchased products, and sales *4
Category 2 Capital goods	61 (1.4%)	Emissions produced from constructing/manufacturing own capital goods
Category 3 Fuel- and energy-related activities	8 (0.2%)	Emissions associated with procurement of fuels from other parties and fuel necessary for generation of electricity, heat, etc.
Category 4 Upstream transportation and distribution	46 (1.1%)	Emissions associated with logistic processes for material, etc. to be delivered to our company concerning raw ingredients, parts, purchased products, and sales *5
Category 5 Waste generated in operations	0.07 (0.0%)	Emissions associated with transporting and processing waste produced by our company *6
Category 6 Business travel	4 (0.1%)	Emissions associated with employee business travel *7

Category 7 Employee commuting	3 (0.1%)	Emissions associated with employees commuting to and from their respective workplaces
Category 8 Upstream leased assets	–	Emissions associated with operation of leased assets hired by our company (excluded if calculated in Scopes 1 and 2)
Category 9 Downstream transportation and distribution	0.7 (0.0%)	Emissions associated with the transportation, storage, cargo handling, and retail of products
Category 10 Processing of sold products	0.2 (0.0%)	Emissions associated with the processing of interim products by business operators
Category 11 Use of sold products	3,464 (81.3%)	Emissions associated with the use of products by users (consumers / business operators)
Category 12 End-of-life treatment of sold products	3 (0.1%)	Emissions associated with the transportation and processing of products for disposal by users (consumers / business operators) *4
Category 13 Downstream leased assets	0.013 (0.1%)	Emissions associated with operation of leased assets
Category 14 Franchises	(n/a)	Emissions at companies operating as franchises
Category 15 Investments	10 (0.2%)	Emissions related to investments
Total	4,264 (100%)	

*1 Excerpt from the fundamental guidelines published by the Ministry of Environment and Ministry of Economy, Trade and Industry

*2 CO₂, SF₆, PFC, and HFC emissions from use of gas, heavy oil, etc., and product manufacturing

*3 CO₂ emissions from use of electricity, etc.

*4 Excludes some regions

*5 CO₂ emissions from product distribution/circulation (sales distribution)

Subject to accounting: 84 companies (production sites)

*6 CO₂ emissions from transportation of waste (waste distribution)

Subject to accounting: Mitsubishi Electric

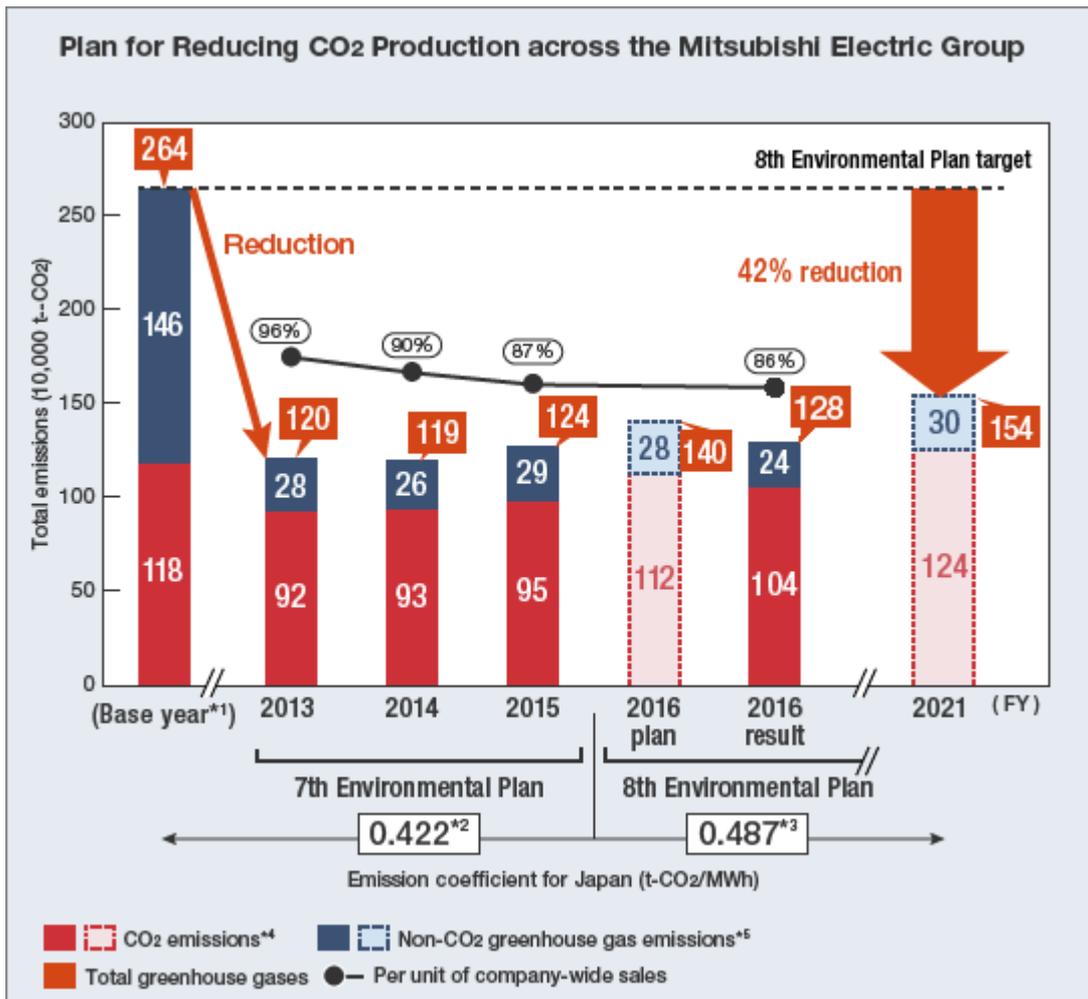
*7 Achievements in Japan

Environment – Reducing CO2 from Production

Targets of the 8th Environmental Plan (Fiscal 2016 to 2018) and Achievements of Fiscal 2016

In the 8th Environmental Plan (fiscal 2016 to 2018), we will move forward with activities to reduce the emissions of "CO₂ originating from energy" combined with "non-CO₂ greenhouse gases (SF₆, HFCs, and PFCs)". Our goal is to lower annual emissions of all types of greenhouse gases to the CO₂-equivalent of 1.54 million tons or less by fiscal 2021.

In fiscal 2016, the first year of the plan, CO₂ emissions amounted to 1.28 million tons, surpassing our goal of 1.4 million tons. The major factors behind this achievement were: (1) aging air conditioners and transformers replaced with high-efficiency equipment in Japan, (2) progress in the shift to LED lighting in Japan, (3) energy savings owing to the development of original production technologies overseas, and (4) improved recovery capacity for SF₆ gas.



*1 Base year for CO₂: Mitsubishi Electric parent company, fiscal 1991; affiliates in Japan, fiscal 2001; and overseas affiliates, fiscal 2006.

Base year for non-CO₂ greenhouse gasses: Mitsubishi Electric parent company and affiliates in Japan, fiscal 2001; overseas affiliates, fiscal 2006.

*2 Figure published by the Japan Electrical Manufacturers' Association (JEMA) in 1997.

*3 Figure published by the Federation of Electric Power Companies of Japan at the time of drawing up the 8th Environmental Plan (in 2013, when two nuclear power stations were operational)

*4 Figure published by JEMA in 2006 has been referred to for calculating the overseas emission coefficient.

*5 Figure published in IPCC's Second Assessment Report was referred to for calculating the Global Warming Potential (GWP) for non-CO₂ greenhouse gases.

Initiatives to Reduce CO2 Originating from Energy and the Results

For reducing CO₂ originating from energy, our activities focused on pushing forward with energy savings in utilities and production facilities. As a result, we reduced emissions by 28,000t in fiscal 2016.

The following initiatives to promote energy savings in utilities resulted in reducing the CO₂ originating from energy by 14,000t: (1) updating of aging air-conditioners to high-efficiency equipment and improvement in operations, (2) introducing LED lighting and improvements in operations, (3) updating fans and pumps to high-efficiency models, and (4) improving the operations of boilers and power receiving and distribution facilities.

Our initiatives to promote energy savings at production facilities included: (1) introducing an energy-saving solutions system based on Mitsubishi Electric's "e-F@ctory" concept, (2) eliminating waste by visualizing energy consumption using this system, (3) updating heating, hydraulic, and pneumatic facilities in an effort to reduce heat loss and stand-by electricity consumption, (4) improving production processes, and (5) implementing other measures such as reducing man-hours. Consequently, we reduced CO₂ emissions by 11,000t.

Going forward, we are planning to implement the following energy-saving initiatives at production facilities: (1) early renewal of air-conditioners that have exceeded their legal service life, (2) further introduction of LED lighting at factories in Japan, (3) reducing wasted energy using the energy-use visualization system, (4) insulating heating facilities, (5) introducing the use of inverters, and (5) reducing stand-by power consumption.

[Example] Siam Compressor Industry Co., Ltd.

Siam Compressor Industry Co., Ltd. manufactures compressors used in air-conditioners and heating and cooling products in Thailand. In fiscal 2016, they reduced CO₂ emissions by 1,544t.

The introduction of heat pumps to compressor testing systems and the painting line had a particularly significant effect on reducing emissions. This helped reduce emissions by a total of 652t.

In addition, the commoditization of coolant pumps among machining equipment and the introduction of a photovoltaic power generation system led to a further reduction of 892t.



SIAM COMPRESSOR INDUSTRY CO., LTD.

[Example] Kobe Area (Kobe Works, Energy Systems Center, Grid Power System Factory)

Mitsubishi Electric has three production bases in the Kobe area. One of them is the Kobe Works, where monitoring control systems are manufactured for the utilities and railway sectors of the social infrastructure. Another base is the Energy Systems Center, where major products include power generation plant systems and particle-beam therapy systems. The last one is the Grid Power System Factory, where electric power distribution and protection control systems are manufactured.

Previously, engineers responsible for design and development were spread out throughout the area. However, the design and development functions have been consolidated and are now located in a newly constructed technology building (completed March 31, 2014) in order to strengthen our engineering organization and improve business efficiency. The new building has LED lighting with dimmer controls installed on all floors, highly efficient air-conditioners and transformers, and elevators with a regenerative power function. Additionally, various other energy-saving measures were incorporated at the time of construction, such as the adoption of insulated double-glass windows, a design utilizing light shelves provided by eaves, and a rooftop garden. Thanks to these measures, CO₂ emissions were reduced by 183t in fiscal 2016.



Technology building



LED lighting on each floor



Rooftop garden

Initiatives to Reduce SF6, HFCs, and PFCs and the Results

Non-CO₂ greenhouse gases emitted by the Mitsubishi Electric Group during its business activities include sulfur hexafluoride (SF₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). SF₆ is used inside gas-insulated switchgear for electrical insulation, as well as in the etching process during semiconductor and liquid-crystal display production. HFCs are used as refrigerants in air conditioners and refrigerators, while PFCs are used during the etching process in production of semiconductors and liquid-crystal displays.

In fiscal 2016, SF₆ emissions were further reduced owing to the increased capacity of gas collection equipment at factories in Japan and improvement in operation during the filling process at overseas plants. In total, the emissions of non-CO₂ greenhouse gases were reduced by the CO₂-equivalent of 30,000t.

In Japan, we will continue improving our capacity for SF₆ collection, as well as introduce more SF₆ and PFC abatement systems to the semiconductor etching process. Meanwhile, overseas we will test regenerators in order to increase the number of times that HFC refrigerants can be regenerated, while continuing to run our refrigerant recovery scheme.

Greenhouse Gases	Past Measures	2013	2014	2015	2016	2017	2018	2021	
SF ₆ (Sulfur hexafluoride)	Vacuum pump Abatement system Early gas-leakage detection								
HFCs (Hydrofluorocarbons)	Recovery								
PFCs (Perfluorocarbons)	Abatement system								

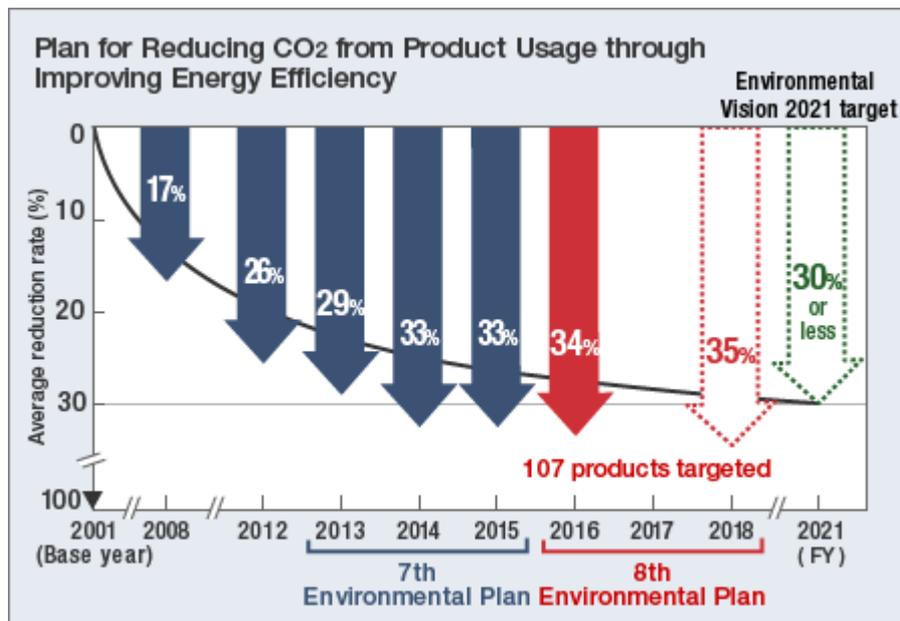
Environment – Contribution to Reducing CO₂ from Product Usage

The Mitsubishi Electric Group has approximately 260 products. Among those products, we have designated applicable products according to the following criteria: (1) the product can be designed and developed under our initiatives, and (2) the product has been specified as having a major environmental influence because it generates CO₂ during use, based on the results of a product environmental aspect analysis we conduct. For these products, we are reducing CO₂ during use and expanding our contributions to reducing CO₂ from product usage.

Targets of 8th Environmental Plan (Fiscal 2016 to 2018) for "Reducing CO₂ from Production Use" and Achievements of Fiscal 2016

CO₂ from product usage is viewed in terms of the power consumed by the customer during product usage and is taken as the CO₂ emissions resulting from production of the power consumed. Raising the energy efficiency of products enables reduction of the CO₂ during product usage. As part of the 8th Environmental Plan (fiscal 2016-2018), the Mitsubishi Electric Group aimed to achieve an average CO₂ reduction ratio of 35% (as compared to fiscal 2001) for 107 products.

The average reduction ratio was 34% in fiscal 2016, taking a step closer to our goal. In particular, further reductions were reported in the areas of industrial mechatronics products and power devices.



[Example]

Full SiC power module-equipped power regeneration and harmonic loss system for rolling stock (Mitsubishi Electric Corporation)



Winner of the Ministry of Economy, Trade and Industry (METI) Minister's Award, the top prize of Excellence in Energy-Conservation Equipment Awards in Fiscal 2016

Equipped with full SiC*1 power modules incorporating SiC transistors, major circuit elements, and SiC diodes, VVVF inverter systems*2 have been installed on railcars. The all-SiC inverter was used on a commercial railway line for the first time in the world, helping to reduce power consumption by about 40% compared to the previously existing system.

*1 Silicon carbide. SiC has higher electrical conductivity than silicon (Si), and thus contributes to reducing power loss.

*2 Variable-voltage, variable-frequency (VVVF) control system that drives AC motors at any given frequency and voltage.

"Kirigamine FZ/FZV Series" household air conditioners (Mitsubishi Electric Corporation)



Winner of the Ministry of Economy, Trade and Industry (METI) Minister's Award, the top prize of Fiscal 2016 Energy Conservation Grand Prize in the Products and Household Models category.

The "Personal Twin Flow" design, in which the left and right fans operate independently, and the development of a newly designed large-capacity heat exchanger enabled a complete change in the structure of indoor units. The product has seen a 13.3%* improvement in the Annual Performance Factor (APF) when compared to the previous year's model.

* Comparison between fiscal 2016 model MSZ-ZW565S (period power consumption of 1,765kWh) and fiscal 2017 model MSZ-FZ5616S (period power consumption of 1,558kWh), according to conditions based on JIS.

High-Intensity discharge (HID) LED lamp system (Mitsubishi Electric Lighting Co., Ltd.)



Winner of the ECCJ Chairman's Award of Fiscal 2016 Energy Conservation Grand Prize.

This is a mercury-free eco-conscious product. Compared to mercury lamps, it uses 79%* less power and lasts about 3.3 times* longer than mercury lamps.

* Comparison between HID LED lamp system Class 600 lamp and a 200W mercury lamp (including power supply).

Targets of 8th Environmental Plan (Fiscal 2016 to 2018) for "Expansion of Contribution to Reducing CO₂ from Production Use" and Achievements of Fiscal 2016

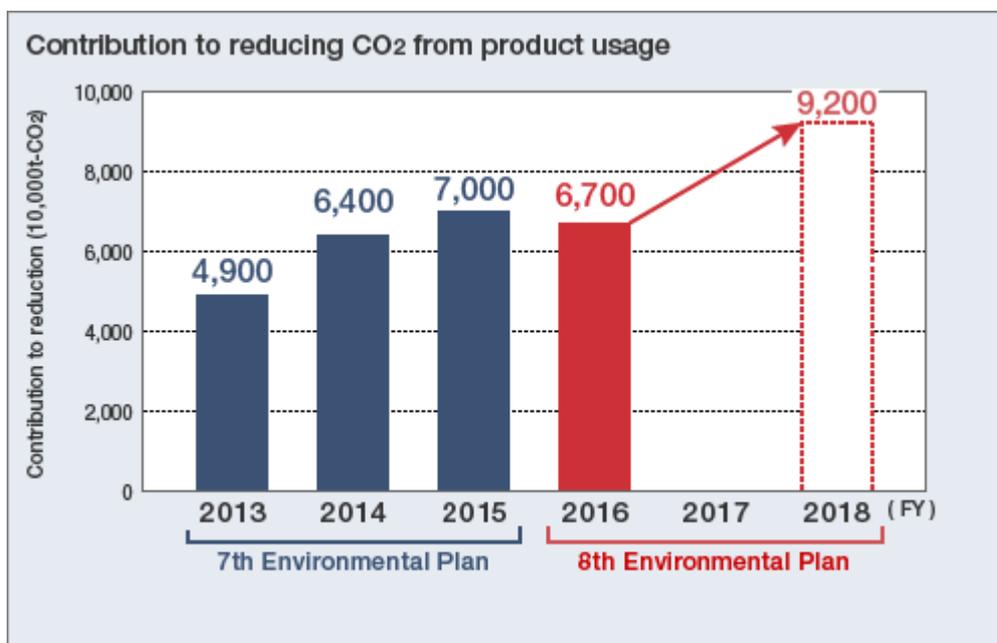
The Mitsubishi Electric Group is working to visualize and expand "contribution to reducing CO₂ from product use." Contribution to reducing CO₂ is represented by the amount of CO₂ deemed to be reduced as a result of switching from older products to new, energy-efficient products. The calculation is done based on the following formula: multiplying the effect of reducing CO₂ over the life of the product by number of units sold.

$$\text{Contribution to reducing CO}_2 = \text{Effect of reducing CO}_2 \text{ from product usage per unit} \times \text{Number of units sold during the fiscal year}$$

For the calculation of contribution to reducing CO₂ emitted, an industry-specific or public standard product-use calculation method is applied. If there is no method for calculating product use specified, we establish our own usage scenario and calculate the level of contribution to reducing CO₂. As for interim products, calculation is done by proportionally dividing product weight and sales volume ratio based on the Scope 3 guidelines of the GHG Protocol.

The target of the 8th Environmental Plan (fiscal 2016 to 2018) is to attain a reduction contribution of 92 million tons for 127 products. The fiscal 2016 reduction contribution was 67 million tons for 124 products. *

* This surpasses the amount of CO₂ emissions originating from energy in Tokyo, 60.6 million tons (as of July 2016 according to the Environmental Bureau of the Tokyo Metropolitan Government)



Breakdown of Products with Assessed Amount of Contributions to Reducing CO₂ from Product Usage

Products (number)	Examples of products	Standard/Index considered for calculation
End products (95)	Plant monitoring control systems, railcar air-conditioning systems, onboard information systems (TIS, ATC, TIMS), monitor/protection control systems for power generation plants, particle therapy systems, circuit breakers, elevators, intelligent transport systems (ITS), satellite communications earth station facilities, optic/wireless access systems, air conditioners, televisions, refrigerators, Lossnay, processing machines, robots, lighting fixtures/lamps, IH cooking heaters, etc.	Contribution gained by reducing power consumed by the product
	Energy-saving support equipment, elevator modernization, Lossnay heat exchange amount	Suppression of power used by introducing energy-saving support equipment, contribution gained by upgrading to highly efficient components at the time of renewal, previously wasted energy that is now used by heat exchange
	Circuit breakers, switchgears	Reduction in amount of SF ₆ gas leaking (CO ₂ equivalent)
	Photovoltaic power generators, turbine generators	Amount of power generated by the generator minus the energy used when generating the power, increase in amount of power generated improving generation efficiency
Interim products (29)	Compressors purchased separately from air conditioners	Contribution by incorporating product that reduces power consumption
	Inverters, motors	Contribution by incorporating product that reduces power loss
	Devices	
	Electric power steering, alternators, starters	Contribution of fuel efficiency gained by incorporating product, proportionally divided based on weight
	Combined-cycle thermal power generator	Reduction of fossil fuel use by updating old thermal power generators, contribution by proportionally dividing CO ₂ emission reduction based on sales amount

- * For the products using electricity, the CO₂ emission factor by country and region listed in CO₂ Emissions from Fuel Combustion Highlights (2013 Edition) is used.
- * For thermal power generators, the thermal power-source factor in the calculation method of the Action Plan for a Low-Carbon Society, published by an organization consisting of four electrical/electronic product manufacturers, is used.
- * For other energy use and greenhouse gases, the factor in the "Greenhouse Gas (GHG) Emissions Accounting and Reporting Manual," published by Japan's Ministry of the Environment and Ministry of Economy, Trade and Industry, is used.

Environment – Reducing CO2 from Logistics

Basic Policies on Logistics

The Mitsubishi Electric Group carries out just-in-time improvement activities to improve logistics. These activities quantify logistics work to make it visible, opening the door to greater efficiency and economy by eliminating irrational, irregular, and wasted efforts. We are also working to reduce environmental impact via "Eco-Logistics" (Economy & Ecology Logistics).

Fiscal 2016 Achievements of the Mitsubishi Electric Group

(Mitsubishi Electric and affiliates in Japan)

Shipping volume unit: 0.0312t-CO₂/million yen (1.6% reduction compared to the previous fiscal year)

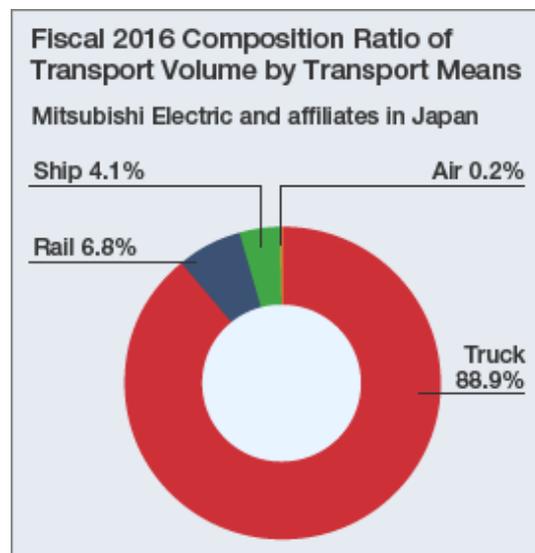
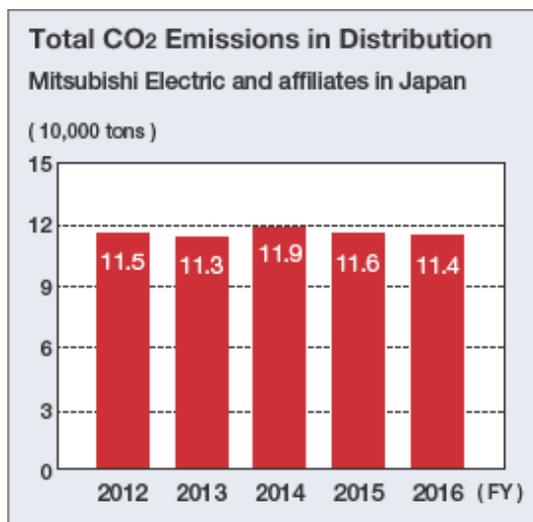
CO₂ emitted: 114,000t (2,000t reduction compared to the previous fiscal year)

The Company and its affiliates in Japan continued to carry out the following measures throughout fiscal 2016.

- Reviewing transport routes
- Implementing modal shift from truck transport to rail transport
- Reducing the number of trucks by improving load ratios

Thanks to these measures during fiscal 2016, the amount of CO₂ emitted by the Mitsubishi Electric Group fell to 98,000t (a slight decrease compared to the previous fiscal year). The amount emitted by affiliates in Japan totaled 16,000t (down 2,000t, a 9% decrease compared to the previous fiscal year).

Regarding overseas affiliates, the amount of CO₂ emitted by a total of 23 companies was 340,000t (down 3000t compared to the previous fiscal year), while shipping volume per unit dropped to 0.327-CO₂/million yen (down 10% compared to the previous fiscal year).



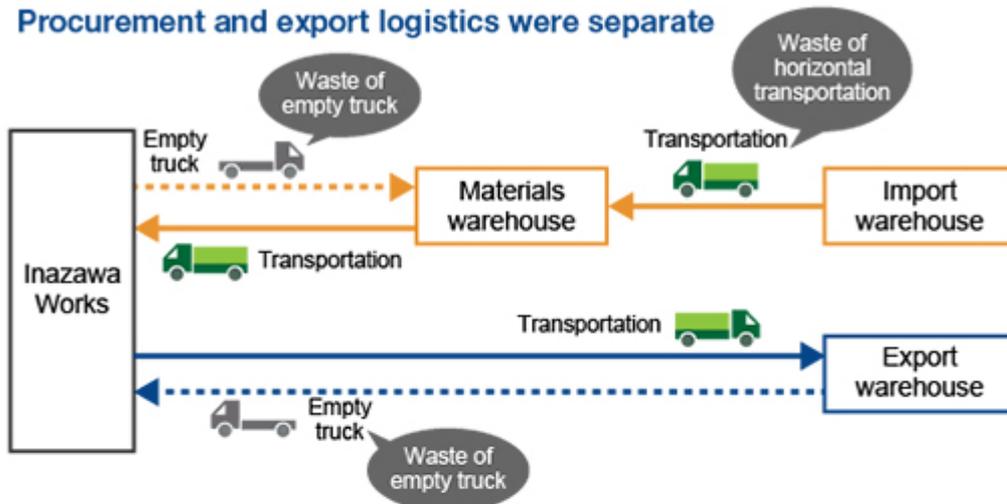
[Example] Inazawa Works Mitsubishi Electric Corporation

Inazawa Works used to procure imported products (procured parts) from an import warehouse near the harbor via a materials warehouse, and ship export products (completed products) to an export warehouse near the harbor from Inazawa Works using different trucks for each shipment. This was wasteful because each truck would run empty one way.

To resolve the issue, the International Logistics Center was established by integrating the import, export, and materials warehouses. This eliminated the horizontal transportation*1 from import warehouse to materials warehouse. Together with round-use transportation*2 between the Center and Inazawa Works, CO₂ emissions have been reduced to one-half that when using the former transportation routes.

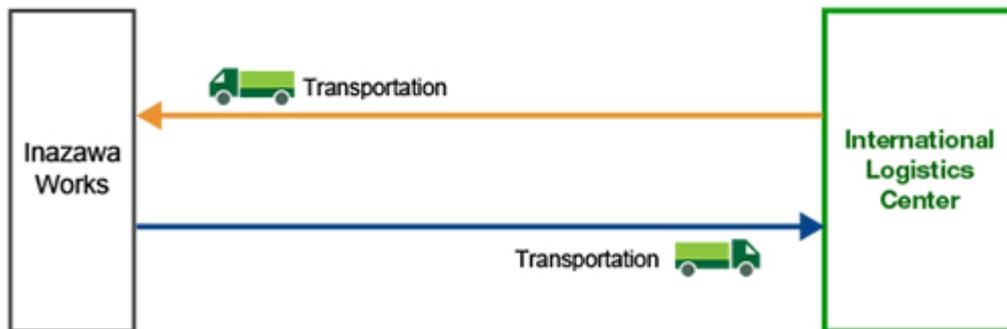
Before Improvement

Procurement and export logistics were separate



After Improvement

Integrated import, export, and materials warehouses



*1 Horizontal transportation: A truck transportation method that doesn't carry freight directly to a destination and instead delivers to a collective place, sorting warehouse, etc.

*2 Round-use: Initiative to reduce empty truck hauling by assigning the truck to collect freight after delivering a load.

Environment – Initiatives toward Creating a Recycling-Based Society

▶ **Effective Utilization of Resources**

A report on priority measures introduced to utilize limited resources more efficiently, our target for reducing the final waste disposal ratio, and information regarding fiscal 2016 initiatives and achievements.

▶ **Reducing Resource Inputs**

Introducing objectives and results of fiscal 2016 initiatives to reduce the size and weight of products while promoting product recycling in an effort to realize a recycling-based society.

▶ **Strengthening Collaboration for Resource Recycling Business**

A report on the expansion of environment-related businesses, and strengthening collaboration in the recycle-and-reuse business and after-sales maintenance business to increase resource efficiency.

▶ **Recycling End-of-Life Products**

Objectives and progress of initiatives to collect and recycle four kinds of home appliances and personal computers, and fiscal 2016 achievements.

▶ **Reducing the Use of Disposable Packaging Materials**

Overview of the Mitsubishi Electric Group's goals to reduce resource inputs through the 3Rs applied to packaging materials, and fiscal 2016 initiatives and achievements.

▶ **Using Water Effectively**

Our views on the effective use of water, and the Mitsubishi Electric Group's achievements on the activities in fiscal 2016.

Environment – Effective Utilization of Resources

Targets of the 8th Environmental Plan (Fiscal 2016-2018) and Achievements in Fiscal 2016

The Mitsubishi Electric Group focuses on the following three measures in their pursuit of reducing final disposal ratios: (1) conversion to valuable resources through waste analysis and thorough separation, (2) higher levels of conversion to valuable resources through sharing information on waste disposal contractors, and (3) improvement in the efficiency of waste recycling logistics.

In the 8th Environmental Plan (fiscal 2016 to 2018), the targeted final disposal ratios are under 0.1% for Mitsubishi Electric and its Japanese affiliates. Both achieved the targets, with final disposal ratios of 0.002% and 0.05%, respectively. Overseas affiliates also reached their target of less than 0.8% for fiscal 2016, with a final disposal ratio of 0.67%.

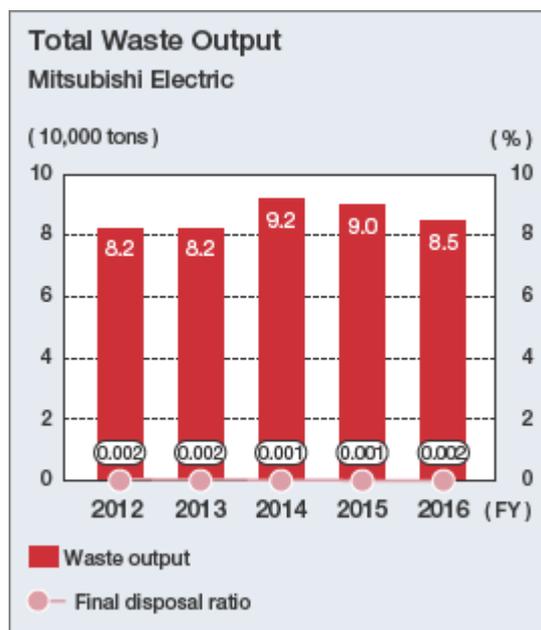
Results of Activities at Mitsubishi Electric

Each Mitsubishi Electric production base manufactures different products, so the types of wastes vary from one base to another. We therefore draw up different plans for each base and work towards achieving them in principle. However, sharing information on contractors and management know-how is encouraged and put into practice, such as cooperating with neighboring bases.

In fiscal 2016, due partly to a decrease in production volume, total waste output was 84,000t, resulting in a final disposal ratio of 0.002%.

In addition, in order to step up our legal compliance, the scope introducing waste management systems has been widened to branches and 26 production bases.

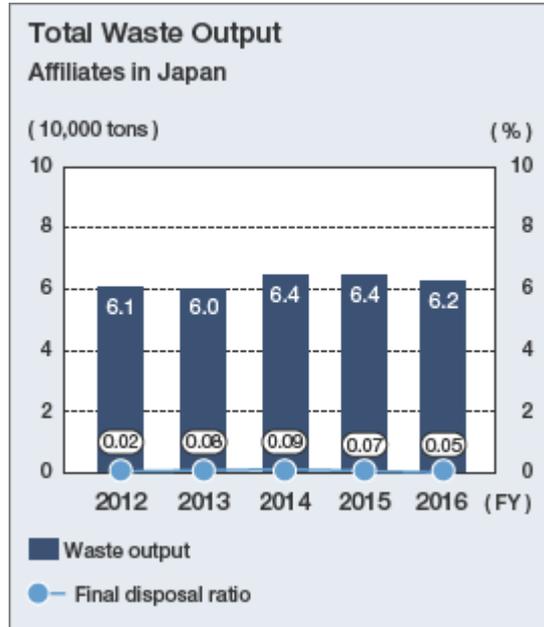
Going forward, we will strive to expand measures to reduce the amount of waste treatment subcontracted.



Results of Activities at Affiliates in Japan

Total disposal waste output was 62,000t in fiscal 2016 owing partly to the reduced scale of business. As a result, the final disposal ratio fell to 0.05%.

In order to strengthen legal compliance at affiliates in Japan, our own waste management systems have been introduced and are being used at approximately 140 affiliates. In the future, use will be extended to their regional bases, including sales offices.



Results of Activities at Overseas Affiliates

It is difficult to set the same target levels as those in Japan for overseas affiliates as regulations and situations concerning waste treatment vary by country and region. Nonetheless, our plan is to lower the final disposal ratio from 0.87% in fiscal 2015 to less than 0.5% over the three years of the 8th Environmental Plan.

To this end, we are aiming to improve overall performance overseas by selecting specific bases to prioritize as "focus bases," and making improvements through thorough separation and further expansion of recycling.

In fiscal 2016, we focused on more vigorous separation and expansive recycling activities. We continued our initiatives, including visits to overseas affiliates by Mitsubishi Electric representatives. Excellent case examples were shared among overseas affiliates, as well as information on separation and collection methods and waste disposal contractors. As a result, total waste output was 65,000t, with the final disposal ratio dropping to 0.67%.

In the future, we will strive to reduce output and final disposal ratios according to regional regulations and achieve targets by cooperating among neighboring bases.



Environment – Reducing Resource Inputs

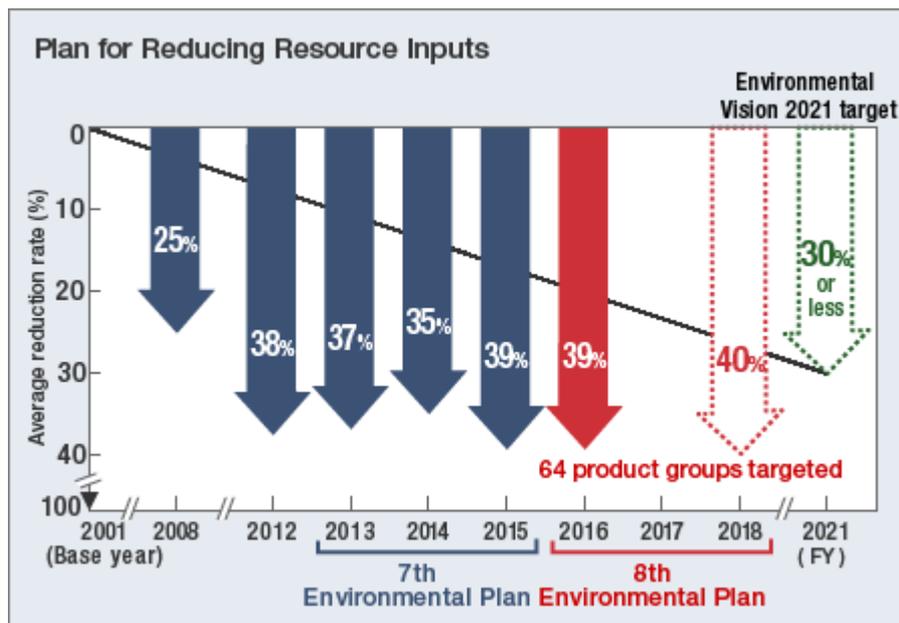
Targets of the 8th Environmental Plan (Fiscal 2016-2018) and Achievements in Fiscal 2016

The Mitsubishi Electric Group is reducing the input of resources by selecting target products to which it applies initiatives to reduce size and weight. Together, the companies in the Group produce approximately 260 products, and for the target of the 8th Environmental Plan (FY 2016 to 2018), we have chosen 64 product groups for production development plans that are to reduce the average resources input ratio by 40% compared to FY2001. This includes individual products that are not planned for continuous production, and products manufactured according to customers' designated specifications will be excluded from those targeted for the resource input reduction.

In fiscal 2016, the average reduction rate for the use of packaging material was 39%, maintaining the level achieved through improvements made in fiscal 2015. Further reductions were not achieved as the sales of products that packaging materials reduction was targeted for (i.e., heavy industrial machinery and systems, information communication systems, and electric home appliances) increased. As can be seen from this example, the average resource reduction rate is influenced by business; however, we will continue to achieve reductions in resource inputs by focusing on products in each segment.

Products Making Notable Progress in Resource Reduction in Fiscal 2016 (compared to fiscal 2015)

- Lossnay, total heat-exchange ventilators: 8% improvement in reduction rate
- Trunk optical transmission systems: 6% improvement in reduction rate
- Escalators: 3% improvement in reduction rate
- Liquid-crystal televisions: 3% improvement in reduction rate



Environment – Strengthening Collaboration for Resource Recycling Business

Expanding Resource Recycling Businesses by Strengthening Partnerships through Shared Case Examples and Technical Information

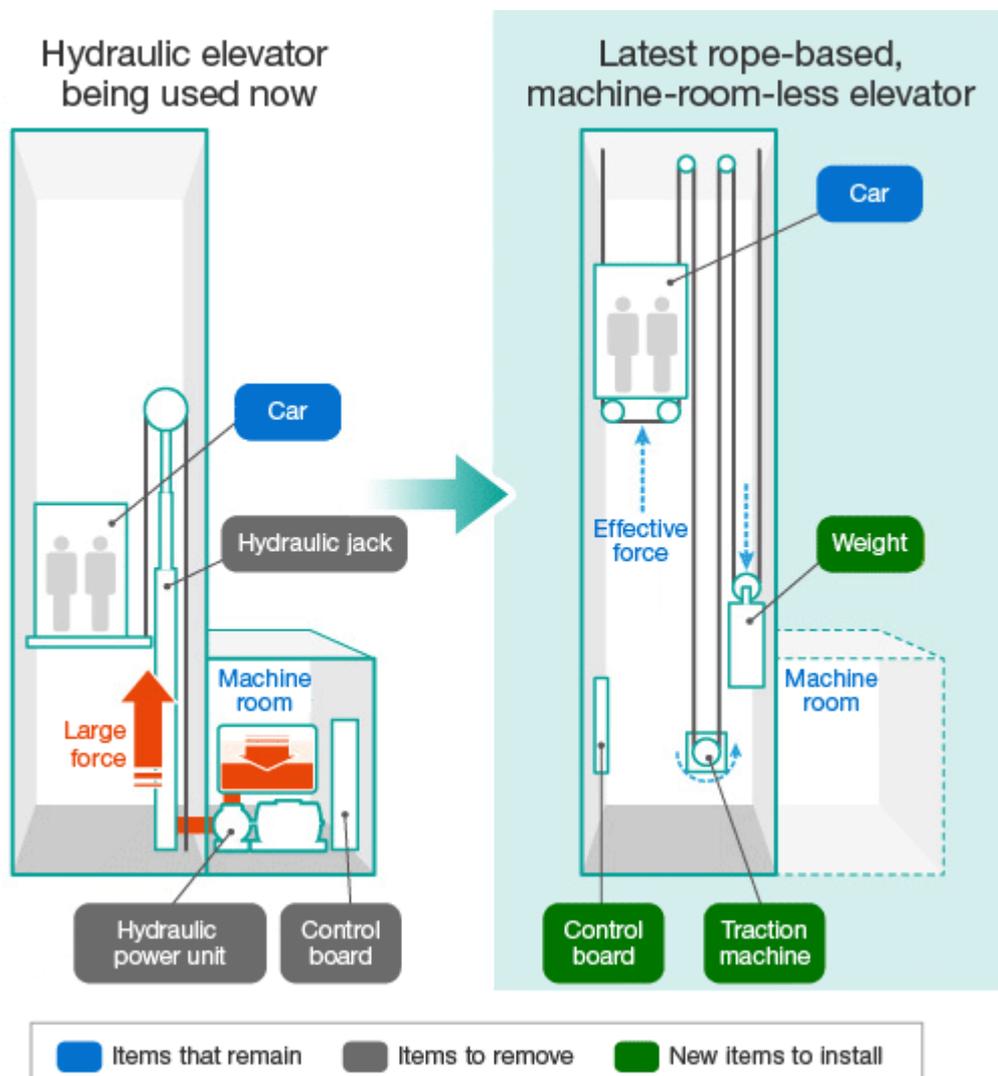
With the world population on the rise and the living standards of emerging nations improving, it is imperative to use resources more efficiently in order to achieve sustainable growth. This issue is one of the flagship initiatives of "EU 2020," a long-term strategy announced by the European Commission in June 2010, and in the Leaders' Declaration adopted at the G7 Summit in Elmau during June 2015. This highlights the fact that global efforts are required.

In order to reduce the input of new resources, the Mitsubishi Electric Group has commercialized "resource recycling businesses" in which we recover resources from used Mitsubishi Electric products and recycle them, in addition to refurbishing existing products, salvaging components that are still usable and using them as they are. In the 8th Environmental Plan (fiscal 2016-2018), strengthening partnerships with resource recycling businesses is listed as one of our objectives, and we intend to internally share case examples and technical information that fall under multiple business categories, while conveying the information outside of the company as well.

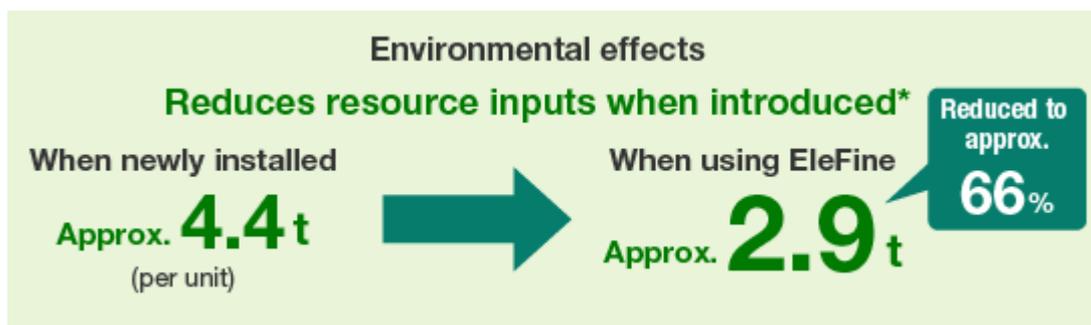
Mitsubishi Electric Group Resource Recycling Business

"EleFine" Elevator Renewal Services

In 2011, the Mitsubishi Electric Group began an elevator renewal service that renovates old elevators into ones with rope-based elevators by replacing the controls and drives of existing hydraulic elevators. This service not only realizes a significant reduction in resource inputs compared to that of replacement with a brand-new rope-based elevator, but also shortens the construction period and leads to cost reduction.



Renovation transitions to a rope-based elevator by replacing the parts and equipment required for control and drive system. Machine room no longer required.



* Comparison with Mitsubishi Electric's machine-room-less elevator (AXIEZ) based on the following specifications: passenger capacity of 9 people, 2-panel center-opening doors, and 6-floor operating system.

Home Appliances Recycling Business(Self-circulation Recycling of Plastics)

The Mitsubishi Electric Group is engaged in a "self-circulation recycling" initiative in which plastics are recovered from used home appliances and then reused in new home appliances. By establishing a technology to sort several kinds of plastics with high accuracy, we have improved the recycling rate of plastics from a mere 6% to as much as 70%.
([Click here](#) for business details.)



"Rebuild Business" (Reuse of Alternators and Starters)

The Mitsubishi Electric Group has been operating a "rebuild business" since 1979. This business consists of collecting used electrical components from automobile manufacturers and refurbishing them to be as good as new products. There are two specific electrical components targeted: alternators that supply electric power to vehicles, and starters that are used to start the engine. By collecting them, disassembling them, and then replacing only broken components and reconditioning them for reuse, this business is helping to save resources.

Since beginning business, the service has been providing services mainly in the United States; however, recently it is expanding in Japan as well.

([Click here](#) for business details.)



Other

In addition to these businesses, our recycling-oriented businesses include renewing electrical-discharge machines, which are often purchased used. We also offer coil rewinding services, which help to maintain power generator efficiency by preventing deterioration. While reducing resource input through product longevity, we are furthermore working to expand our resource recycling businesses, taking advantage of our ability to meet the demand for shorter delivery times and lower costs.

Renewal of electrical-discharge machines



Before



After

Rewinding of generator coils



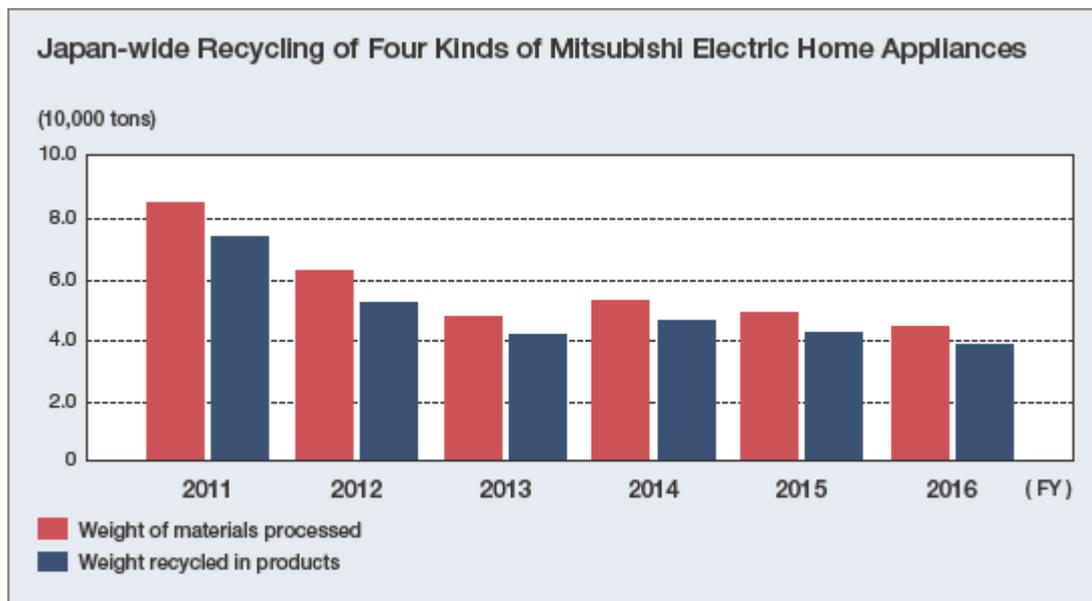
Environment – Recycling End-of-Life Products

Recycling Four Kinds of Home Appliances

Japan's Home Appliances Recycling Law* makes the collection and recycling of four kinds of appliances mandatory: air conditioners, television sets (CRT, LCD, and plasma models), refrigerators/freezers, and washing machines / tumble dryers.

In 1999, Mitsubishi Electric commenced operations at a recycling plant, Hyper Cycle Systems Corporation (HCS), the first in the industry. By the end of fiscal 2016, HCS had recycled 700,000t of material. The results for the collection and recycling of four kinds of Mitsubishi Electric home appliances in fiscal 2016 are shown in the accompanying graph.

* Home Appliance Recycling Law (April 2001): This law obliges stakeholders to collect and recycle home appliances such as air conditioners, television sets, refrigerators, and washing machines. Manufacturers and importers must recycle steel, copper, aluminum, glass, plastic, and other materials and they are also responsible for setting up a system to recycle their own products. The law was amended in December 2008 to also include LCD and plasma televisions, as well as tumble dryers.



Mitsubishi Electric holds the “Design Technologies for the Environment Seminar,” at which time it introduces technologies accumulated in recycling factories that can be utilized in daily product design. Developing technologies for sorting materials collected from used home appliances and utilizing recycled materials to manufacture new products enables the expansion of recycled materials applications.



The Collection and Recycling of Four Kinds of Home Appliances at Home Appliance Recycling Plants (Fiscal 2016)

	Unit	Air Conditioners	Television Sets		Refrigerators / Freezers	Washing Machines / Tumble Dryers	Total
			CRT	LCD / Plasma			
Recovered units at collection points	1,000 units	323	118	26	331	185	985
Handled units	1,000 units	318	133	26	328	184	991
Handled weight	Tons	13,082	3,262	516	20,150	6,773	43,785
Recycled weight	Tons	12,483	2,496	466	16,582	6,380	38,408
Recycled ratio (Sold material ratio)	%	95	76	90	82	94	-

Recycling Personal Computers

Mitsubishi Electric promotes the recycling of used computers and monitors. In fiscal 2016, we collected a total of 5,621 household and industrial-use computers, with recycling ratios reaching statutory targets*1.

For end-of-life household-use computer equipment, we have implemented a plan of marking used computers with a PC Recycle Mark*2 tag to waive the disposal fee. For some products, customers are required to register equipment after purchase in order to get the tag themselves, but the procedure is very straightforward. Mitsubishi Electric has made it possible for customers to obtain recycling tags by sending a postcard or requesting one via the Internet*3. When we receive a disposal request for a product sold in October 2003 or later, we determine whether the product is eligible for a recycling tag to ensure the customer does not pay the recycling fee twice.

There is a risk of data leakage from the hard disk drives of disposed computers. Although computer users have the basic responsibility for preventing data leaks, the companies we have contracted to recycle computers punch holes in the hard disk drives or use a strong magnet to destroy any data physically and magnetically, in order to prevent any confidential data from being leaked. Interested computer owners can also pay for a program to delete all data completely before their used computers are taken away.

Notes

- *1 Desktop computers: 50% or more
Notebook computers: 20% or more
CRT displays: 55% or more
Liquid-crystal displays: 55% or more
- *2 PC Recycle Mark: The recycle mark stipulated by industry group PC3R Promotion Association was established to promote the 3Rs (reduce, reuse, recycle) among manufacturers, distributors, and importers of computers and monitors. From October 2003 onward, they began targeting household personal computer and monitor users. The tag may be displayed on products at the time of purchase or available afterward through registration.
- *3 Because Mitsubishi Electric stopped selling home-use PCs in fiscal 1999, the Recycle Mark is available only for PC displays.

Material Recycling from Used Computers (Household and Industrial Use) (Fiscal 2016)

	Unit	Desktops		Notebooks		CRT Displays		LCDs		Total	
Collected weight	Tons	0.6		0.1		29.6		24.2		54.5	
		Office	Home	Office	Home	Office	Home	Office	Home	Office	Home
		0.4	0.3	0.0	0.1	2.7	26.9	2.8	21.4	5.9	48.6
Collected units	Units	68		38		1,415		4,100		5,621	
		Office	Home	Office	Home	Office	Home	Office	Home	Office	Home
		41	27	15	23	130	1,285	470	3,630	656	4,965
Handled weight	Tons	0.6		0.1		29.6		24.2		54.5	
Recycled weight	Tons	0.5		0.1		23.3		20.2		44.1	
Recycling ratio	%	80.5		68.0		78.5		83.6		-	

* Including all-in-one computers

Environment – Reducing the Use of Disposable Packaging Materials

Mitsubishi Electric Group's Fiscal 2016 Achievements

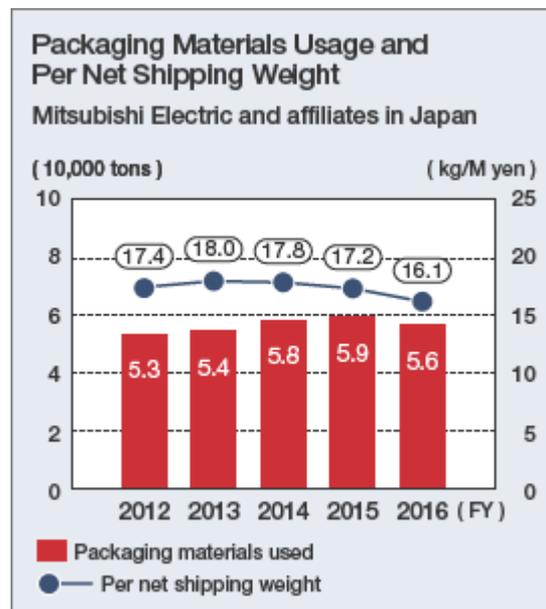
The Mitsubishi Electric Group is improving its logistics work as a part of its just-in-time improvement activities. In this area, we have set a basic principle of reducing the weight of the transport packaging while ensuring safe delivery of our products to customers. Under this concept, we are advancing the 3Rs of packaging: Reduce (simplify packaging), Reuse (expand the use of returnable containers and packaging), and Recycle (recycle used packaging materials).

Mitsubishi Electric and Affiliates in Japan

- Packaging requirements per volume shipped: 16.1kg/million yen (6.4% reduction compared to previous fiscal year)
- Packaging volume used: 56,000t (3,000t reduction compared to previous fiscal year)

For Mitsubishi Electric and affiliates in Japan, packaging requirements per volume of shipment decreased owing to packaging simplification and expanding the use of returnable containers.

At our overseas affiliates, the use of packaging materials by 22 companies totaled 12,700t (an increase of 8,000t compared to the previous fiscal year) as a result of increased shipments. Packaging requirements per volume shipped fell to 122kg/million yen (down 12.9% compared to the previous fiscal year).



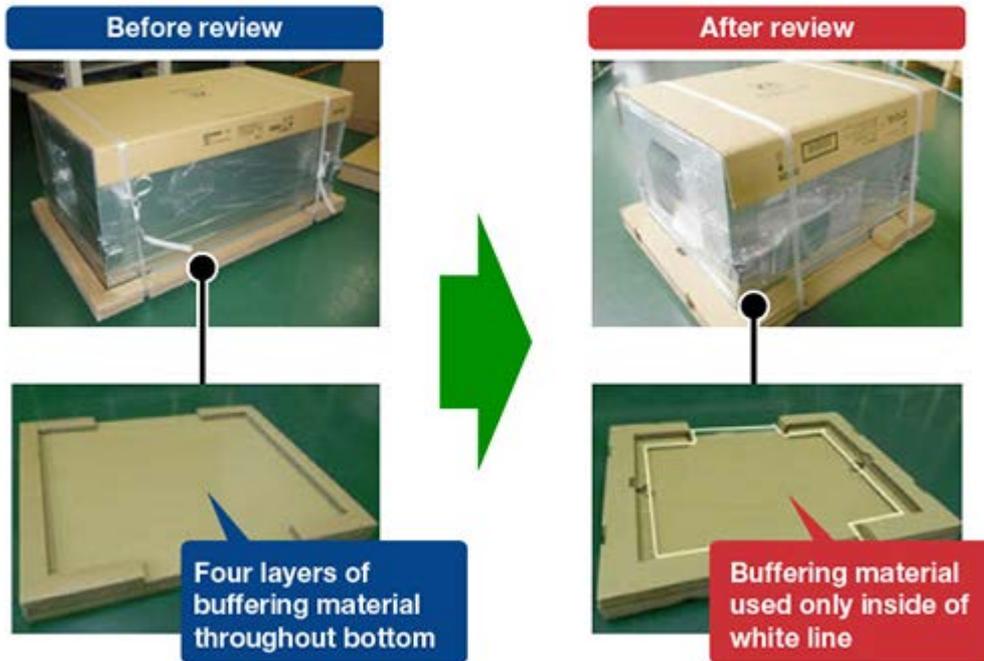
[Example] Nakatsugawa Works, Mitsubishi Electric Corporation

The Mitsubishi Electric Group is working to streamline packaging by designing packaging that is the most appropriate for the transportation environment, thereby reducing the amount of packaging materials disposed of after delivery.

As an example, the Nakatsugawa Works successfully reduced packaging materials disposal by 34% by improving the packaging of the "Straight Sirocco Fan" for air conditioners. An all-cardboard package was incorporated based on an eco-conscious initiative introduced in the past; however, packaging design was reconsidered to further reduce environmental load and improve packaging material buffering property and product durability. This initiative has resulted in a substantial reduction in the buffering material used for the bottom of the package.

The new packaging received the Appropriate Packaging Award in the 2015 Japan Packaging Contest (Organizer: Japan Packaging Institute).

**Minimized the use of buffering materials,
reducing packaging material disposal volume 34%**



Environment – Using Water Effectively

Promoting water conservation and effective use of water by increasing the awareness of water risk in Japan and overseas

Due to increasing water shortages worldwide, water pollution, and climate change, water risk is currently increasing. Since this has an influence on raw materials production and product manufacturing, the need for corporate water risk management is also on the rise.

The Mitsubishi Electric Group utilizes WRI Aqueduct* to keep track of current and future water risks. For example, the countermeasures required for drought and flooding are different, so we are clarifying the priority of actions to be taken at each base, and are proceeding with water risk mitigation countermeasures.

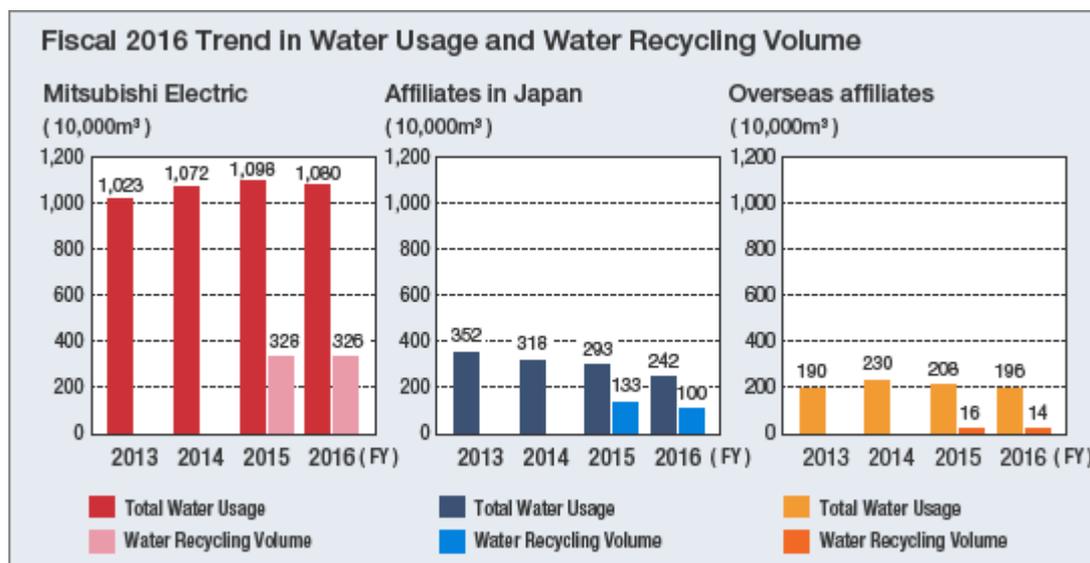
The Mitsubishi Electric Group views public water, industrial water, groundwater, and other sources of water as a valuable resource. Accordingly, initiatives targeting water conservation and effective use of water are being implemented in order to keep track of usage in all production bases in Japan and overseas.

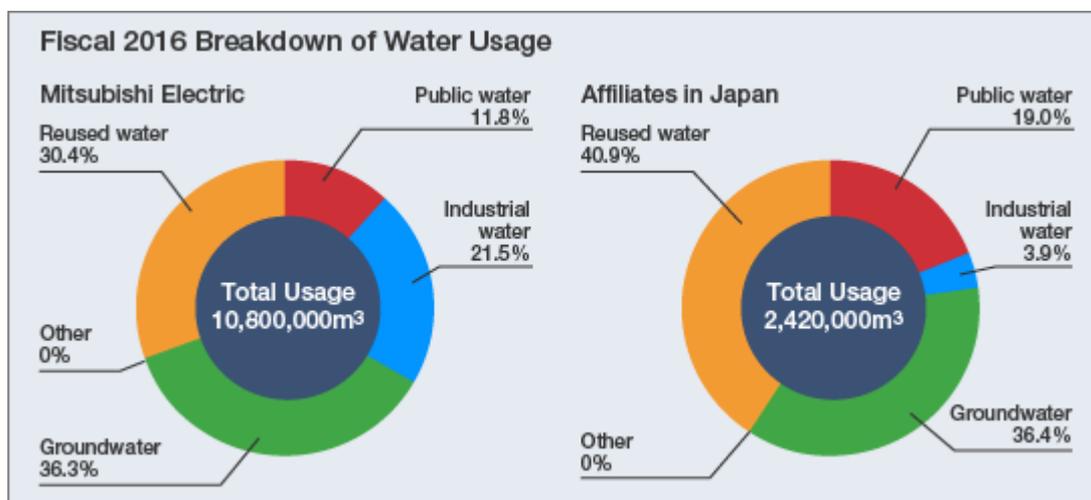
Total water consumed at Mitsubishi Electric dropped from 10.98 million m³ in the previous fiscal year to 10.8 million m³ in fiscal 2016, a reduction of 1.6%. The volume of water recycled was 3.26 million m³, down 0.6% from 3.28 million m³ in the previous fiscal year.

Our affiliates in Japan consumed a total of 2.42 million m³, a reduction of 17.4% from 2.93 million m³ in the previous fiscal year. The volume of water recycled was 1 million m³ compared to 1.33 million m³ in the previous fiscal year, a reduction of 24.8%.

Our overseas affiliates consumed a total of 1.96 million m³ compared to 2.08 million m³ in the previous fiscal year, a reduction of 5.8%. The volume of water recycled was 0.14 million m³ compared to 0.16 million m³ in the previous fiscal year, down 12.5%.

* WRI Aqueduct: A water risk evaluation tool developed by the World Resources Institute (WRI).





Fiscal 2016 Breakdown of Water Usage by Region Overseas

(units : m3)

	Water Usage				Water Discharged		
	Total Usage	Public Water / Industrial Water	Groundwater	Rivers / Spring Water	Total Amount	Sewage	Public Water
China	774,407	773,032	0	1,375	639,076	630,107	0
Southeast Asia	854,669	978,411	0	0	647,526	404,918	242,608
Europe	17,026	17,026	0	0	5,147	5,147	0
North America	32,108	29,489	0	2,619	26,079	26,079	0
Central & South America	19,443	30	19,413	0	6,202	6,202	0
Total	1,821,396	1,797,989	19,413	3,994	1,324,031	1,072,454	242,608

Environment – Managing Chemical Substances

Managing 3,163 Controlled Chemical Substances using Our Own Chemical Substance Management System

Mitsubishi Electric and its affiliates in Japan have been managing chemical substances on a voluntary basis since 1997. These substances include refrigerant fluorocarbons (HFCs*1 and HCFCs*2) used in air conditioners and refrigerators, volatile organic compounds (VOCs), and the six RoHS substances. Combined with the 462 substances designated under the PRTR Law*3 (PRTR*4) revised in November 2009, the above comprise a current list of 3,163 substances we voluntarily manage under a comprehensive Chemical Substance Management System that includes purchasing information about materials and components.

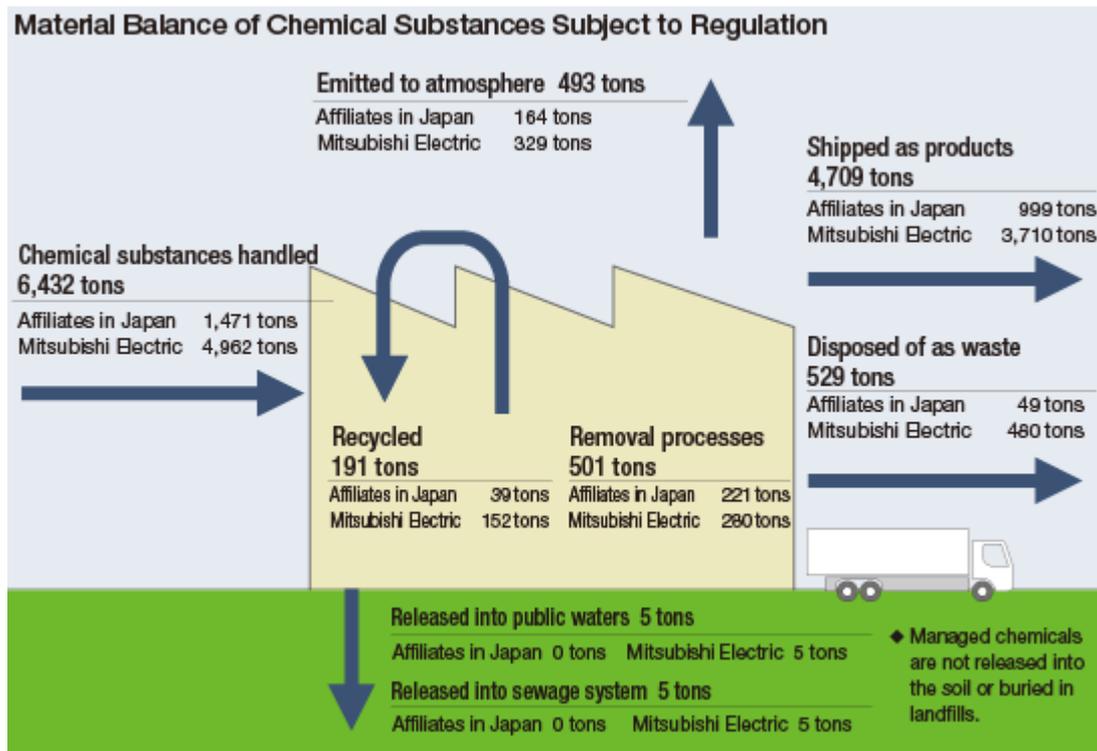
In fiscal 2016, Mitsubishi Electric used 145 different chemicals totaling 4,962t (fiscal 2015: 145 substances, 6,107t), while affiliates in Japan used 41 substances totaling 1,471t (fiscal 2015: 42 substances, 1,996t). Details on the release and transfer of these substances are shown in the figure below. In the future, we will continue assessing and managing our use of these substances and activities to reduce waste.

*1 HFCs: hydrofluorocarbons.

*2 HCFCs: hydrochlorofluorocarbons.

*3 PRTR Law: Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to Their Management.

*4 PRTR: Pollutant Release and Transfer Register, a system by which businesses assess and report to authorities the volume of potentially harmful chemical substances released into the environment and the volume transferred within waste. Authorities, in turn, compile and release information on total volumes based upon the reports and other statistics.



Environment – Environmental Communication

Providing Environmental Information Online and through Corporate Publications

Since 1998, Mitsubishi Electric has continuously reported on its environmental objectives and achievements through a combination of detailed data and case studies. Mitsubishi Electric also runs an informative site aimed at elementary school students, through which students can enjoy learning about environmental issues.

Environmental Report Website



▶ Japanese-language website 



▶ Global website



▶ "Eco-Planet" website for children 

Environmental Sustainability Report



Japanese-language version



English-language version



Chinese-language version

"Eco Changes" Statement

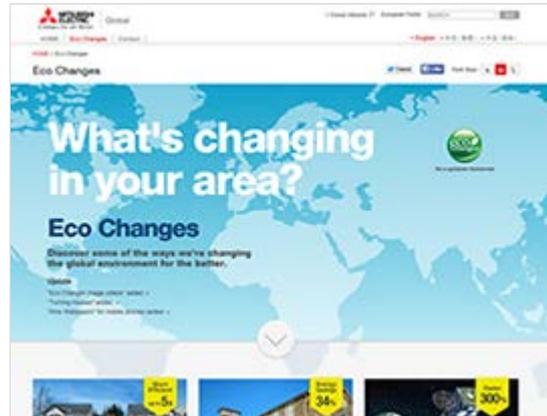
In June 2009, we announced the environmental statement for the Mitsubishi Electric Group in Japan: "Eco Changes – from in the home to outer space." This statement expresses the Group's stance on environmental management. We also launched a dedicated website to introduce a variety of Eco Changes initiatives. The website hosts content from the Eco Changes Lab, by which visitors can learn about Eco Changes through comics and games, making it enjoyable and easy to understand for every age group.

For overseas markets, we established the statement "Eco Changes – for a greener tomorrow" in June 2010 and a separate catchphrase for China "*jing yu jie neng, jin xin huan bao*," which translates as "experts in energy conservation, dedicated to environmental protection," in April 2012, as part of our broad efforts to roll out environmental communications in areas around the world.

Eco Changes Website



▶ Japanese-language website



▶ Global website

Environmental Statement Booklet



Japanese-language version



English-language version

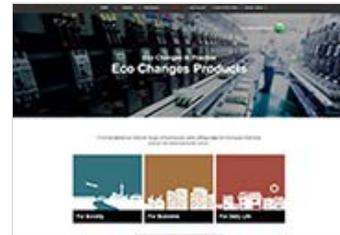


Chinese-language version

Examples of Environmental Communications around the World

Global

We launched a micro-website named "Mitsubishi Electric's Environmental Spotlight" in 2008 in order to introduce the vision and policy of the Mitsubishi Electric Group as a global, leading environmental company. This site explains our excellent advanced environmental technologies and products, and various activities that are contributing to the environment in regions around the world. In 2015, the website was renewed to have responsive compatibility, enabling it to be viewed on tablets and smartphones in addition to computers, as well as provide better interactivity and usability, and ensuring that the Mitsubishi Electric Group's environmental efforts and stance are conveyed even more clearly.



▶ "Mitsubishi Electric's Environmental Spotlight" Website

China

In April 2012, we launched Eco Changes in China under a new environmental statement, "*jing yu jie neng, jin xin huan bao*," which translates as "experts in energy conservation, dedicated to environmental protection." Beginning in August 2014, we started a series of corporate advertisements under the theme of "One Mitsubishi Electric Declaration." This advertising campaign declares our stance as a company that provides one-stop solutions from all angles, including the realization of comfortable lifestyles for people, eco-conscious town-building, and leading business support by maximizing the overall strengths of the Mitsubishi Electric Group based on our business activities.



Corporate advertising in China

Asia

In India, we have developed ads that emphasize our activities to change the environment around the world through our businesses and products.



Corporate advertising in India

Europe

In the various countries of Europe, corporate advertising is a tool by which we not only introduce our products and businesses, but also promote environmental communication initiatives.



Corporate advertising in Turkey

The Americas

In North and South America, Mitsubishi Electric promotes Eco Changes through magazines advertisements, TV commercials, and other forms of media.



Corporate advertising in Brazil

Japan

We promote Eco Changes using a variety of media to help raise its visibility. In fiscal 2016, in addition to placing advertisements introducing the energy-saving achievements at our factories in newspapers, we placed online advertisements for our "Eco-Planet" website for children on school project report websites, thereby targeting children and attracting visitors to the "Eco-Planet" website.



Corporate advertisement for newspapers and magazines



Newspaper advertisements to publicize the energy-saving achievements at our factories



Banner ads for "Eco-Planet" website

These ads were placed on children's school project report sites during elementary school summer holidays



▶ Key Technologies site

This site introduces environmental technologies through easy-to-understand animated videos

Environmental Exhibitions

Eco-Products 2015 (Japan)

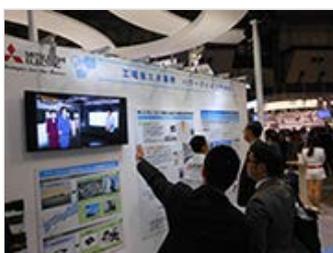
The Mitsubishi Electric Group took part in "Eco Products 2015," which was held at Tokyo Big Sight (exposition venue) from December 10 to 12, 2015. We divided our booth into two different areas: an "Energy-Saving Proposals Zone" for businesses and an "Environmental Technologies Zone" for the general public. In this way, we introduced how we contribute to the environment through our products and technologies to different groups of visitors.

In the Energy-Saving Proposals Zone, energy-saving achievements at the Innovation Center—the design and technology division at the Power Device Works—were the focus of the exhibits. In addition to this, a section was dedicated to personnel responsible for energy-saving equipment; where they demonstrated technologies used to visualize energy consumption by factories, offices, shops, and small- to medium-sized buildings. In part of the Environmental Technologies Zone, environmental performance was compared between the latest and previous models of our home electrical appliances. In other parts, products and technologies that contribute to reducing environmental load for broader society were exhibited, including short-time radioactivity measuring equipment and regenerative power utilization technologies for railcars.

Moreover, a children's workshop was held on the stage under the theme of "Plastic Bottle Cleaner" making. Combined with an exhibit showing the latest water treatment technologies in the booth, the event helped children learn more about treating water.



External appearance of exhibition booth



Energy-Saving Proposals Zone



Environmental Technologies Zone



Business presentation



Children's workshop



New and Old Home Electrical Appliance Museum

Environment – The Environment and Business

As a global, leading green company that contributes to creating a more affluent society, Mitsubishi Electric works together with members of the Mitsubishi Electric Group to develop products and technologies that are helping to realize a low-carbon, recycling-based society. These efforts can be witnessed in all areas of business and are an important factor in supporting the Group's growth strategy.

Here, we provide an outline of each business group and their priority environmental issues, and introduce the measures and initiatives implemented to reduce environmental impact.

▶ Public Utility Systems Group



▶ Energy & Industrial Systems Group



▶ Building Systems Group



▶ Electronic Products and Systems Group



▶ Communication Systems Group



▶ Living Environment & Digital Media Equipment Group



▶ Factory Automation Systems Group



▶ Automotive Equipment Group



■ Semiconductor & Device Group



■ Information Systems & Network Service Group



Environment – Public Utility Systems Group

Business Overview and Priority Environmental Issues

Providing a Wide Range of Key Products for Social Infrastructure, Including Water Treatment, Roadway, and Rolling Stock Applications

Mitsubishi Electric's Public Utility Systems Group offers an extensive range of products and services used in public utilities and transportation to governments, highway and railway operators, and a host of other companies involved in social infrastructure. These solutions include water treatment plant systems, intelligent transport systems, railway information systems, and electromagnetic products for rolling stock. Our aim is to manufacture products that are smaller, weigh less, provide better performance, and operate with higher efficiency, thereby reducing environmental impact by consuming fewer resources and using less electricity.

In recent years, we have also placed a focus on next-generation infrastructure. Our efforts include introducing solutions to fully optimize the energy used by railways, energy-saving business related to water treatment processes, and initiatives for the smart community business. At sites such as the Kobe Works, Itami Works, Nagasaki Works, and overseas affiliates—where operations include designing and manufacturing products and systems—energy consumption has been reduced by introducing improvements in areas like facilities, testing, and distribution. Initiatives for preventing soil and water pollution, including carefully managing the toxic substances used in painting facilities, have been implemented as well.

Priority Environmental Issues

- Climate change
- Air, water, and soil pollution due to operations and procurement
- Proper management of chemical substances in design and manufacturing

Message from Public Utility Systems Group

Helping Build Next-Generation Social Infrastructure with a Broad Range of Technologies and Continuous R&D in Order to Realize the Vision of a Low-Carbon Society

Mitsubishi Electric's Public Utility Systems Group provides a host of products that serve a vital, long-term role in social infrastructure, including water treatment facilities, roadways, and rolling stock. As part of this, while ensuring high quality and functionality in design/manufacturing, we are continuing to promote the use of fewer resources and less power with smaller size, greater efficiency, and higher performance as the basis for our aim to realize a low-carbon society.

In recent years, we have seen heightened expectations toward the development of next-generation social infrastructure that makes full use of renewable energies and information and communication technologies (ICT), which supports greater power supply efficiency and optimization. In response, we are working diligently on total energy and environmental solutions for railways. As part of our commitment to the full optimization of energy consumed by railways utilizing ICT, we have developed new energy technologies, and produce and store energy for train energy management systems (TEMS), station energy management systems (SEMS), factory energy management systems (FEMS), and railway energy management systems (REMS).

Among these activities, an inverter equipped with a large-capacity, full-SiC power module for rolling stock won the Ministry of Economy, Trade and Industry Minister's Award, the top prize of Excellence in Energy-Conservation Equipment Awards in Fiscal 2016, as well as the Excellence Award of the Eco Products Awards and the Ichimura Industrial Award from the Ministry of Health, Labour and Welfare. We will continue to work towards saving energy by expanding applications that use full-SiC devices.

We have also developed novel water treatment technologies using a gas/liquid interface discharge*1 and an immersion-type membrane separation bioreactor (Eco-MBR)*2 focusing on energy-saving business related to water treatment processes. Furthermore, the Public Utility Systems Group is expanding its activities outside of Japan, conducting demonstrations and testing in China and Singapore.

In addition, we are developing the potential of smart communities, which will achieve stable supplies of energy using a combination of renewable energy and off-grid power sources.

Going forward, Mitsubishi Electric's Public Utility Systems Group stands firmly committed to making



Takahiro Kikuchi
Executive Officer
In Charge of Public Utility
Systems

society safer and more convenient for everyone by making full use of its wealth of proprietary technologies and strengths in technological development.

- *1 Gas/liquid interface discharge: An efficient water treatment method with a simplified configuration in which OH (Hydroxyl) radicals are generated in a highly efficient way to process insoluble organic substances in wastewater. OH radicals are an oxidant with extremely strong oxidizing capabilities.
- *2 Immersion-type membrane separation bioreactor (Eco-MBR): A device to clean membrane filters used for processing and recycling municipal and industrial wastewater using ozonized water.

Initiatives Contributing to the Environment and Society

Total Energy and Environmental Solutions for Railways

As part of our commitment to the total optimization of energy used by railways, we are helping to realize the vision of a low-carbon society.

- **Production of Inverter Incorporating Large-capacity, Full SiC Power Module for Rolling Stock**

One of our production initiatives was the commercialization of an inverter equipped with a full-SiC power module for use in rolling stock. The new product was launched at the end of fiscal 2015 and was proven to help save energy by approximately 40%. The equipment is now being used by many customers.



Inverter with large-capacity, full-SiC power module for rolling stock

- **Production of station auxiliary power system**

We have produced and introduced to the market a station auxiliary power system that is capable of supplying the regenerative electric power generated when rolling stock is braking directly to a station's electrical facilities (lights, air conditioners, elevators, etc.). Each station where the system is installed saves approximately 600kWh per day (equivalent to the electricity used by 60 households). We are planning to develop a hybrid version that combines a storage battery with the power system and a model that is even smaller than the previous one.

- **Traction Energy Control System**

We are developing a traction energy control system that uses ICT to control overhead voltage based on a railcar's operating status. This system sends information on railcar position and operations in real-time via an information-communication network to a land-based management system that controls substation output, station auxiliary power systems, and electricity storage systems. The ultimate goal of the solution is to minimize energy consumption across an entire railway system.

Smaller, Lighter Air-conditioning System for Rolling Stock

In addition to introducing smaller-diameter piping and achieving a 20% reduction in heat exchanger size, we have readjusted materials to reduce the weight by 6%, thereby enabling the production of a more compact, lighter air-conditioning system. Additionally, to help prevent global warming caused by depletion of the ozone layer, our aim is to reduce environmental impact by promoting the use of an alternate refrigerant that has a zero ozone-layer depletion factor.



Air-conditioning system for rolling stock

Highly Efficient, More Compact Ozone Generator Realized

Our ozone generators are being used in advanced water treatment processes and paper pulp bleaching because of their superior oxidation and ability to eliminate bacteria, odors, and colors. The more compact and higher efficiency design was achieved through the use of narrower electrodes and shorter gaps developed for oxygen sources at the air source. This new design results in a 15% cut in system power consumption.



Ozone generator

Development of Water Treatment Technology Utilizing Gas-Liquid Interface Electrical Discharge

Mitsubishi Electric has developed a water treatment technology that uses gas-liquid interface electrical discharge to generate OH radicals. OH radicals are used to treat persistent organic substances in wastewater, and enable the production of water treatment systems with simplified configurations. By applying an electrical discharge process directly to wastewater flowing along an inclined surface, OH radicals are generated at the gas-liquid interface—the boundary between liquid and gas—and in the liquid itself, thus enabling efficient water treatment. This technology doubles the energy efficiency of the conventional technique and can reduce operating costs.

Development of Water Treatment Technology Utilizing a Membrane Separation Bioreactor with Ozonized Water

We have developed a water treatment technology that uses an emersion-type membrane separation bioreactor (Eco-MBR) that uses ozonized water to clean the membrane filters for treating and recycling municipal and industrial wastewater. The Eco-MBR system is compact and energy-efficient, and is capable of high-speed filtration, which enables the device to treat twice as much water per membrane filter surface area compared to conventional methods.

Development of an Energy Management System

We have developed a function that enables optimal energy supply by predicting power demand—based on factors such as past usage results and weather forecasts—and combining power sources like commercial power, photovoltaic power, wind power, and storage batteries, and we delivered such a system to Satsuma Sendai City, Kagoshima Prefecture in fiscal 2016. Moving forward, the plan involves practical application of the smart energy system in initiatives for building management systems, water treatment plant systems, etc.

Reducing Power Consumption and Weight of Diamond Vision

By increasing the efficiency of the power and drive circuit for the LED drive, optimizing the drive voltage, and introducing a high-efficiency LED, we have reduced power consumption per unit of area by 3%. Moreover, a review of the chassis structure has enabled us to reduce the screen weight by 40% without sacrificing the strength.



Diamond Vision

Initiatives for Reducing Environmental Impact

Continuous Improvement Activities

Initiatives to reduce energy consumption and CO₂ emissions such as improving facilities, testing, and distribution and enforcing waste separation continue on a daily basis at sites such as Kobe Works, Itami Works, and Nagasaki Works.

- **Equipment Improvements**

New lines built at the Kobe Works and Itami Works employ LED lighting, higher efficiency air conditioners, and photovoltaic systems to achieve greater power savings. We are also making improvements that contribute to increasing facility efficiency, such as utilizing the exhaust from thermal-catalyst boilers as a heat source for drying ovens and generating warm water that is used to wash products.

- **Testing improvements**

When testing large electrical equipment such as the VVVF* equipment used in rolling stock, efforts are made to utilize energy effectively, such as using power generated from electrical generators connected as artificial loads that are non-destructive, as well as using night-time power to operate drying ovens.

* VVVF: Variable-voltage, variable frequency control for AC electric motors.

- **Distribution Improvements**

We are promoting the reduction of CO₂ emissions by utilizing returnable packaging and making a modal shift in transportation from using trucks and planes to using railways and ships.

Overseas Production and Maintenance Sites

In response to growing railway demand overseas, in addition to our overseas sites in countries such as North America, Mexico, and Italy, we started operations in India and Poland in Fiscal 2016. To prepare for greater demand in Europe, the US, and Asia while considering global warming in the future, we will reinforce and expand overseas production sites and promote local production for local consumption in order to reduce CO₂ produced during transportation.

Environment – Energy & Industrial Systems Group

Business Overview and Priority Environmental Issues

Delivering Equipment and Systems that Support Stable Electricity Supply

Mitsubishi Electric's Energy & Industrial Systems Group provides a wide range of systems and products that play a vital role in power generation, power conversion, power distribution, and power retailing. On the product side, this includes generators, switches, transformers, switchgear, and vacuum circuit breakers, while systems include plant monitoring, system stabilization, grid protection & control systems, and DC technologies. With the realization of a low-carbon society now an important theme globally, we are more committed than ever to contributing to the realization of a society in which power companies and end users alike can live safely, securely, and comfortably. This will be accomplished through the development of high-efficiency equipment and by increasing our involvement in businesses related to smart grids and smart communities, as well as continuing our activities to reduce environmental load.

We manufacture equipment and systems at the Energy Systems Center and Transmission & Distribution Systems Center (both are located in Hyogo Prefecture and engage in small-lot production), as well as at the Power Distribution Systems Center (Kagawa Prefecture; small-lot and mass production) and at our affiliates in Japan and overseas. Our business group focuses on reducing the environmental impact resulting from the operations of our overseas affiliates, reducing the emission of SF₆ gas—which has a high global warming potential—and strengthening the management of chemical substances under the guidance of our domestic site, which is the mother factory.

Priority Environmental Issues

- Climate change
- Depletion of mineral resources
- Proper management of chemical substances in design and manufacturing
- Preservation of biodiversity in areas where we operate

Message from Energy & Industrial Systems Group

Helping Achieve a Sustainable Society by Developing High-Efficiency Equipment and Stepping Up Our Involvement in Businesses Related to Smart Grids/Smart Communities

As a provider of a full range of equipment and systems that support power systems from power generation to transmission and distribution, we recognize that achieving a sustainable society represents one of our most important missions. Based on this, the Energy & Industrial Systems Group is now focusing on the following initiatives.

1. Development of high-efficiency equipment and promotion of expanded applications

With our aim to reduce greenhouse gases throughout a product's life, we are developing and commercializing high-efficiency generators, switches for controlling heat generation, transformers that reduce energy loss, and equipment that eliminates or reduces the use of SF₆ gas, which has a high global warming potential, with the ultimate goal of reducing CO₂ emissions from product usage.

2. Stepping up our involvement in businesses related to smart grids and smart communities

Utilizing technologies and know-how acquired at our in-house proving and testing facilities, we are expanding the delivery of products such as monitoring control systems, smart meter systems and battery energy storage systems that contribute to realizing "highly economical, extremely reliable, high-quality power distribution systems," "systems that optimize energy use by achieving interconnectivity utilizing ICT*" and "a resilient energy infrastructure that operates seamlessly even at the time of an emergency."

We are also working on the development of power generation stabilizing equipment and systems capable of answering new demand. This includes further improving the efficiency of thermal power generation, promoting the expansion of nuclear power generation business based on the energy policies of each country, and handling the nationwide demand and supply of electricity in Japan by connecting electric power utilities companies.

On the other hand, regarding reducing the environmental impact resulting from business activities, our focus is to continuously reduce the energy used in production and testing processes and enforces the



Yasuyuki Ito
Executive Officer
In Charge of Energy &
Industrial Systems

strict management of chemical substances, thereby contributing to the creation of a safe, secure, and comfort society.

*ICT:Information and Communication Technology

Initiatives Contributing to the Environment and Society

Development of Indirect Hydrogen-Cooled Turbine Generators that Reduce Environmental Impacts

With growing concern for global warming caused by CO₂ emissions and a worldwide increase in electric power demand, Mitsubishi Electric developed a new series of products, the VP-X Series. This is a larger-output, higher-efficiency version of our indirectly hydrogen-cooled turbine generators. The lower heat resistance of the insulation and the optimized shape of ventilation flue are major factors behind the higher output, and the inclusion of high-efficiency fans, low-loss bearings, and reductions in end eddy-current loss mean higher efficiency. Additionally, we have reduced the outer diameter of the generator by 20% from that of conventional models by utilizing a smaller hydrogen gas cooler and an optimal layout in order to improve mobility and save space where it is installed. The VP-X Series generators have been available commercially since April 2015 and are available in outputs ranging from 200 to 900MVA.



High efficiency VP-X turbine generator



870MVA verified generator

Development and Dissemination of Switchgear that Reduce Environmental Impact

With the aim of reducing greenhouse gases, Mitsubishi Electric is promoting the popularization of 70kV class cubicle-type gas insulated switchgear (C-GIS) equipped with a vacuum circuit breaker that uses no SF₆ as the result of adopting dry-air insulation. We are also developing a gas-insulated circuit breaker (GCB) series that utilizes a spring structure instead of the conventional hydraulic structure to significantly reduce maintenance work and minimize energy loss. We have completed commercialization for products up to 500kV and are now working on minimizing material consumption and operating power, as well as extending the life of the equipment.



Cubicle-type gas insulated switchgear (C-GIS)



Gas circuit breaker

Transformers that Reduce Environmental Impact

We supply customers in Japan and overseas with low-heat generation, highly efficient transformers that contribute to the reduction of CO₂ emissions. These transformers reduce electricity loss that can occur between the power plant and end user during transmission and conversion. In addition, we are developing compact transformers that help reduce the amount of material used. Furthermore, for rolling stock, we have developed and delivered natural-air cooling transformers that use airflow generated by the running train to cool the transformer. As the natural-air-cooling transformers for rolling stock generate less heat and are cooled by incoming wind alone, without employing an electric-motored fan, they offer a significant contribution to saving energy.



High-efficiency transformer



On-board transformer (for rolling stock)

Power Electronics Systems for Electric Power, Smart Meter Systems and Battery Energy Storage Systems Essential for Realizing Smart Grids and Smart Communities

Regarding business related to smart grids and smart communities and their contribution to adjustments in supply-demand balance during the peak electric power consumption period during summer and winter, over the last 30 years we have abundant experiences spanning the delivery of power electronics for electric power facilities, including capacitors and harmonic filters, contributing to advanced operations of power systems. Furthermore, we have been accumulating technologies and know-how utilizing a proving and testing facility installed based on assumed distribution networks in 2020. Utilizing the technologies and expertise gained in this way and feedback from customers, we're expanding business.

- **Power Electronics Systems for Electric Power**

From the development of the latest, high-capacity low-loss power devices to the construction of systems for large-scale electric power facilities, we offer integrated services. In order to improve flexibility in electric power operations and solve various problems in electric power systems, highly sophisticated power electronic technologies are applied. We will continue contributing to building power distribution facilities that support the foundation for the realization of smart grids.

- **Smart Meter Systems**

Smart meter systems will be the core component for fully liberalizing retail power sales. In order to make it possible to freely select where one purchases electricity, the information as to when, where, and how much was used will be indispensable. Therefore, we are currently focused on developing a system that enables large volumes of meter data to be collected accurately at low cost, and its actual operation in several utilities. In addition, these smart meter systems are capable of providing as much electric power as required for individual users' power-/energy-saving actions via alternative channels.

- **Battery Storage Systems**

Battery storage systems are essential for the flexible operations of power systems. We are installing battery energy storage systems for small-scale power systems in locations such as remote islands and testing is making progress. These systems are the key to balancing power generation when using renewable energy, for which output fluctuates, and power generation using fossil fuels. Battery energy storage systems are also helpful as a countermeasure for the excess power or fluctuations that result from using renewable energy in the main power grid system. Mitsubishi Electric is focusing on expanding products that take full advantage of renewable energies such as wind and solar power without restricting outputs, and is contributing to the realization of a low-carbon society and the stable operation of power systems.

Development of the Latest Instrumentation Control System with Minimum Environmental Impact

This system offers extensively enhanced functionality and improved performance compared to conventional systems. It simultaneously realizes resource and space savings with volume and weight reductions of up to 30% compared to the previous model. Additionally, power consumption has been reduced by up to 33% compared to conventional systems. The CPU card and I/O module are designed so that hardware components from the previous generation are compatible, making replacement possible as well. This minimizes resource consumption when updating equipment and contributes to reducing the environmental impact.



Instrumentation Control System

Initiatives for Reducing Environmental Impact

Staying Focused on Preventing Environmental Pollution and Reducing CO₂ during Production

The Energy & Industrial Systems Group's manufacturing bases (4 at Mitsubishi Electric, 8 affiliates in Japan, 2 overseas affiliates) manufacture equipment in small lots, including large generators and transformers. They also produce medium-sized equipment and system devices using small-lot production and manufacture components, assemble products, and perform testing for plates, machine work, and insulation materials. Each factory pays particularly close attention to prevent air, water, or soil pollution, since they handle chemical substances and insulating oil. These factories also use great amounts of energy because of their large furnaces, cleanrooms, hot-water baths, and testing facilities. As a result, each is taking steps to reduce CO₂ from production by systematically installing PV systems, electrifying steam-powered equipment, and conserving energy by reusing factory exhaust heat as well as by promoting activities that minimize the release of SF₆ gas into the atmosphere.

Raising the Effectiveness of Environmental Activities by Sharing Information between Factories

The Energy & Industrial Systems Group is working to raise the effectiveness of its environmental initiatives by having environmental managers from Mitsubishi Electric's works and affiliates become involved in various ways, such as by participating in environmental promotion conferences or conducting energy conservation inspections at affiliate companies.

Fiscal 2016 Implementation Status

- **Environmental Promotion Conferences**

Sessions: 4 (2 managers' meetings; 2 working-level meetings)
Theme: Activities established for reducing CO₂ emissions during production by improving facility operations and JIT manufacturing processes
Main results: Reduced CO₂ emissions by 1,492t-CO₂/year as a consolidated group, including all affiliate companies, implementing energy-saving measures such as improving operations in production facilities, switching to electricity for steam facilities, reducing loss of steam, and improving JIT manufacturing processes.

- **Environmental Audit**

Audits were conducted at SGC, Ryosai Technica, Tada Electric Industrial Apparatus Works, Ryosei (Hyogo Prefecture), and Marugame Ryoden Technica (Kagawa Prefecture).

Environment – Building Systems Group

Business Overview and Priority Environmental Issues

Delivering Safe, Secure, and Convenient Products and Solutions that Enhance the Value and Functions of Entire Buildings

Mitsubishi Electric's Building Systems Group provides building management systems including everything from elevators and escalators to access control, building management, and surveillance cameras to public and private building owners in over 90 countries. As these are essential components of social infrastructure, it is necessary to deliver and sustain products and services that are safe, secure, and convenient. To this end, we provide full support ranging from initial sales to maintenance services and renewal, as well as new solutions that further enhance the value and functions of entire buildings. As part of this, we are aggressively expanding the sales of energy-efficient, compact, and lightweight elevators and escalators, as well as building management system products that realize attainable energy savings according to building usage conditions by monitoring and controlling the energy usage conditions of building facilities. Doing this will help to reduce CO₂ emissions throughout society and enable us to contribute to reducing environmental impact.

Counting the Inazawa Works, the Building Systems Group has manufacturing bases in 11 countries around the world including, Thailand and China. Inazawa Works serves as the mother plant developing and manufacturing elevator and escalator components such as traction machines, device components, and control equipment. Environmental initiatives such as reducing CO₂ from production, switching over to lead-free solder, and eliminating the use of wood in packaging materials by adopting returnable containers are being expanded from the Inazawa Works to other manufacturing companies as we promote reducing environmental impact globally.

Priority Environmental Issues

- Climate change
- Waste reduction and management
- Proper management of chemical substances in design and manufacturing

Message from Building Systems Group

Proactively Proposing Building Solutions for Energy Savings and Reducing Environmental Impact through Our Elevator, Facima, and DIGUARD Systems

The Building Systems Group is in charge of manufacturing building systems and the elevators and escalators that provide vertical transportation. It is contributing to the realization of a society with more vitality and comfort, proactively carrying out business while placing a priority on user safety and security throughout the product lifecycle, as well as being involved in activities to protect the environment.

This business group develops products with high energy- and resources-saving performance, continues to manufacture products that are becoming ever smaller and lighter, and has introduced some of the latest energy-conscious technologies. We manufacture all products while giving due consideration to reducing environmental burden, including emitting less CO₂, using fewer hazardous metals and chemical substances, and promoting recycling. At the time of the renewal of existing facilities, we attempt to reduce the volume of waste by using existing equipment where possible, as well as reducing power consumption. We also propose new building solutions in the form of our Facima*1 and DIGUARD*2 systems, which achieve improved energy-saving performance, comfort, convenience, and efficiency through energy management based on building use records, and offer enhanced security and crime prevention features.



Nobuyuki Abe
Executive Officer
In Charge of Building
Systems

*1 Facima: Open integrated management system for building facilities.

*2 DIGUARD: Mitsubishi Electric's total security solution.

Initiatives Contributing to the Environment and Society

The Building Systems Group is contributing to society by providing smaller and lighter elevators and escalators, and building systems that offer higher energy- and resources-saving performance while using fewer hazardous substances. We are also pressing forward to realize even more effective use of resources and greater energy savings through the renewal of existing facilities to make them more efficient.

High-speed Elevators – NEXCUBE (for Japan) and NexWay (for overseas)

Compared to other models, high-speed elevators require a large-capacity traction machine with high power consumption. To counter this, through application of its original stator core technology, Mitsubishi Electric has successively introduced traction machines that are more energy efficient, more compact, and lighter than conventional models. For the control devices, we use full-silicon carbide (SiC) in the production of our world-leading power semiconductor modules. Compared to our previous products, power loss is reduced by approximately 65%, and volume is reduced by 40% as a result of restricting heat discharge. Additionally, owing to the incorporation of an energy-saving elevator group control system that controls the allocation of multiple elevator cars, further energy savings (up to 10%) has been realized.



Full-SiC semiconductor module and control device

AXIEZ Series – Standardized Elevators for the Japan Market

AXIEZ Series elevators greatly reduce power consumption and achieve energy savings of up to 20% compared to conventional models. They accomplish this by using a gearless traction machine equipped with a permanent magnet motor, LED ceiling lighting inside the car, reduced standby power when the elevator is not in operation, and having an optimized balance between the car and counterweight. AXIEZ Series elevators can contribute to even further reductions in power consumption through the incorporation of a converter system that stores and uses electricity generated during braking. Furthermore, we have added a large-capacity elevator to the lineup. With a capacity of 17-26 passengers, it is ideal for applications where traffic flow is high such as large office buildings, commercial facilities, and hospitals. Compared to conventional models, this model has a more compact traction machine, and elevator car, counterweight, and hoistway structural parts are all lighter.



AXIEZ

NEXIEZ Series – Standardized Elevators for International Markets

The NEXIEZ Series, a line of standardized elevators for international markets manufactured in Thailand by Mitsubishi Elevator Asia Co., Ltd., also uses a gearless traction machine equipped with a permanent magnet motor. This results in a more compact, lightweight design and a 20% reduction in power consumption compared to conventional models. NEXIEZ Series elevators can contribute to even further reductions in power consumption as they are equipped with LED interior lighting and a converter system that stores and uses electricity generated during braking. For Central and South America and India, we have introduced strategic models for each region, and are promoting local production and local procurement as we aim to disseminate our highly energy-efficient products.



NEXIEZ-LITE (elevator for India)

"Elemotion+" Elevator Renewal Menu

To maintain the safety, security and comfort of elevators, renewal at appropriate times* is essential. The Elemotion+ menu facilitates the renewal of existing rope-type elevators to the latest model equipped with an inverter-controlled system and a gearless traction machine equipped with a permanent magnet motor. The renewal models ensures safe, secure, smooth and comfortable rides, as well as a reduction in power consumption of up to 60%. Further energy savings is also possible by incorporating LED lamps for the ceiling lighting of the elevator cars. Moreover, Elemotion+ offers a variety of replacement equipment, enabling the customer to make decisions based on budget and preferred installation time, and also contributing to reducing the volume of waste.

* Mitsubishi Electric regards 25 years after completion of a building as an indication for renewal.



Elemotion+

Facima Building Automation System

Facima is a building automation system for monitoring and controlling building facilities such as air conditioning, lighting, and access status. The system optimizes demand control by monitoring peak energy demand and stopping the operation of air-conditioning/lighting facilities as required based on a priority order set by the building manager in advance. Facima also automatically controls building facilities according to tenant business hours and holidays, which assists in achieving reductions in power consumption while considering user comfort and convenience. Additionally, Facima collects and analyzes data on the operation of building facilities, visualizes energy use conditions, and proposes energy-saving and cost-reducing options for the entire building.



Facima BA-system touch

Initiatives for Reducing Environmental Impact

Rolling Out Initiatives of Mother Factory at Overseas Manufacturing Companies

The Building Systems Group manufactures elevators and escalators at manufacturing companies in 11 countries worldwide, including Japan, Thailand, and China. At the Inazawa Works, the mother factory in Japan, there is a particular aim to improve the energy efficiency of machinery used in processes that consume large amounts of power, such as the production equipment for machining and painting. In the future, as local manufacturing for local consumption increases and the production ratio of our overseas manufacturing companies grows, we will proactively introduce the following initiatives and other measures to overseas manufacturing companies with the aim of reducing environmental impact at the global level.

- **Promoting Production Equipment Energy Savings and Lower VOC Emissions**

A wide range of processes are involved in the production of elevator and escalators. One of the processes requiring high power consumption is machining. However, by updating to the latest processing equipment and shortening the processing time, higher productivity has been achieved and power consumption suppressed. The use of heating energy is very high in painting processes as well, where heat is utilized both during the preparation process (parts cleaning) and drying process. With this in mind, the temperature and quality of the processing liquid were reviewed and the temperature was lowered, resulting in a reduction in power consumption. We have also installed a volatile organic compound (VOC) removal device in the painting line to reduce VOCs emitted during the drying process. Additionally, we visualize factory air usage (flow meter at factory entrance) as part of our activities to reduce power consumption from compressor usage.

- **Introducing Renewable Energies**

Additional photovoltaic module panels were installed at the newly built Elevator QM Center and other facilities, bringing the total number installed to 1,461. Their combined output is 342.9kW and the electricity generated is used to power equipment and air-conditioning inside the factory. Additionally, for all group company buildings constructed in the future, we will promote the utilization of photovoltaic modules and eco-conscious items (specifications such as LED lighting, water-saving toilets, and recycling materials).

- **Upgrading Aging Facilities and Introducing LED Lighting**

We have updated aging boilers, compressors, transformers, and air conditioners to more efficient equipment, and are switching to the use of LED lighting when replacing lighting equipment, thereby achieving greater energy savings.

- **Promoting Materials Recycling**

We are collecting and sorting waste plastic for recycling purposes. To further promote this initiative, we began collecting and sorting electronic component reels, plastic bands, and plastic containers in April 2011. This has enabled us to recycle one ton of materials every month.

- **Reducing Wooden Packaging Materials and Number of Trucks**

To comply with the increasing demand for zero emissions from construction sites in Japan, we are promoting the use of returnable containers for appearance parts (jamb, elevator car) of not only standard elevators and custom-order elevators, but also the "Elemotion+" renewal model, for which future demand is expected to rise. In this way, we are aiming to eliminate the use of wooden packaging materials and reduce the number of trucks used.

- **Lead-free Printed Circuit Boards**

We are engaged in initiatives to reduce the use of lead in compliance with regulations being enacted around the world, including Europe's RoHS. Today, elevators are not subject to the RoHS directive, but as a voluntary measure, we are steadily changing from eutectic to lead-free solder in the manufacturing of printed circuit boards.

Environment – Electronic Products and Systems Group

Business Overview and Priority Environmental Issues

Safeguarding People's Lives and Contributing to Space Research and Cutting-edge Technologies

Mitsubishi Electric's Electronic Products and Systems Group manufactures communications, broadcast, and observation satellites, ground control systems required for satellite operations, and large telescopes such as the Subaru Telescope. In this way, we are safeguarding people's lives and contributing to space research and cutting-edge technologies. We also supply electronics equipment such as contact image sensors used in copiers and modules for millimeter-wave radar used in vehicle safety systems to communications companies and automotive manufacturers. At the Kamakura Works and Communication System Center, our main sites in Japan, activities such as reducing CO₂ from production, preserving biodiversity, local cleanup activities, and employee visits to local elementary and junior high schools for the purpose of educating children about coursework prior to entering a company and environmental issues are promoted.

Priority Environmental Issues

- Climate change
- Deforestation
- Preservation of biodiversity in areas where we operate

Message from Electronic Products and Systems Group

Working to Solve Environmental Problems and Develop Products for Next-generation Energy Solutions

The products of the Electronic Systems Group play a vital role in solving humankind's shared environmental problems and in the development of next-generation energy solutions. For example, we are the primary contractor for manufacturing the "IBUKI" (GOSAT) launched in 2009 and GOSAT-2 scheduled for launch in 2017, which are designed to observe the concentration distribution of greenhouse gases and monitor the emission and absorption of these gases, thereby assisting in the prevention of global warming. Launched in 2014, DAICHI-2 Advanced Land Observation Satellite (ALOS-2) contributes to safeguarding people's lives and solving global-scale environmental problems. Additionally, the geostationary meteorological satellites Himawari-8 and Himawari-9 (launched in October 2014 and operating beginning July 7, 2015, and scheduled for launch in 2016, respectively) will provide even greater observation capabilities for monitoring global warming and weather phenomena. We are also conducting research on space-based solar power generation; that is, generating electricity from sunlight in outer space and sending the electricity back to Earth via radio waves for a 24-hour-a-day stable supply of electricity.



Masamitsu Okamura
Executive Officer
In Charge of Electronic
Products and Systems

Meanwhile, one of our ground-based solutions is Doppler Lidar, which can remotely measure the moving speed of dust and particulates in the atmosphere. Doppler Lidar can also monitor and forecast substances that have an environmental impact on the basis of automobile emissions or the heat-island effect. It is expected that this technology will contribute to the renewable energy domain through more efficient control of wind farms and extending the service life of wind turbines.

We are also working to reduce CO₂ emissions from the production of these products and enhance the efficiency of energy utilization. More specifically, most precision electronic devices are manufactured in cleanrooms and require the use of testing equipment. As such, we are introducing initiatives to improve the operation of air conditioning and testing equipment so that energy is used more efficiently.

Initiatives Contributing to the Environment and Society

Contributing to World-leading Global Environment Observation

The Japan Aerospace Exploration Agency (JAXA) selected Mitsubishi Electric as the primary contractor for GOSAT-2*1. The satellite is scheduled for launch in 2017 as the successor to the "IBUKI" (GOSAT) (launched in January 2009), which was developed as the world's first satellite dedicated to space observation of the concentration distribution of greenhouse gases.

GOSAT-2 is equipped with high-performance observation sensors that will enable more precise measurements of greenhouse gas concentration distribution. It will also estimate particulate matter (black carbon, PM2.5, etc.), a capability which assists in monitoring atmospheric pollution. This time, just as with "IBUKI", Mitsubishi Electric is in charge of the entire project, including development and production of the satellite system and observation sensors, constructing the ground-based facilities, and overseeing satellite control operations after launch.

Moreover, GOSAT-2 is expected to be a focal point in international coordination and cooperation, with several greenhouse gas observation satellites following in the footsteps of IBUKI, such as OCO-2 launched by the United States in 2014 and Europe's CarbonSat, which is scheduled for launch in the future.

*1 GOSAT-2: Greenhouse gases Observing SATellite-2



Greenhouse gases Observing SATellite-2 (GOSAT-2)

Contributing to Enhanced Monitoring Capabilities of Weather Phenomena and the Global Environment

The weather forecast is a part of our daily lives. Following Himawari-7, which continues to operate smoothly, Mitsubishi Electric developed the Himawari-8, which was launched in 2014 and began operation on July 7, 2015. There is also a plan to launch Himawari-9, which will have performance equivalent to that of Himawari-8, in 2016.

Equipped with world-leading next-generation meteorological observation sensors, Himawari-8 and Himawari-9 will enable an advanced level of monitoring atmospheric phenomena (typhoons, torrential rain, etc.) and the global environment (sea ice, volcanic ash, yellow sand phenomena, etc.) thanks to enhanced resolution and more observation channels, doing so with the time required to make observations significantly reduced.



Himawari-8 and Himawari-9 meteorological satellites

Contributing to Understanding Disaster Situations and Monitoring of Oceans and Forests

Satellite application such as observation at the time of a disaster and monitoring the conditions of forests and agriculture are expanding and becoming common around the globe. Mitsubishi Electric's Advanced Land Observing Satellite-2 "DAICHI-2" (ALOS-2) is a global observation satellite launched on May 24, 2014 with the objectives of safeguarding people's lives and solving global-scale environmental problems. As the main contractor for "DAICHI-2", the successor to "DAICHI", Mitsubishi Electric was in charge of manufacturing the satellite, the synthetic aperture radar, and ground-based control and processing systems.

"DAICHI-2" is expansively carrying on the "DAICHI" mission of map creation, regional observation, understanding disaster status, and resource exploration. It is useful for understanding the growth status of grains and other crops, and is supporting the smooth supply of resources and energy, as well as international initiatives to tackle global environmental problems. In addition, "DAICHI-2" can assist in monitoring the illegal logging of forests in tropical rainforest zones such as in Southeast Asia and Brazil.



Advanced Land Observing Satellite-2 "DAICHI-2" (ALOS-2)

Ecological Contributions through Various Uses of Highly Precise Positioning Data

The Quasi-Zenith Satellite System, a system of positioning satellites especially for use by Japan, has an orbit with a large period of time spent near the zenith above Japan. As a result, positioning signals can be sent to spots where positioning was previously difficult, such as places blocked by buildings or mountains. As a supplement to GPS, it has enabled a dramatic improvement in positioning precision: from approximately 10m to the centimeter-level. It is expected that this highly precise positioning data will be used to develop solutions contributing to the environment in diverse fields; for example, eco-drive control and automatic driving using road elevation and positioning data in the automotive sector, more efficient railcar operation and management in the railway sector, and automatic operation of agricultural and construction machinery in the agricultural, construction, and civil engineering sectors.



First Quasi-Zenith Satellite "MICHIBIKI"

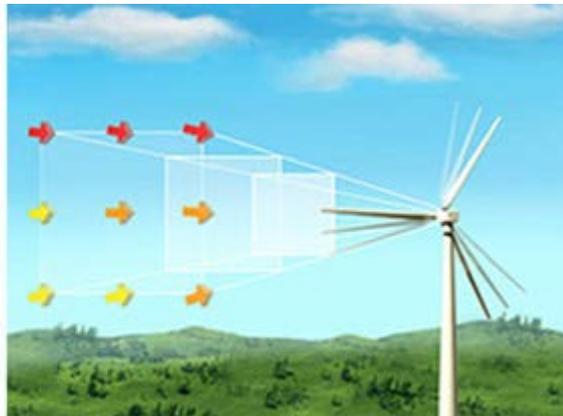
Doppler Lidar Systems for Wind Resource Assessments

The purpose of Doppler Lidar (Light Detection and Ranging) systems is to measure wind velocity and direction by detecting aerosols and their movement in the atmosphere. Due to remote research of wind conditions conducted, Doppler Lidar now enables real-time measurement of the wind that conventional anemometers are incapable of, such as monitoring and forecasting wind direction in cities (e.g., heat-island phenomenon, environmental impact of substances from automobile emissions, and air pollution), and applications for larger wind generation plants and expanding wind farms. Based on data obtained, optimum control can be realized.

One type of Doppler Lidar for wind farms is installed on the nacelle of the wind turbine and measures wind velocity and direction in five to nine directions. Its purpose is to measure wind velocity and direction along the line of sight at a horizontal distance of 40 to 250 meters or more*2. Measurement data is sent to the turbine in real time, enabling turbine control that optimizes power generation efficiency, protects the wind turbine, and reduces maintenance cost*3. It's also possible to install Doppler Lidars on offshore wind turbines, or existing wind turbines, and they can be used to monitor and extract observation data from a remote location using wireless monitoring and control functions. Eye-safe wavelength (near-infrared, invisible) Class 1M lasers are used to ensure eye safety.

*2 Observation distance varies depending on atmospheric conditions.

*3 Wind turbine power curve can be measured.



Doppler Lidar for wind turbines

Initiatives for Reducing Environmental Impact

Initiatives for Reducing CO₂ Emissions in Production

Precision electronic devices are mainly manufactured, assembled, and tested in cleanrooms to maintain quality. In addition, because of the variety of test equipment used, we are striving to reduce CO₂ emissions from production by improving productivity and reducing the use of electricity. To achieve this, we adjust the air conditioning of the cleanroom based on whether or not testing equipment is being used. We also analyze the heat in computer server rooms so that hotspots can be eliminated, separate the cold- and hot-air duct work for air conditioners and servers, and optimize air conditioner control.

New Production Building at Kamakura Works – CO₂ Emissions Cut by Approx. 23%

The design building of Kamakura Works, which was completed in January 2015, has successfully cut CO₂ emissions by implementing the following measures.

- **Energy Consumption Control**

Not only is Mitsubishi Electric controlling and monitoring when lights are turned on and off, and the adjustment of each lighting fixture through the introduction of LED lighting and a layout-free lighting control system, but it is also reducing power used for lighting with automatic ON/OFF control triggered by motion sensors (introduced for common areas and offices). We have also cut the power consumption of air-conditioning systems through the adoption of LOSSNAY ventilation units equipped with a night purge function*1.

- **Utilization of Natural Ventilation and Natural Light**

We installed an Eco-Void, an open-ceiling space in the center of the building spanning from the first floor to the roof. On each floor, windows are positioned to face the Eco-Void, generating an updraft from natural wind pressure and the chimney effect of the space, creating natural ventilation that reduces the need for air-conditioning.

Furthermore, we installed a light collection system as the highest point of the Eco Void. It continuously collects natural light and uses a light-tracking sensor to capture the sunlight at its highest intensity, a factor that varies throughout the seasons. Regardless of the season or time of day, natural light is collected from the first floor up, cutting down on electricity consumed for lighting.

- **Measures Related to Building Structure**

By introducing heat insulating sandwich panels*2 and Low-E glass*3 for the exterior walls, we have alleviated the burden of heating and cooling.

- *1 Night purge function: Draws low-temperature external air into the building at night and uses it to lower cooling load when starting air-conditioning equipment the following morning.
- *2 Heat insulating sandwich panels: A building material made from two steel panels with heat insulating material sandwiched in-between. These panels are of a sophisticated design and lightweight, offering excellent insulation performance, strength, fire resistance, durability, and installation ease.
- *3 Low-E (Low Emissivity) glass: A sheet of glass whose surface is coated with a special metallic membrane that consists of tin oxide or silver. The Low-E membrane increases the reflection rate of far-infrared rays. Multi-pane Low-E glass reduces heat transfer, achieving greater insulating performance.

Environment – Communication Systems Group

Business Overview and Priority Environmental Issues

Providing Communications Equipment and Services Contributing to the Advancement of Today's Information Society

Mitsubishi Electric's Communication Systems Group is making contributions to the advancement of today's information society through products and services supplied to communications carriers, financial services firms, retail companies, and governments, both in Japan and abroad. These products and services include communications infrastructure equipment that uses optical and wireless information communications technologies (ICTs) as well as network camera systems equipped with the latest video surveillance technologies. ICTs have advanced at a rapid pace and demand has changed almost overnight. Therefore, in order to deliver satisfaction to our customers around the world, we are striving to develop cutting-edge technologies and build an efficient yet flexible production system with the Koriyama Plant in Fukushima Prefecture and the Communication Network Center in Amagasaki, Hyogo Prefecture as bases for those activities.

Priority Environmental Issues

- Climate change
- Depletion of mineral resources

Message from Communication Systems Group

Contributing to the Development of Communications and Network Camera Markets, and Reducing Environmental Impact through Our Value-Added Systems

Telecommunication networks that incorporate optical and wireless ICTs and security systems that utilize video surveillance technologies are key elements of the social infrastructure that make progress in our daily lives and industry possible. Moreover, as these devices become more functional and are used by more and more people, electricity consumption will also increase rapidly. As a result, the Communication Systems Group is striving to achieve greater energy savings and reduce environmental impact with a focus on three core themes.

The first is "energy-efficient products." Here, we are working on energy-efficient designs for optical access systems used in communications infrastructure equipment and communications gateways for service providers.

The second is "achieving energy savings in services provided using our products." Here, our optical and wireless access systems are used in automated meter readers for smart grids, while our communications gateway equipment is now being used in HEMS/BEMS to help make it easier to monitor electricity use. We are also working to market our network equipment for M2M services and for obtaining data for demand response programs.

The third is "environmental contributions during installation work." Here, we are producing network cameras that reduce and reuse communications cables.

We are moving forward with the reduction of CO₂ from production, and at our Koriyama Plant, which was damaged in the Great East Japan Earthquake, we rebuilt the manufacturing building as an "eco factory" and reduced CO₂ emissions from the production of our main products by 25% compared to conventional methods.

Going forward, we will continue refining our optical and wireless information communication technologies and video surveillance technologies while delivering value-added systems to our customers. This will enable us to help develop communications and network camera markets around the world, including security systems, while mitigating environmental impact.

*ICT: Information and Communication Technology



Takashi Nishimura
Executive Officer
In Charge of
Communication Systems

Initiatives Contributing to the Environment and Society

More Energy-Efficient and Compact Optical Access Systems

The GE-PON ONU customer network terminating unit for optical access systems uses a passive optical network (PON) to provide up to 64 users with a single optical fiber connection, which makes the unit more compact and energy-efficient. In addition, this unit achieves a 65% reduction in power consumption and 74% reduction in material usage compared to conventional units because of its use of low-power consumption parts and reduced number of parts.



Customer network terminating unit

Providing equipment that delivers energy management services

We supply gateway equipment to service providers that connects various household, factory, or building networks to an energy management system using the cloud. This equipment is used to obtain power consumption data from home appliances, air conditioning units, or production lines which is then used to deliver demand response services* that strike a balance between electricity supply-demand and energy management systems, such as HEMS.

* Demand response: When tight supply-demand conditions are present, the user curbs power use or shifts it to another time at the request of the supplier to maintain an appropriate supply-demand balance.



Gateway equipment

Reducing and Reusing Communications Cables

We are working to reduce and reuse communications cables during installation work through production of the MELOOK μ + digital network camera system, which can use existing analog camera cables for high-definition and highly functional digital network camera systems without the need to lay new LAN cables for digital CCTV.

Initiatives for Reducing Environmental Impact

Environmental Assessment Evaluations

We require environmental assessments for all new product development projects. These assessments are helping us to make products and packaging more compact and to reduce the amount of packaging materials we use.

Expanding Environmental Management to the Supply Chain

In addition to reducing CO₂ during production and at the product usage phase, we are streamlining product transportation and reducing CO₂ by improving loading ratio and introducing a modal shift.*

* Modal shift: Switching from using truck transportation to marine or rail transportation, which can carry large volumes of goods and is earth friendly.

Koriyama Factory – Reduced CO₂ Emissions from Production by 25%

At the Koriyama Factory, where our new manufacturing building was constructed as an "eco factory," CO₂ emissions during the production of main products have been reduced 25% compared to conventional methods. This was achieved through the introduction of photovoltaic power generation and energy-efficient utilities including LED lighting, and by improving productivity.

Koriyama Factory – Reduced Use of Organic Solvents

The Koriyama Factory engages in every step of the manufacturing process from materials processing—such as plate fabrication and molding—to product assembly. It has reduced the use of organic solvents by introducing a microbubble wash during the plate cleaning process and changing to powder paint solvents.

Communication Network Center – Achieved Greater Energy Efficiency through Production Line Improvements

The Communication Network Center, which designs nearly all of the products made by the Communication Systems Group and assembles communications equipment, made improvements to its production line to more flexibly respond to changing demand from the marketplace, resulting in less space being used and improved productivity. As a result, the Center significantly reduced the amount of electricity it uses for lighting and air conditioning equipment necessary for production. In addition, the Center is making the utilities used by its design and sales offices even more energy-efficient by upgrading to more efficient air conditioning and making operational improvements.

Environment – Living Environment & Digital Media Equipment Group

Business Overview and Priority Environmental Issues

Providing a Broad Range of Products and Services with a Focus on "Smart Quality"

Mitsubishi Electric's Living Environment & Digital Media Equipment Group manufactures air conditioners, ventilating units, water heaters, photovoltaic systems, lighting solutions, kitchen appliances, home electronics, and video imaging equipment, and supplies eco-conscious products and services for a wide-ranging market including homes, offices, and factories. With production bases located in Japan, Europe, Americas, Asia, and China, our operations are worldwide. At those production bases, we are promoting energy savings by introducing the Company's energy-efficient products and improving productivity at the above-mentioned factories. At the same time, we are strengthening the management of chemical substances throughout the supply chain and working to ensure the proper management of waste, exhaust, and wastewater.

Priority Environmental Issues

- Climate change
- Depletion of mineral resources
- Proper management of chemical substances in design and manufacturing
- Air, water, and soil pollution due to operations and procurement

Message from Living Environment & Digital Media Equipment Group

Developing Eco-friendly Products and Reducing Our Own Environmental Impact

The Living Environment & Digital Media Equipment Group regards the air conditioning and refrigeration systems business, one of Mitsubishi Electric's growth drivers, as its area of focus. In addition to expanding the operations in various segments such as room and packaged air conditioners, we are pressing forward with the creation of new businesses and strengthening present ones. In Fiscal 2017, we plan to increase our development and manufacturing activities in existing businesses, with a production framework spreading over five major locations: Japan, Europe, USA, Asia, and China. At the same time, we are building the foundation of a cyclical business, including synergies with MELCO Hydronics & IT Cooling S.p.A. (MEHIT, formerly DeLclima), which we acquired a major share of in 2015, and expanding our business scope through the creation of new businesses.

As we expand our businesses, it is important for us to contribute to reducing environmental impact through energy-saving initiatives for our customers and recycling. As part of this, based on the Living Environment & Digital Media Equipment Group's concept of "Smart Quality", we are supplying a broad range of eco-friendly products and services for the home, office, and industry. These include energy-saving products that reduce CO₂ from usage as well as photovoltaic systems that generate renewable energy and do not produce CO₂ during power generation.

Meanwhile, as activities to reduce CO₂ from production, the Living Environment & Digital Media Equipment Group is proactively introducing its core energy-saving products—namely, air conditioners, LED lighting fixtures, heat-pump hot-water supply systems, and photovoltaic systems—at all production sites. We are also promoting energy-saving activities by improving productivity linked to just-in-time improvement activities using IT.



Takeshi Sugiyama
Senior Vice President
In Charge of Living
Environment & Digital
Media Equipment

Initiatives Contributing to the Environment and Society

Kirigamine ADVANCE FZ Series Room Air Conditioners Won METI Minister's Award, the Top Prize of 2015 Energy Conservation Grand Prize

The Kirigamine ADVANCE FZ Series is equipped with the world's first*1 twin-propeller fan system in which the left and right fans operate independently, delivering substantial energy savings and unprecedented levels of comfort. In recognition of these achievements, the air conditioner model received METI (Ministry of Economy, Trade and Industry) Minister's Award, the top prize of Fiscal 2015 Energy Conservation Grand Prize in the Products and Business Models category.

*1 Launched on October 30, 2015. Based on in-house review of air conditioner indoor units.



Kirigamine ADVANCE FZ Series Room Air Conditioner

Slim ZR Series Package Air Conditioners for Retail Stores and Offices Achieve Industry's Top Annual Performance Factor (APF)*2

The Slim ZR Series is equipped with the world's first*3 "full-SiC DIIPM",*4 achieving the industry's top energy-saving performance*5 with the Slim ZR P280 (10hp).

- *2 Annual Performance Factor: An indicator introduced in 2007 that enables the evaluation of energy efficiency approximately equal to that under actual usage conditions.
- *3 As of February 5, 2016. Based on in-house review of package air conditioners for retail stores and offices.
- *4 SiC: Silicon Carbide, DIIPM: Dual-In-line Package Intelligent Power Module (semiconductor power module with a built-in control element with protective functions)
- *5 As of February 5, 2016. Based on in-house review of P280-class package air conditioners for retail stores and offices. Based on the APF 2015 rating for PLZX-ZRP280EFK in the JIS B 8616:2015 package air conditioner category.



Slim ZR Series package air conditioners for retail stores and offices

Grand Multi Series Building Air Conditioning System Achieves Industry's Top-Class APF

The Grand Multi Series is equipped with the world's first*6 flat-tube heat exchanger, optimized refrigerant distribution, and a high-efficiency compressor. As a result, they have achieved the industry's top-class APF.*7

*6 As of beginning sales in October 2013 (based on in-house review).

*7 As of February 2015, based on in-house review of building multi-split air conditioners.



Grand Multi Series building air conditioning system

MILIE LED Lighting – Realizing Low Power Consumption and Comfort

The MILIE LED lighting brand name was coined from the words "Mitsubishi", "lighting," and "ecology." It expresses our desire to make positive contributions to the Earth and society through LED lighting. The lineup has been expanded with products for a wide variety of applications. Products include high-efficiency LED base lights for offices, high-ceiling LED base lights for factories, warehouses, and gymnasiums, high-luminosity LED downlights and spotlights for retail stores, and lighting control systems that provide energy savings and comfort automatically.



MILIE LED lighting

DIAMONDSOLAR® Photovoltaic System Makes Full Use of Natural Energy

The DIAMONDSOLAR® system delivers a remarkable power generation capacity using a combination of high-output modules and high-efficiency power conditioners. In addition, the Multi Roof Series, which comes in a wide variety of shapes, can maximize the power generation area on the roof using product combinations, thereby generating abundant electricity for daily life.



245W Multi Roof Series PV module (launched June 2016)

Initiatives for Reducing Environmental Impact

High-Efficiency Air Conditioners, LED Lighting, and PV Power Generation Systems Being Used at Each Manufacturing Site and Affiliate

All of our manufacturing sites and affiliates utilize the Company's core energy-saving products—namely, high-efficiency air conditioners, heat-pump hot-water supply systems, and LED lighting—and reduce CO₂ emissions from production. We have also installed photovoltaic systems that are contributing to the reduction of peak electricity demand during the summer.

Promoting Energy-saving Activities Linked to Just-in-time Improvement Activities Utilizing IT

We are engaged in energy-saving activities by introducing improvements that result in higher productivity. These include initiatives such as company-wide just-in-time improvement activities in the factory that reduce equipment operating loss, as well as making improvements to logistics and reviewing production methods.

Strengthening the Management of Chemical Substances Affecting the Environment and Human Health

In response to EU RoHS directives that specifically call for eliminating the use of hazardous substances and REACH regulations requiring that information on chemical substance content be provided, we are strengthening the management of chemical substances throughout the supply chain in product procurement, design, production, sales, and services.

Environment – Factory Automation Systems Group

Business Overview and Priority Environmental Issues

Helping Customers in the Manufacturing Industry to Enhance Their Competitiveness

Mitsubishi Electric's Factory Automation Systems Group provides customers in the manufacturing industry with a wide range of products and solutions in the field of industrial mechatronics, including factory automation controllers, drive products, energy-saving support products, equipment in the field of electric power distribution control, and processing machines.

The Factory Automation Systems Group has manufacturing bases in Nagoya and Fukuyama domestically, and China, Southeast Asia, and India abroad. We are expanding overseas procurement and production as part of the effort to strengthen our global business network. Amidst this move, we are strengthening chemical substances management in the parts and materials procurement process and environmental management at factories. Moreover, we are helping the businesses of our customers in and outside Japan to improve their added value and competitiveness through products and services with higher energy-saving performance. This is being carried out at our sales and service bases located in Japan, China, Korea, Taiwan, Southeast Asia, India, the US, Europe and South America.

Priority Environmental Issues

- Climate change
- Depletion of mineral resources
- Proper management of chemical substances in design and manufacturing
- Air, water, and soil pollution due to operations and procurement

Message from Factory Automation Systems Group

Delivering Devices, Equipment, and Solutions that Help Reduce Energy Usage during Production to Customers around the World

Devices and equipment used in industrial mechatronics are essential to adding value and enhancing the competitiveness of a business through quality and productivity improvements for customers in the manufacturing industry. Mitsubishi Electric's Factory Automation Systems Group provides devices and systems that possess high energy-saving capability for production facilities in factories where the bulk of energy is consumed.

We are helping our customers reduce the total cost of development, production and maintenance by taking advantage of our factory automation and information technologies, and continue to support customers' improvement activities. With our concept of proposing solutions orientated to manufacturing that stays one step ahead, we are also strongly supporting manufacturing and management optimization from the aspects of production, product quality, the environment, safety, and security. Various data collected in real time from a production site go through preliminary processing according to usage, and then data to be used onsite is fed back immediately to the production site, while the data required for use at higher levels as information is supplied to IT systems. In this way, we provide an overall environment that is optimized to the fullest for Monozukuri (manufacturing). We are also contributing to energy savings, one of our goals, by continuing to promote improvements using such a manufacturing environment.

In addition, we are verifying productivity and facility utilization ratio through the operation of a "model factory where e-F@ctory solutions are being used" at the Nagoya Works. In the factory, the results of a number of activities have indicated the benefit of reducing CO₂ from production, as well as including improved productivity, shorter lead times, and less product quality loss.

We are committed to contributing to our customers' manufacturing activities by continuing to propose combinations of our highly energy-efficient factory automation products and cutting-edge factory automation solutions.



Kei Uruma
Executive Officer
In Charge of Factory
Automation Systems

Initiatives Contributing to the Environment and Society

"e-F@ctory" Mitsubishi Integrated Factory Automation Solution

The primary goal of the e-F@ctory integrated FA solution is to reduce the total cost of development, manufacturing, and maintenance processes. e-F@ctory utilizes sophisticated technologies and information management to optimize factory operations through improved productivity, quality, and energy consumption—thus shaping the factory model of the future. The e-F@ctory concept received the "2015 Frost & Sullivan Southeast Asia Enabling Technology Leadership Award".



⊕ ZOOM

e-F@ctory Mitsubishi integrated FA solution

MELSEC iQ-R Series Programmable Controller

A newly developed high-speed system bus enables the MELSEC iQ-R Series to realize a processing capacity 40 times greater than the MELSEC-Q Series. Furthermore, variation in control cycles has been minimized to ensure maximum stability in manufacturing quality utilizing the synchronized operation of controllers connected via networks. This contributes to further improving the efficiency of production facilities and optimizing factory operations. In recent years, the application of controllers has expanded to water treatment facilities, photovoltaic power generation systems, and electric power monitoring systems, contributing to energy savings and environmental improvements for customers outside of the FA field as well.



MELSEC iQ-R Series programmable controller

eX-F Series Fiber Laser Processing Machines

The eX-F Series is the culmination of incorporating fiber laser technology into our eX Series two-dimensional laser processing machines to realize superior oscillation efficiency. It includes various advanced features, such as Mitsubishi Electric's original high-efficiency servomotor, servo amplifier, and inverter-control cooling unit. This combination has realized a 60% reduction in power consumption.*1 In addition, the Eco Mode setting, which stops machine functions step-by-step, reduces power consumption by much as 70% during periods of standby.*2 Moreover, energy-saving operation is further promoted by visualizing power and gas consumption via a monitor that displays energy use.



eX-F Series fiber laser processing machine

*1 Compared to Mitsubishi Electric ML3015eX-45CF-R two-dimensional CO₂ laser processing machine

*2 Compared to power consumption without using Eco Mode

F Series Industrial Robot

In response to the need for an efficient parts supply network, shorter startup time, and the flexibility to handle a variety of parts, we developed intelligent technologies that use force sensors, 3D vision sensors, multifunctional electric hands, and more. These intelligent technologies are applied to the assembly cells that manufacture magnetic contactors. Compared to conventional mass-production lines, it has become possible to produce small lots of multiple items, productivity has been improved, the production area footprint has been reduced, and production efficiency and product quality have been improved. In recognition of its abilities, the F Series was awarded the 47th (2014) Ichimura Prize in Industry for Distinguished Achievement from the New Technology Development Foundation Japan.



F Series industrial robot

SF-PR Superline Premium Series Energy-Saving Motor

If all of the approximately 100 million standard motors in Japan were replaced with highly efficient Top Runner-compliant motors (equivalent to IE3*3), calculations show that some 15.5 billion kWh of power usage could be reduced annually. The same holds true for other countries as well, indicating the important role that IE3-compliant industrial motors will play in improving natural environments in Japan and abroad. Top Runner-compliant SF-PR Series was awarded the Japan Machinery Federation Chairman's Award at the 2014 (35th) Excellence in Energy-Conservation Equipment Awards as an induction motor applying cutting-edge, high-efficiency design technology.



SF-PR Superline Premium Series energy-saving motor

*3 IE3: Premium efficiency class under IEC60034-30, which classifies single-speed, three-phase, cage-induction motors into energy-efficiency classes.

Eco-Monitor Series Energy Measuring Unit

By installing our energy measuring unit in switchboards and distribution boards, it is possible to measure various data such as energy consumption, voltage, and current. This unit not only measures and analyzes the overall consumption of factories and buildings, but also the individual consumption of departments, sections, lines, and equipment, achieving efficient energy usage by managing the basic unit.



EcoMonitor Light Energy Measuring Unit

KB-HD and KB-HDA High-Voltage Direct-Current No-Fuse Switches

KB-HD and KB-HDA switches for direct-current (DC) power are used in systems and facilities that contribute to the creation of an eco-conscious, including photovoltaic power generation systems producing renewable energy and high-voltage DC power-feeding data centers. In recognition of the fact that these products are equipped with a highly reliable, extremely economic DC interruption system, they were awarded the "2015 R&D 100 Award" by R&D Magazine, Co., Ltd (USA).



No-Fuse KB-HD switch for HVDC systems

Initiatives for Reducing Environmental Impact

Reducing CO₂ from Production – Nagoya Works and FA Equipment Production Building

In 2013, we completed construction of a main production building that utilizes the latest equipment. We are constantly pursuing cutting-edge energy-saving techniques. (The below results are comparisons with energy-saving equipment introduced in 2008.)

- Improved heating insulation of external walls, adoption of Low-E multilayered glass (low emissivity multilayered glass with thermal barrier for high insulation)
- Introduction of Mitsubishi Electric's latest air conditioning system, the Compact Cube e Series (cuts power consumption by 1,051,200kWh per year)
- Incorporation of LED lighting system with motion sensors (cuts power consumption by 24,700kWh per year)
- Introduction of an energy management system that utilizes the FA energy solution e&eco-F@ctory to measure and control the power consumption of air conditioning, lighting, and exhaust as well as airflow

Reducing CO₂ from Production – Fukuyama Works Smart Meter Production Building

The Fukuyama Works Smart Meter Production Building is in charge of producing smart meters, which are essential to building next-generation energy networks. This facility has implemented the following measures in order to reduce CO₂ emissions from production.

- Reduced heat transfer by 84% for the rooftop and 42% for the wall through full insulation measures and adopting a window-less structure for the production area
- Achieved greater energy efficiency by preventing excessive heating and cooling onsite by centrally managing a City Multi air conditioner system with Move-Eye using the G-150AD Web-based central controller
- Raised the efficiency of air conditioner operations by using an energy-efficient, compact air-cooled heat pump chiller
- Achieved significant energy savings by installing LED lighting (650 straight tubes and 24 ceiling lights) on the building's interior and roof overhangs (reduced energy consumption by 28,400kWh/year and reduced replacement costs by 370,000 yen/year)

Switching to Higher Efficiency Equipment

We are in the process of systematically replacing aging utility equipment with more efficient models.

Achieved Zero Emissions

We have achieved zero emissions at both Nagoya Works and Fukuyama Works.

Strengthening Chemical Substance Management and Environmental Risk Measures

In addition to expanding design and parts procurement overseas with a main focus on emerging countries, we are promoting local production for local consumption. We are also strengthening measures for chemical substance management in parts procurement and reducing environmental risk at overseas factories.

Regarding the management of chemical substances, we obtain a written guarantee that harmful chemical substances have not been used, and conduct analyses to determine if parts contain harmful substances when necessary.

Environment – Automotive Equipment Group

Business Overview and Priority Environmental Issues

Strengthening Our Global Development, Production, and Sales Systems

The Automotive Equipment Group provides powertrain products, body control products, and car multimedia devices globally. As a full support supplier, we work together with our customers to develop cutting-edge technologies and endeavor to provide a wide range of services, from production, sales, and supply to spare parts and rebuilds. To reduce environmental load, our three development sites in Japan (i.e., Himeji Works, Sanda Works, and Fukuyama Works) function as mother factories, managing our 14 production sites in 11 countries overseas to ensure compliance with environmental guideline designs that consider environment-related regulations, product environmental restrictions in each country and region, and the disposal and recyclability of products as well as preventing air, water, and soil pollution.

Priority Environmental Issues

- Climate change
- Preservation of biodiversity in areas where we operate
- Proper management of chemical substances in design and manufacturing
- Air, water, and soil pollution due to operations and procurement

Message from Automotive Equipment Group

Contributing to the Realization of a Low-carbon Society through the Development of Low Fuel Consumption Technology for Vehicles

Aiming to be an advanced global environmental entity, the Mitsubishi Electric Group is contributing to the realization of a sustainable global environment.

The Automotive Equipment Group is proactively developing business at the global level, engaging in initiatives to reduce CO₂ emissions by both installing its products in vehicles to realize better fuel efficiency and reducing energy consumption in manufacturing processes.

In regards to improving the fuel efficiency of automobiles, engines are becoming more efficient in order to achieve low fuel consumption. Mitsubishi Electric is helping to make vehicles more efficient through related products such as ignition systems for the precise control of combustion in high-compression ratio engines and turbo actuators that control the boost pressure of downsized turbo engines, and the control thereof.

We are developing motorized equipment that is more compact and has higher efficiency. Some examples are a compact motor for electric power steering being applied in large vehicles, a belt-driven motor generator with an enhanced deceleration energy regenerative function, and quiet idling stop restarters.

As an example of energy saving in manufacturing processes, a new production building has introduced LED lighting and cutting-edge energy-saving technologies such as automatic light adjustment, and central monitoring and optimized control of air conditioning and ventilation equipment. By thoroughly enforcing energy-saving measures, such as adopting photovoltaic generation in existing buildings, we are controlling the use of electricity. These achievements are being implemented at overseas manufacturing bases as part of our global energy-saving efforts.



Isao Iguchi
Senior Vice President
In Charge of Automotive
Equipment

Initiatives Contributing to the Environment and Society

Fuel Efficiency Technologies for Internal-combustion Engines

We are helping to make automobiles more fuel efficient through products that are compact, lightweight, and offer high performance and high efficiency such as alternators, starters, and electric power steering systems. Our idling stop-and-start systems, which link the engine control unit, transmission control unit, alternator, starter, and electric oil pump, ensure reduced fuel consumption for customers. In February 2015, our GXi alternator acquired Europe's ECO Innovation Technology certification.



GXi alternator

Electric-powered Products Contributing to the Dissemination, Safety and Comfort of EVs/HEVs

To realize safe, comfortable automated driving cars by using advanced preventive safety technologies, we optimize Mitsubishi Electric's strengths such as semiconductor device design, circuit design, structural design, and vehicle motion control technologies. Furthermore, we aim to provide more efficient electric-powered products* that involve the collaboration of multiple technologies.

* Electric-powered products: Products that contribute to promoting the use of electricity in automobiles by having equivalent or superior functions compared to devices driven by gasoline combustion.



EMIRAI3 xAUTO automated driving concept car

Car Navigation Systems Helping to Save Energy

To make fuel efficiency more enjoyable for customers, we are developing and supplying car navigation systems that include a function to search for the route with the best energy savings to minimize fuel consumption, and a function to evaluate to what extent the driver is driving in an eco-friendly manner.



DIATONE SOUND.NAVI high-end audio and car navigation system

Promoting Proper Management of Chemical Substances in Design and Production

The Automotive Equipment Group is actively expanding its business globally and is striving to ensure compliance with REACH regulations, the ELV directive of the EU, and other environmental laws and regulations covering its activities and products around the world. Additionally, because the chemical substances management system of the International Material Data System (IMDS) has been introduced in the automotive industry, we are ensuring compliance with environmental guideline designs that consider the disposal and recyclability of automobiles.

Initiatives for Reducing Environmental Impact

Rolling Out Measures Implemented in Japan at Our International Sites

Himeji Works, Sanda Works, and Fukuyama Works in Japan are promoting the following measures, as well as introducing them throughout the Americas, Europe, and Asia.

- Lean manufacturing to avoid the 3 "M"s: muda, mura, muri (meaning "waste," "variation," and "overburden" in Japanese)
- Updating to more efficient equipment
- Improving operation using just-in-time activities
- Introducing initiatives to prevent air, water, and soil pollution
- Sharing of best practices

Environment – Semiconductor & Device Group

Business Overview and Priority Environmental Issues

Delivering Key Devices to Support Our Information Society on a Global Scale

Mitsubishi Electric's Semiconductor & Device Group delivers key devices supporting a sustainable, low-carbon society. Our extensive lineup includes power devices for the high-efficiency motor control and electricity conversion of home appliances and industrial equipment, high-frequency devices used in everything from mobile phones to satellite communications, optical devices supporting high-speed optical communications, and TFT LCD modules that improve information interfaces. These products are developed and manufactured at the Power Device Works, High Frequency & Optical Device Works, the LCD Division, and their affiliates in and outside Japan. Each of these facilities is focused not only on developing low-power consumption products with minimized loss but also on implementing energy-efficient manufacturing solutions. Since semiconductor factories tend to consume large amounts of electricity to maintain a clean environment in clean rooms and to perform advanced production processes often requiring a large amount of energy, we continuously reduce energy consumption through such measures as introducing high-efficiency air conditioners. In addition, to prevent the depletion and contamination of water resources, we recycle and reuse large volumes of pure water used in production processes. We have also introduced chemical substance management systems to properly manage chemical substances in our products.

Priority Environmental Issues

- Climate change
- Proper use of water in areas where we operate
- Preservation of biodiversity in areas where we operate
- Proper management of chemical substances in design and production

Message from Semiconductor & Device Group

Contributing to the Realization of a Low-carbon Society by Providing Energy-efficient Products

In order to achieve a sustainable global environment, it is imperative to lose minimal power when generating and using it. Power modules are key devices playing a significant role in reducing power loss and are being incorporated into home electric appliances, rolling stock, and industrial equipment. Products offered by Mitsubishi Electric, the world's No.1 power module manufacturer, are being used all over the world and are contributing to a reduction in energy consumption globally. In addition, Mitsubishi Electric's Semiconductor & Device Group has developed state-of-the-art power modules using silicon carbide (SiC), which contributes to a sustainable reduction of the energy consumed when compared to conventional silicon (Si) products. By enhancing the lineup of these power modules and expanding the market for them and our related businesses, we are contributing to reducing carbon emissions further.

To address the issue of reducing the amount of energy consumed by IT equipment, the Semiconductor & Device Group provides high-performance, high-efficiency, and compact high-frequency & optical devices. These devices realized by our compound semiconductor device technologies are employed in gigabit wireless communications equipment and optical fiber communications, reducing the amount of energy consumed by IT equipment to ultralow levels. In addition, not only are we reducing the amount of energy consumed by devices themselves, we are also developing devices that reduce the electrical power required for cooling base stations, promoting a reduction in energy use by the IT industry as a whole.

In the field of TFT LCD modules, we employ mercury-free, energy-saving white LEDs in TFT color LCD modules. Our extensive lineup of color TFT LCD modules includes various types from standard products to outdoor products featuring ultrahigh brightness. They are supplied for a broad range of applications, including POS terminals, vending machines, ticket machines, displays for banks, and in-vehicle & in-vessel displays.

In addition to focusing on the development of these low-power consumption products, as part of our measures against global warming caused by production, the Semiconductor & Device Group continually and proactively reduces its own energy usage through such measures as employing high-efficiency air conditioners in cleanrooms, improving wafer processing operations, and reducing the emissions of non-CO₂ greenhouse gases (SF₆, HFC, and PFC) through the introduction of detoxifying equipment.



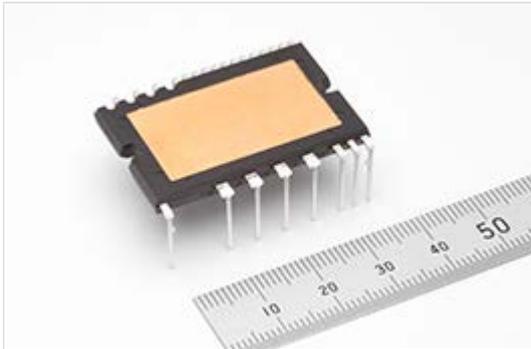
Toru Sanada
Executive Officer
In Charge of
Semiconductor & Device

Initiatives Contributing to the Environment and Society

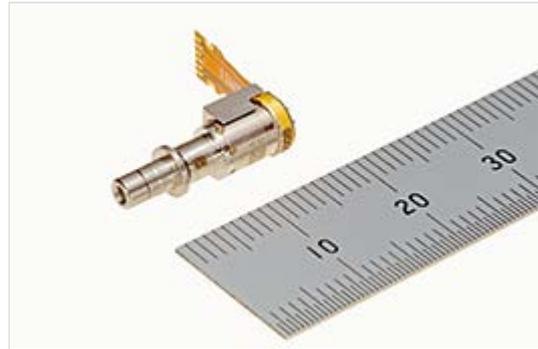
Low Power Consumption Power Devices

Power devices have been developed and produced using silicon semiconductors. However, they are believed to be approaching a "silicon limit," where it will be impossible to simultaneously achieve an advanced degree of both low loss and high voltage. To continue making advances despite this limit, we are developing new semiconductor devices with silicon carbide (SiC), which offers low-power consumption capabilities and can be used in a wide range of applications. For example, compared to the silicon (Si) devices used in inverters, the characteristics of SiC power devices include a power loss reduction of more than 70% during operation and higher-speed switching.

In fiscal 2011, Mitsubishi Electric was the first in the world to equip air conditioners with SiC power modules. Since then, we have promoted their use in various products such as rolling stock and industrial equipment. In fiscal 2015, we developed a full-SiC power module compatible with power conditioners for photovoltaic generation systems in domestic households, contributing to the realization of a power conversion efficiency of 98.0%. We will continue to accelerate the development of new technologies and products to respond to market needs.



Ultra-compact full-SiC DIPIM



10Gbps DWDM CAN EML-TOSA high temperature operation optical transmission module

Initiatives for Reducing Environmental Impact

Making Cleanrooms More Energy Efficient

The manufacturing of semiconductors and devices is conducted in cleanrooms under rigorous temperature, humidity, and cleanliness controls to ensure product quality and reliability. Maintaining such a high-level cleanroom environment requires air conditioners that consume as much energy as production equipment. These circumstances led to our decision to take every possible step to reduce energy consumption; for example, by replacing conventional air conditioners with high-efficiency units and improving the efficiency of wafer processing equipment.

- **Use of High-efficiency Air Conditioners**
Power Device Works at the Kumamoto site has changed over to higher efficiency air conditioners and is now managing all units collectively. This realizes a 16.6 million kWh (equivalent to 7,000t of CO₂) reduction in annual electricity consumption.
- **Installation of Photovoltaic Systems**
Rooftop PV systems have been installed at Sagami Administration Center and Power Device Works at the Fukuoka site, with rated power outputs of 436kW and 300kW, respectively. These systems reduce energy usage by a total of 710,000kWh/year (equivalent to 300t of CO₂).
- **Installation of Ice-Based Thermal Storage System**
The LCD Division uses nighttime power to create ice for its ice-based thermal storage system. Cold energy stored in the ice is then used for air conditioning. This system helps us reduce the division's electricity usage and realize a peak shift, in response to requests from Japanese government and power companies.
- **Application of Yellow LED Lamps**
At the Power Device Works and High Frequency & Optical Device Works, we have been systematically moving toward LED lighting. In Fiscal 2016, we installed practical-use LED yellow lamps, which affect manufacturing conditions, for verification purposes as well. This realizes a 650,000 kWh (equivalent to 275t of CO₂) reduction in annual electricity consumption.
- **Promotion of Fuel Conversion from Oil to LNG**
At the Power Device Works, fuel has been shifted to LNG, which generates 20% less CO₂ when burning compared to oil. This realizes a CO₂ reduction of approximately 2400t/year.

Focusing on Reducing Energy Consumption in Office Buildings by Combining Our Best Energy-saving Technologies

The design technology building at the Fukuoka-based Power Device Works is equipped with various environment-conscious features, including the Company's Facima system, which controls and manages energy consumption. This building has been recognized for its high environmental performance and was awarded the highest evaluation of "S Rank" under Fukuoka CASBEE*, a system that evaluates the environmental performance of buildings. Moreover, a new technological control building for the LCD business also earned the recommendation rank of "A (very good)" under Kumamoto CABEE, in recognition of its high environmental performance.

* CASBEE: Comprehensive Assessment System for Built Environment Efficiency. A standardized Japan-wide evaluation system jointly developed by industry/government/academia that ranks buildings according to their environmental performance.

Ongoing Waste Reduction Activities

Each of our manufacturing sites achieved zero waste emissions from production processes in fiscal 2006. Since then, we have been conducting waste reduction activities at our sites to promote the more efficient use of materials and turn waste into valuable materials.

Focusing on Water Recycling and Preventing Contamination from Wastewater

Semiconductor production factories use large volumes of pure water. From the viewpoint of preventing further depletion of water resources, we are making efforts to reuse pure water. As part of this, we ensure removal of organic and inorganic contaminated impurities contained in the wastewater, and have established a system to process and recycle effluent.

Thorough Management of Chemical Substances

In order to quickly and accurately respond to customer inquiries related to information on the environmental impact of our products, we have introduced a chemical substances management system.

Environment – Information Systems & Network Service Group

Business Overview and Priority Environmental Issues

Delivering Optimal IT Services and Solutions to a Broad Range of Customers

Mitsubishi Electric's Information Systems & Network Service Group consists of the Information Systems Integration Division and three other companies: Mitsubishi Electric Information Systems Corporation, Mitsubishi Electric Information Network Corporation, and Mitsubishi Electric Business Systems Co., Ltd. We are a one-stop provider of optimal solutions and IT services for a broad range of areas including social, public, and corporate systems. We cover the entire lifecycle of information systems and network systems, from the planning and concept stage to operation and maintenance.

Priority Environmental Issues

- Climate change

Message from Information Systems & Network Service Group

Contributing to the Realization of a Low-Carbon Society through the Promotion of Various Green IT Services

Under the creed "Diamond Solutions – Comfort, Peace of Mind, Development," the Information Systems & Network Service Group is committed to enhancing customer satisfaction and helping achieve a sustainable society through its solutions tailored to the management strategies and challenges of its customers, as well as solutions that resolve social issues.

In recent years, we have also been focusing on environmentally effective businesses with green IT, which seeks to reduce environmental impact through the use of IT. Specifically, we are aggressively expanding our products and services that reduce environmental impact, such as those that curb power consumption through server integration and consolidation, reduce the need for business travel with video conferencing, and promote paperless work environments through ledger computerization. At the same time, in addition to green IT, we are also strengthening our data center solutions based on rising demand associated with BCPs*1. Our cutting-edge proprietary technologies have helped companies to reduce data center power consumption by approximately 36%*2 compared to their servers built and operated in-house. Efforts for saving energy in data centers also help companies to reduce CO₂ emissions from their business activities.



Shinya Fushimi
Executive Officer
In Charge of Information
Systems & Network
Service

Going forward, in order to achieve smarter societies, we will leverage the many component technologies and strengths of the Mitsubishi Electric Group to build next-generation information systems using the latest IT solutions, such as M2M*3, Big Data, and energy management systems including HEMS*4 and FEMS*5.

*1 BCPs: Business Continuity Plans.

*2 Approximately 36%: Actual value achieved during a project where the user relocated an in-house server to our data center; includes server integration.

*3 M2M (Machine-to-Machine): A computer network where connected equipment mutually exchanges information without human involvement to automatically optimize control.

*4 HEMS: Home Energy Management System.

*5 FEMS: Factory Energy Management System.

Initiatives Contributing to the Environment and Society

Using Data Centers to Help Customers Reduce Their Environmental Impact

We operate data centers—which are specialized facilities containing servers and communications equipment—and offer housing services, where customer servers are relocated to one of our data centers, as well as hosting services, where we lease servers at our data centers to customers. Through these services, we are able to reduce the environmental impact of our customers through IT. We are also focused on making our data centers more eco-friendly with floor designs that make it possible to place servers in denser layouts by separating the cool airflow from air conditioners from the heat emitted by servers. Our data centers are also using electricity more efficiently thanks to the use of high-efficiency water-cooled air conditioners. These innovations have helped companies to reduce their CO₂ emissions by approximately 36% compared to their servers built and operated in-house.



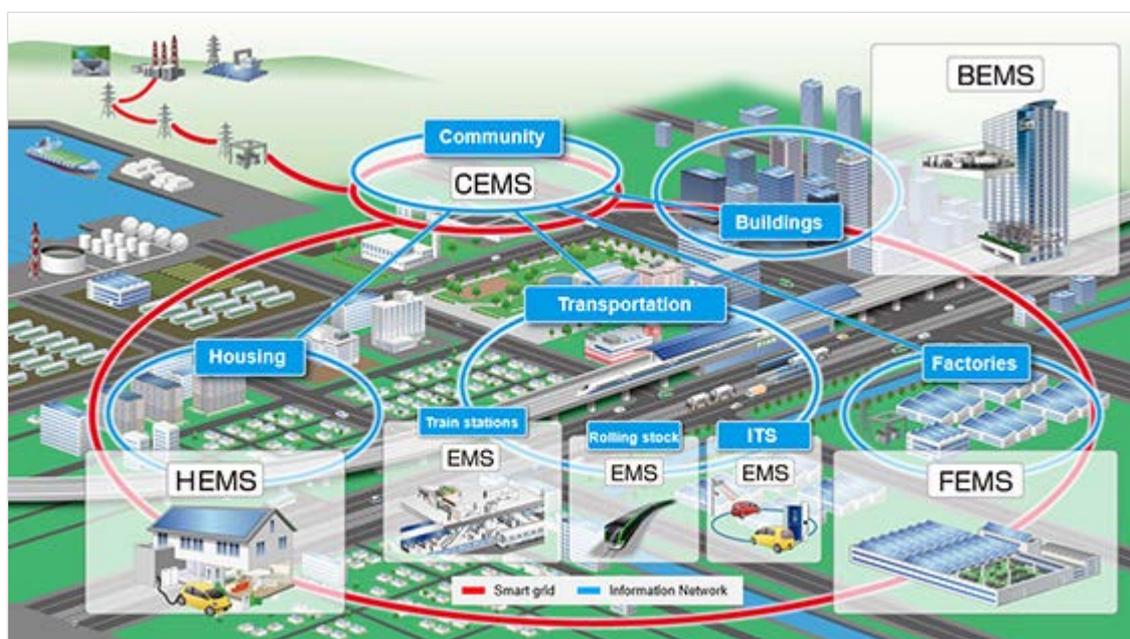
Data center

Furthermore, we have installed photovoltaic panels in an effort to reduce power consumption with clean energy, and planted greenery atop data center roofs to prevent the heat island effect. In addition to using the information infrastructure inside our data centers, we provide an IaaS*6 platform service that makes it possible to use resources more appropriately based on data processing volumes, which achieves further cost reductions and improvements in energy savings.

*6 IaaS (Infrastructure as a Service): A service that provides information infrastructure (servers, communication equipment, communication lines, etc.) over a network.

Promoting Initiatives to Realize Smart Communities

Given the increasing seriousness of global environmental issues such as climate change, deforestation, and preservation of biodiversity, we are aiming to realize smart communities with optimally controlled energy throughout all areas, from power systems to home appliances. Based on energy management systems (xEMS) that link machines and IT and process the enormous amount of data collected from the machines, we contribute to optimized energy control in various fields such as home appliances and housing equipment, factories, and buildings.



BEMS: Building Energy Management System
CEMS: Community Energy Management System
HEMS: Home Energy Management System
FEMS: Factory Energy Management System

Initiatives for Reducing Environmental Impact

Continuous Activities Aimed at Reducing Environmental Impact

The offices and factories of our companies are working continuously to reduce their environmental impact through energy-saving initiatives, sorting and reducing waste, upgrading fleet vehicles to fuel-efficient models, and improving the energy efficiency of logistics in procurement, product shipping, and waste disposal.

Data Center Utilization

We are reducing environmental impact through the operation of energy-efficient data centers.

Promoting Computer Recycling

Following the enactment of Japan's Act on the Promotion of Effective Utilization of Resources on April 1, 2001, we established our own collection and recycling system for used business computers. We also set up a collection and recycling system for household personal computers after revisions were made to this law that took effect on October 1, 2003. Going forward, we will continue to develop recycling-friendly products as part of our commitment to increase the reuse and recycling of our products.

Promoting More Efficient Use of Energy and Resources

We are implementing a variety of initiatives to improve energy efficiency and reduce the use of resources.

- **Energy-saving Initiatives**

We implemented the following measures in fiscal 2012, which we continue to carry out today to realize further reductions in electric power use.

- Relocation of servers to data centers. Stopped using server air conditioners that had been added inside offices.
- Changed computers to new models that use less electricity.
- Revised settings for demand controllers and curbed power usage.

- **Resource-saving Initiatives**

Since fiscal 2010, we have provided recycling boxes for office paper on every floor and have been continuing our commitment to recycling office paper. Furthermore, since fiscal 2013, we have provided dedicated recycling boxes in order to recycle paper cups used for our tea and coffee machines.

Environment – Environment Site Map

Mitsubishi Electric's environmental initiatives are introduced in four parts: "Basic Policy and Approach to Environmental Management", "Environmental Report", "The Environment and Business" and "Environmental Topics."

▶ From the President

Simultaneously pursuing a sustainable society and safe, secure, and comfortable lifestyles for all – Mitsubishi Electric Group initiatives are introduced by Masaki Sakuyama, President and CEO of Mitsubishi Electric Corporation.

Chinese language version of the above page:

- ▶ 领导致辞

▶ Overview

From various angles we introduce special features of the Mitsubishi Electric Group that are creating value in the environmental field, including Corporate Mission and Business Lines, Management Objectives, Environmental Vision and Key Issues, Opportunities for Growth, and Strengthening the Environmental Management Foundation.

▶ Basic Policy and Approach to Environmental Management

Environmental Policy, Vision & Plan

- ▶ Group Environmental Policy
- ▶ Environmental Statement: Eco Changes
- ▶ Environmental Vision 2021
- ▶ Aiming to Become a Global Leading Green Company
- ▶ Environmental Plan
- ▶ Environmental Considerations for Products
- ▶ Environmental Considerations for Procurement
- ▶ Creating a Society in Tune with Nature

Features and Initiatives of Environmental Management Aiming to

- ▶ Long-term Perspective and Management Approach towards Solutions for Environmental Issues
- ▶ Environmental Management Structure
- ▶ Environmental Audits
- ▶ Training of Environmental Personnel
- ▶ Environmental Risk Management
- ▶ Improving the Level of Environmental Initiatives

▶ Environmental Report 2016

Specific Targets and Achievements in Fiscal 2016

- ▶ Targets and Achievements of the 8th Environmental Plan (Fiscal 2016–2018)

Chinese language version of the above page:

- ▶ 第8次环境计划（2015-2017年度）目标与成果

Initiatives for Environmental Conservation

- ▶ Environmental Considerations for Value Chain Management

- ▶ Reducing Greenhouse Gases Emitted in the Value Chain
- ▶ Reducing CO₂ from Production
- ▶ Contribution to Reducing CO₂ from Product Usage
- ▶ Reducing CO₂ from Logistics
- ▶ Effective Utilization of Resources
- ▶ Reducing Resource Inputs
- ▶ Strengthening Collaboration for Resource Recycling Business
- ▶ Recycling End-of-Life Products
- ▶ Reducing the Use of Disposable Packaging Materials
- ▶ Using Water Effectively
- ▶ Managing Chemical Substances

Environmental Communication

- ▶ Environmental Communication

Scope of Report and Data

- ▶ Period and Scope of the Report
- ▶ Material Balance
- ▶ Environmental Accounting
- ▶ Environmental Performance Data
- ▶ Awards

Chinese language version of two of the above pages:

- ▶ 关于报告期间与范围
- ▶ 物料衡算

▶ The Environment and Business

The policy of environmental-based social contribution and initiatives in all business groups.

- ▶ Public Utility Systems Group
- ▶ Energy & Industrial Systems Group
- ▶ Building Systems Group
- ▶ Electronic Products and Systems Group
- ▶ Communication Systems Group
- ▶ Living Environment & Digital Media Equipment Group
- ▶ Factory Automation Systems Group
- ▶ Automotive Equipment Group
- ▶ Semiconductor & Device Group
- ▶ Information Systems & Network Service Group

▶ Environmental Topics

▶ A New Dimension in Water Recycling

Here we present entirely new water recycling technology that utilizes the power of electricity to break down substances in water that were previously difficult to manage. We discuss the features of this technology and give some examples of its applications, including "microbubbles" that remove grime with the power of bubbles, and ozone generators called "ozonizers" that produce delicious, safe, clear water with the power of ozone.

▶ Plastic Recycling Comes of Age

Until now, it was considered difficult to recirculate plastics, or recycle them from home electronics

appliances for reuse in new home electronics appliances, as only 6% of the material could be recycled. However, Japan's first large-scale, high-purity plastics recycling system has raised that rate to 70%, more than 10 times the previous level. We will introduce the secret behind this technology, and how it evolved.

▶ **New Energy Potential — A Wireless Sensor Powered by Small Vibrations**

Office Building Energy Savings Simulation Technology

▶ **Tapping into Hidden Deposits of Rare Earth Elements Found in Cities**

Mitsubishi Electric Group developed a system that can efficiently recover rare earth magnets used in the compressors of household room air conditioners and began recycling this precious commodity.

▶ **Kyoto Works Becomes Home to a Family of Ducks**

June 2012. Kyoto works, one of our factories discovered a duck was building a nest. In the beginning of July, 7 cute chicks were hatched. Parent duck and chicks moved to paddy field nearby with our staff watching over them.

▶ **Archives**

▶ **Environmental Sustainability Report**
