Environment: Global Warming Prevention at Factories

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Reducing CO_2 Emissions through Production Activities

Panasonic is working to reduce CO_2 emissions in factories with the aim of contributing to climate change mitigation, as well as improving production efficiency in factories and reducing energy costs.

Since fiscal 2011, we have been using our unique indicator,**the size of contribution in reducing CO_2 emissions**, to improve our energy management capabilities and reduce the CO_2 emissions per basic unit, working to maximize the size of contribution in reducing CO_2 emissions in production activities. In revising Green Plan 2018, our Environmental Action Plan, we changed the indicator for CO_2 reductions in our production activities to "CO_2 basic unit," with the target for fiscal 2019 to exceed the fiscal 2014 level by at least 5%.

In addition to individual efforts implemented in each factory, energy-saving and CO_2 emission reduction measures including horizontal introduction of good examples across the company, specialist training, and CO_2 ITAKONA initiatives*[1] are promoted. We are also promoting the introduction of photovoltaic power generation to achieve our fiscal 2019 target of "at least 10,000 MWh of in-house renewable energy adoption." Our investment in CO_2 emissions reduction in fiscal 2017 was 2.8 billion yen*[2].

As a result, the CO_2 basic unit in fiscal 2017 reduced by 8% compared to fiscal 2014. Not only the basic unit but also the total amount of energy consumption is reducing steadily.

Furthermore, we are shifting the lighting to LED at our factories, offices, showrooms, and other buildings. We plan to complete this transition on a global scale by the end of fiscal 2019*3.

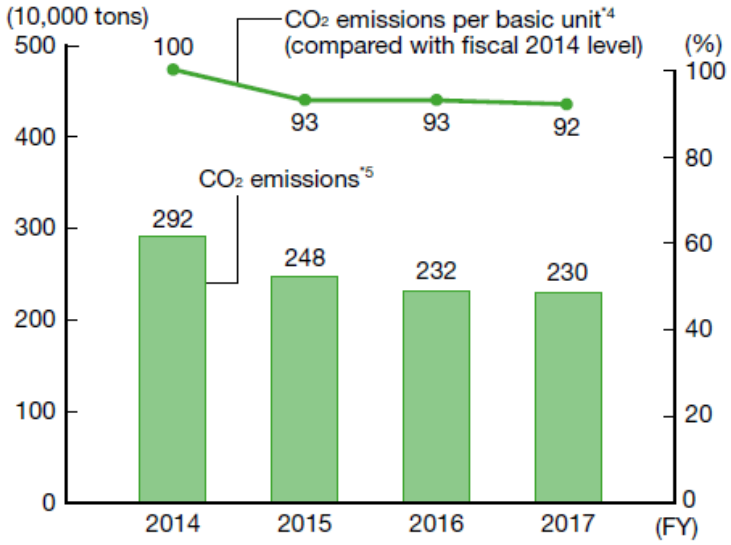
Panasonic is a member of Keidanren's Commitment to a Low Carbon Society, a voluntary action program for global warming prevention across the entire electric and electronic industry, with the targets set aiming at 2030. Specifically, we are steadily implementing energy-saving measures in factories and offices in order to achieve the goals set by the industry in Japan, aiming improvement in energy consumption rate in factories and large offices at an annual rate of 1% on average towards 2030.

*1 ITAKONA is a term unique to Panasonic which refers to a process by which we review stages prior to production to study raw materials to ensure waste is minimized and quality is maintained. We apply a similar review process for our CO_2 emissions reduction efforts and call these our CO_2 ITAKONA initiatives. The activity is aimed at discovering energy conservation measures from a new viewpoint through continuous display of energy consumption levels (energy consumption per basic unit), and analyzing the factors that influence the variables in each basic unit.

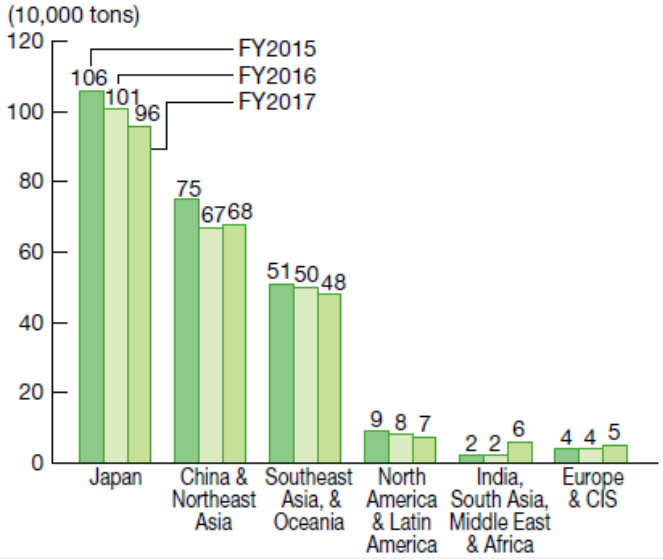
*2 Includes all investments concerning CO_2 emissions reduction. Differences or appropriate portions are not calculated.

*3 Installable sites

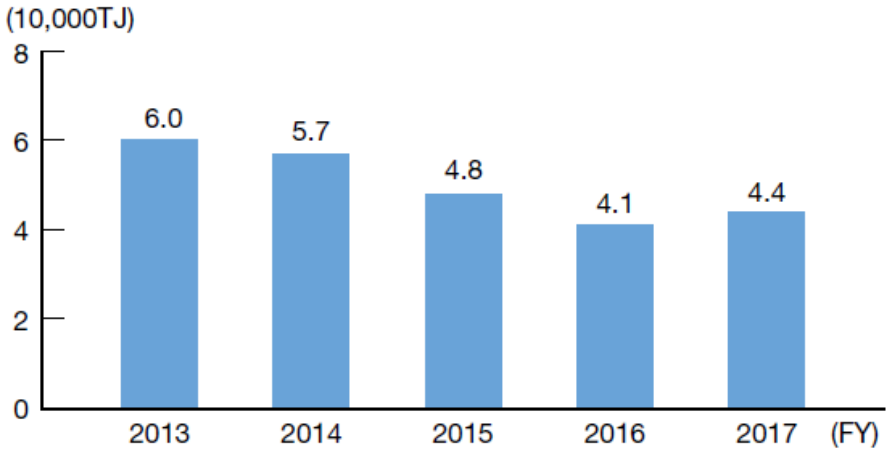
■CO_2 Emissions in Production Activities and CO_2 Emissions Per Basic Unit



■CO_2 Emissions in Production Activities (by region)



■Energy Consumption in Production Activities



*4 Calculated using the weighted average of improvement rates compared to the fiscal 2014 in CO_2 emissions per basic unit, which is calculated by dividing CO_2 emissions by the volume of activity closely related to CO_2 emissions, including production amounts and volumes, etc. of each factory.

*5 The factors related to fuels are based on the Guidelines for Calculation of Greenhouse Gas Emissions (version 2.2) published by the Japanese Ministry of the Environment. The CO_2 emission factor (kg-CO_2/kWh) for electricity purchased in Japan in each fiscal year is fixed at 0.410 to accurately reflect efforts for CO_2 emissions reduction. If the factors set for each fiscal year are used instead (0.570 for fiscal 2014, 0.554 for fiscal 2015, 2016 and 2017), total CO_2 emissions will be 3.19 million tons for fiscal 2014, 2.77 million tons for fiscal 2015, 2.61 million tons for fiscal 2016, and 2.58 million tons for fiscal 2017. The factors above are also used for electricity purchased from power producers and suppliers (PPS). The GHG Protocol factors for each country are used for electricity purchased outside Japan.

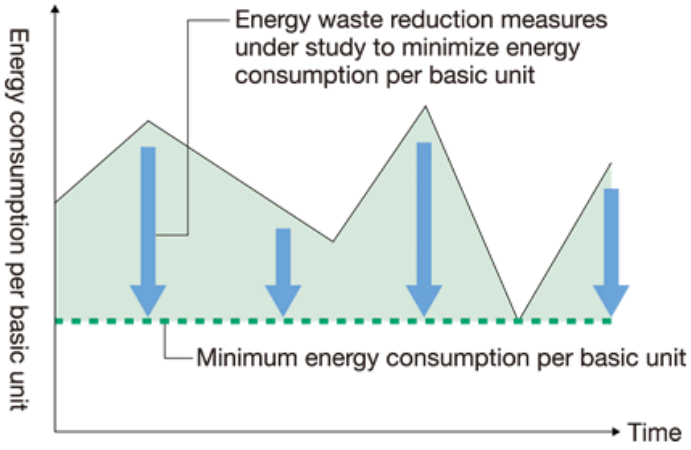
Promoting CO_2 Reduction Activities in our Factories

To ensure the reduction of CO_2 emissions at our factories, it is important to track the energy consumption of each factory and the effects of specific emissions reduction measures to visualize reduction effects. To date, we have introduced

more than 40,000 measurement systems and Factory Energy Management Systems (FEMS) at all of our global manufacturing sites, and we have continued to promote our CO_2 METAGEJI [*6] initiative.

Based on this scheme, the CO_2 ITAKONA initiative has been implemented since fiscal 2011. The activity is aimed at discovering energy conservation measures from a new viewpoint through continuous display of energy consumption per basic unit of production, and analyzing the factors that influence the variables in each basic unit.

■Concept of the CO_2 ITAKONA Initiative



In order to accelerate action under the CO_2 ITAKONA initiative, we developed the SE-Navi software that displays energy and production data simultaneously and analyze energy consumption per basic unit. The "energy-saving navigation function" of this software quantitatively extracts energy loss per device as well as loss per factor, based on the automatic energy loss analysis results through CO_2 ITAKONA analysis. With this function, energy-saving efforts prioritizing processes with large energy loss have been made easier .

Conventionally, energy consumption and other data had been analyzed manually by specialists in order to develop energy conservation measures. This function automatically analyzes data and enables users to consider energy conservation measures based on the energy-saving measure database. Not only did this contribute to a reduction in working time but also to the identification of energy-saving measures without the assistance of specialists.

*6 METAGEJI is a term unique to Panasonic which refers to visualizing energy consumption and implementing measurable reduction initiatives by introducing measurement instruments, such as meters and gauges.

To continuously study mechanisms for CO_2 reduction, the Factory CO_2 Reduction Working Group was set up in fiscal 2017 as a corporate-wide program. One of the working group's activities is the exhaustive use of measuring instruments and FEMS previously introduced to bring greater results of CO_2 reduction. In model plants, measurement of physical data of main processes such as temperature, humidity, and differential pressure, was added to enable multifaceted data analysis and to bring further depth to our energy saving efforts.

At Panasonic Energy (Wuxi) Co., Ltd., in China, attention was focused on heat source facilities with much exhaust gas, and work data including heat volume, flow rate as well as points for quality control including dew point were visualized in addition to energy data measurement. The introduction of a standby mode, which enables reduction of emissions while keeping the internal temperature of furnace from dropping when not in production, and automatic switching to standby mode when temporarily not in production, has led to an annual CO_2 reduction of 115 tons.

At Automotive & Industrial Systems Company's Uji Factory in Kyoto, temperature, humidity, and differential pressure in and outside the manufacturing processes were incorporated into existing FEMS for data analysis. This led to the discovery of a production floor with excessive intake of external air. An annual CO_2 reduction of 80 tons was achieved

by discontinuing this external air intake and changing to internal air circulation.

Factory CO_2 Reduction Working Group

Utilization of Renewable Energy

In order to reduce CO_2 emissions, Panasonic actively and globally promotes the adoption of renewable energy suitable to the characteristic of the region, such as photovoltaic power generation.

Adoption of a Photovoltaic Power Generation System in Singapore

In Singapore, a photovoltaic power generation system with an output capacity of 1.0 megawatt-peak(MWp) was adopted in Panasonic Factory Solutions Asia-Pacific (PFSAP) in September 2016. A total of 3,476 Panasonic PV module HIT® panels were installed on the rooftop of three factory buildings. At its peak, the factory's photovoltaic (PV) system is expected to power, on average, close to 20% of its entire energy consumption. Panasonic HIT® panels can generate more energy even on limited rooftop spaces due to industry’s top-level efficiency. In addition, the panels are more suited to tropical climates, since they can also maintain high power generation performance even under high temperatures. The product is manufactured by Panasonic Energy Malaysia, located in Kulim Hi-tech Park in Kedah, Malaysia.

Installation of this system is based on a leasing agreement with Sunseap, the largest clean energy provider in Southeast Asia. This is the second, of such leasing agreement in Singapore, following the installation of a 2.4 MWp a photovoltaic power generation system at Panasonic Appliances Refrigeration Devices Singapore (PAPERDSG) in October 2015 also under a leasing agreement with Sunseap. The system in PFSAP is the second of such leasing arrangement between Panasonic and Sunseap.

[Press release] Panasonic Factory Solutions Asia Pacific Adopts Sustainable Power Generation with Sunseap

Photovoltaic power generation system in PFSAP

Adoption of Wind Power Generation System in Belgium

In Europe where wind power generation is advanced, a 2.0 MW wind power generation system was adopted in Panasonic Energy Belgium (PECBE) in November 2016. Under an agreement with a local power company, a wind power turbine was installed on the factory premises, which enabled covering roughly 25% of the factory's peak total demand.

Wind power generation system in PECBE

Increasing the Efficiency of Biomass Power Generation Systems in Japan

The Gunma Factory of Panasonic Eco Solutions Interior Building Products Co., Ltd. uses wood scraps and wood particles generated from manufacturing processes as fuel for its biomass boiler. Ever since the system was installed, steam generated by the biomass boiler is used in production in the factory processes, and excess steam is used to generate power. Continuous improvements have been implemented since 2011, including reducing the size of the dust collector, using inverters for fans, and reviewing the wood particle transportation route. We will promote the increase in the efficiency of boilers to make more effective use of wood scrap fuel, as well as examine expanding to other factories in the future.

Biomass power generation system in Gunma

Adoption of Biomass Boilers in the UK

In Europe, Panasonic Manufacturing UK (PMUK) newly adopted a wood biomass boiler. Conventionally, used wood

pallets were shipped as waste, and the wood chips manufactured were used as fuel for biomass power generation in the community. From fiscal 2017, a wood chip production machine, a storage warehouse, and a biomass boiler were installed in the factory to produce wood chips within the factory for use as biomass boiler fuel. This has enabled reduction in the number of trucks to ship wood pallets as well as reduction in boiler gas consumption, achieving an annual reduction of CO_2 emissions by 65 tons. With biomass power generation, we will aim further CO_2 reduction.

Biomass boiler in PMUK

As a result of such efforts, our in-house renewable energy adoption across the entire company[*7] reached 12,000 MWh[*8] in fiscal 2017, and we have achieved our target under the Green Plan 2018, our environmental action plan, revised in fiscal 2017, which was to reach 10,000 MWh in the use of in-house renewable energy by fiscal 2019.
Adoption of photovoltaic power generation systems is also underway at respective sites on a global scale in addition to those mentioned above, and we aim for completion at all sites considered feasible for adoption by the end of fiscal 2021. We will continue our efforts to achieve further reductions in CO_2 emissions.

*7 Includes renewable energy utilization at non-production sites.

*8 Includes photovoltaic, wind, and biomass power but not power from heat pumps.

Working toward the Emissions Trading Scheme in China

In China, a pilot program of the Emissions Trading Scheme (ETS) has been conducted in two provinces and five cities (provinces of Guangdong and Hubei and cities of Beijing, Tianjin, Shanghai, Chongqing, and Shenzhen). Panasonic Industrial Devices Taiko (Shenzhen) Co., Ltd. and Panasonic Industrial Devices (Shanghai) Co., Ltd. are included in the list of pilot enterprises. The Emissions Trading Scheme is expected to be expanded throughout entire China in FY2018, and in response to this, we are accelerating our drive to cut CO_2 emissions in manufacturing.

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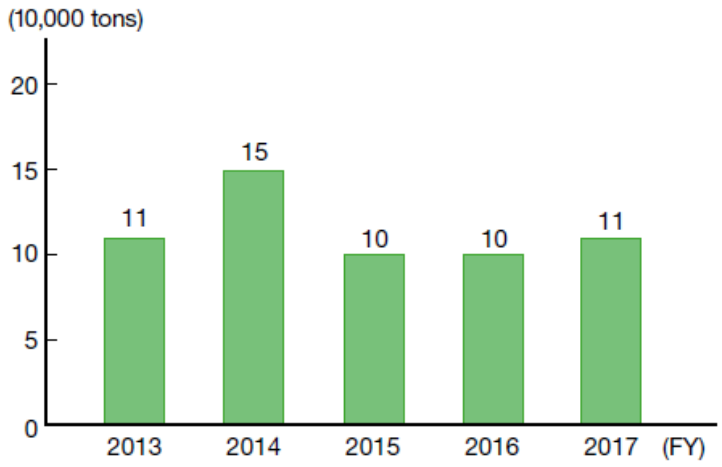
Reducing the Emissions of GHGs Other than CO_2 from Energy Use

GHGs other than CO_2 from energy use emitted by Panasonic include hydrofluorocarbons (HFCs) used in air conditioner factories as refrigerants for products and nitrogen trifluoride (NF_3) used as a cleaning gas in LCD factories. To reduce these gases, we implement a variety of measures, such as preventing leakage of refrigerants, recovering waste refrigerants, decomposing at external parties, and installing removal devices.

GHG emissions other than CO_2 from energy use (CO_2- equivalent; hereinafter the same) in fiscal 2017 amounted to 110,000 tons, which was 10,000 tons more than the previous fiscal year. With NF_3 being newly added to the fiscal 2014 measurements due to the new GHG coverage in the second commitment period of the Kyoto Protocol, the Global Warming Potential (GWP) was reviewed, resulting in the increase of 0.04 million tons. Meanwhile, a reduction of 0.04 million tons was derived from the transfer of management of the wafer manufacturing process in the Hokuriku semiconductor diffusion plant to a joint venture from fiscal 2015.

■Emissions (CO_2 -equivalent) of GHGs Other than CO_2 from Energy Use in Production Activities



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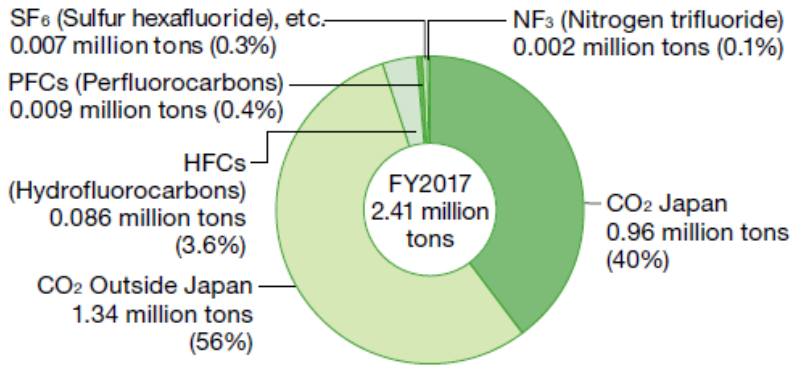
Breakdown of Total GHG Emissions (by gas and by scope)

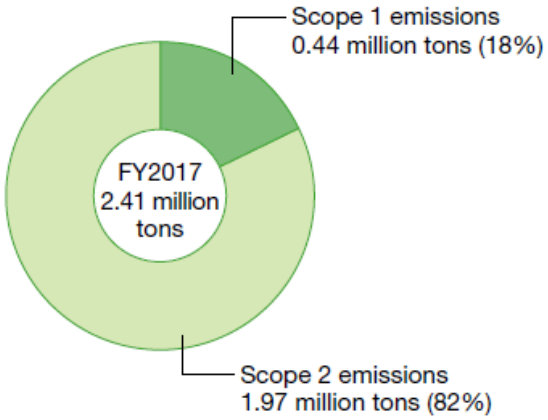
Our GHG emissions, including emissions from energy sources and other sources, reached 2.41 million tons in fiscal 2017, the breakdown being 18% for Scope 1 emissions*9 and 82% for Scope 2 emissions*9 (**see Scope 3 emissions**).

*9 GHG emissions defined by the GHG Protocol, an international calculation standard for GHG emissions. Scope 1 emissions refer to all direct GHG emissions from facilities that are owned or controlled by the reporting entity (e.g. emissions from usage of town gas or heavy oil). Scope 2 emissions refer to GHG emissions from manufacturing of the energy that is consumed in facilities owned or controlled by the reporting entity (e.g. emissions from generation of electricity that the reporting entity purchased).

■Breakdown of Total GHG Emissions (CO_2-equivalent) in Production Activities (by category)



■Breakdown of Total GHG Emissions (CO_2-equivalent) in Production Activities (by scope)



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Area / Country