Chapter II Reducing Our Environmental Burden

Amid an upward trend in energy consumption at data centers as cloud services expand in recent years, the Fujitsu Group has set new targets in our Environmental Action Plan (Stage VII) for the promotion of environmental considerations in data centers. In addition, we have set targets that include reduction of GHG emissions from workplaces, business partners, and distribution operations; the effective use of water resources; and expanded use of renewable energy.

Key Achievements in FY 2015

- Greenhouse gas (GHG) emissions Reduced by **34.7%** (compared to FY 1990)
- CO_2 emissions in transport per sales Reduced by **15%** (compared to FY 2014)
- Water use Reduced by **4.6%** (compared to FY 2014)

About Symbols Used ✓ Examined by third-party organization ○ FY 2015 target achieved

	Theme	Target items (targets through the end of FY 2015)	FY 2014 Key Performance	FY 2015 Key Performance		Status	
Our Business	Efficient Business Operations: Reduce Greenhouse Gas Emissions	Reduce greenhouse gas emissions in our business facilities by 20% compared to 1990.	33.1% reduction	34.7% reduction	✓	○	P. 34
	Efficient Business Operations: Energy Intensity	Improve energy intensity in our business facilities over 1% each year.	5.1% improvement	2.9% improvement	✓	○	P. 34
	Efficient Business Operations: Data centers	Improve environmental performance of our major data centers.	Formulated Guidelines for Promoting Environmentally Conscious Data Centers Adopted PUE visualization tools	Approx. 2% improvement in PUE		○	P. 36
	Efficient Supply Chain: Logistics	Reduce by over 1% on average every year CO_2 emissions*1 per sales from transport compared to 2013.*2	13% reduction	15% reduction	✓	○	P. 38
	Efficient Supply Chain: Procurement	Expand activities of reducing CO_2 emissions to all types of suppliers.	Reached 100% of business partners implementing CO_2 reduction or limitation measures	Reached 100% of business partners implementing CO_2 reduction or limitation measures		○	P. 39
	Efficient Use of Resources: Renewable Energy	Increase generation capacity and procurement of renewable energy.	Concluded an agreement to purchase solar generated power in the U.K. Purchased approx. 21,000 kWh of green power	Added the amount of electricity purchased that was generated by hydro power in Finland Purchased approx. 28,000 MWh of green power		○	P. 40
	Efficient Use of Resources: Water	Continue efforts for efficient use of water, e.g. water recycling and water saving.	Water usage: 16,600,000 m^3 (reduced by 10.8% compared to FY 2013)	Water usage: 15,830,000 m^3 (reduced by 4.6% compared to FY 2014)	✓	○	P. 41
Continuous targets*3	Reduced Environmental Impact: Chemicals	Reduce chemical emissions to less than the average level of 2009-2011 (PRTR: 21 tons, VOC: 258 tons).	PRTR: 19 tons; VOC: 219 tons	PRTR: 19 tons; VOC: 201 tons	✓	○	P. 43
	Reduced Environmental Impact: Waste	Reduce the amount of waste to less than average level of 2007-2011 (amount of waste: 31,134 tons). Keep Zero Emission in factories in Japan.	Waste generated: 22,258 tons Achieved zero emissions at domestic business sites	Waste generated: 20,660 tons Achieved zero emissions at domestic business sites	✓	○	P. 44
	Reduced Environmental Impact: Recycling	Maintain over 90% resource reuse rate of business ICT equipment at Fujitsu recycling centers.	94.3%	94.5%	✓	○	P. 46

***1 Reduce CO_2 emissions:** Calculate emissions of CO_2 equivalence from energy consumption ***2** As the initial target was achieved, from FY 2014 the Fujitsu Group has changed the target
***3 Continuous targets:** Targets to be achieved through business activity because already achieved high level performance.

Reducing Greenhouse Gases (GHG) Emissions and Boosting Energy Intensity at Our Business Sites

Our Approach

The Fujitsu Group is working in every location where it does business to reduce emissions from its own sites, promote the reduction of emissions along its value chain, and contribute to the reduction of emissions by its customers and society overall, in order to help fight global warming, and to do so from a common understanding of the necessity to halve (or cut by 80%, in the case of developed countries) greenhouse gases emitted across the globe by 2050.

The primary GHG emissions from our business sites (plants, data centers, and offices) are CO_2 accompanying energy (electricity, fuel oil, and gas) usage, and perfluorocarbon (PFC), hydrofluorocarbon (HFC), sulfur hexafluoride (SF_6), and nitrogen triflouride (NF_3) used in semiconductor manufacturing. We have set reduction targets for these and are striving to decrease the amounts we use and emit.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Reduce greenhouse gas emissions in our business facilities by	20% (compared to FY 1990)
	Improve energy intensity in our business facilities over	1% (average rate*)
FY 2015 Targets	Reduce greenhouse gas emissions in our business facilities by	20% (compared to FY 1990)
	Improve energy intensity in our business facilities by an average	1% or more (average rate*)
FY 2015 Key Performance	Reduced greenhouse gas emissions in our business facilities by	34.7% (compared to FY 1990)
	Improved energy intensity in our business facilities	2.9% (average rate*)

* Average over three years from FY 2013 through 2015.

FY 2015 Performance and Results

Promoted Reductions of CO_2 Emissions Accompanying Energy Consumption

As CO_2 reduction measures, we continued in FY 2015 energy saving practices with the machinery at each business site (including installing inverters and BAT*-applicable machinery, etc.) optimizing production processes and drive machinery, optimizing office air-conditioning temperatures, saving energy used for lighting and office automation equipment, and promoting visualization and data measurement with regard to energy consumption.

In addition, to reduce emissions of gases other than CO_2 (such as PFC, HFC, SF_6, and NF_3), we are switching to low global warming potential (GWP) gases, and installing abatement systems on production lines.

* **BAT (Best Available Technologies):** State-of-the-art technologies that are available for use and help contribute to reducing GHG.

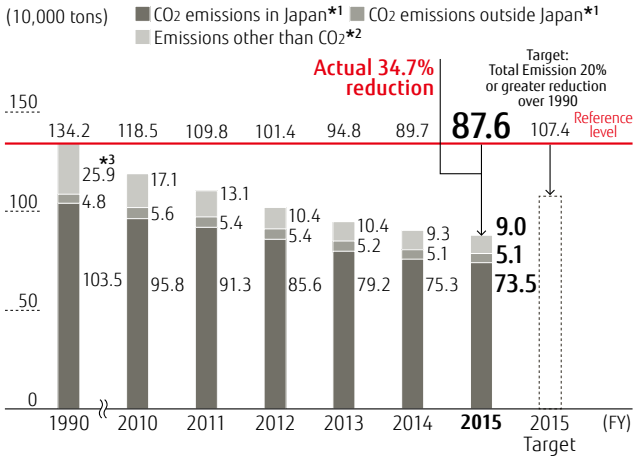
21,000-ton Year-On-Year Reduction of GHG

FY 2015 overall GHG emissions were approximately 876,000 tons (emission rate per unit of sales: 18.5 tons/100 mill. yen), which was a 34.7% reduction compared to FY 1990.

The breakdown of GHG was approximately 786,000 tons of CO_2 (735,000 tons emitted in Japan, 51,000 tons outside Japan) and approximately 90,000 tons of gases other than CO_2.

FY 2015 energy intensity improved 1.5% over FY 2014 while the energy intensity improved an average of 2.9% over three years from FY 2013 through 2015.

Trends in Total Greenhouse Gas Emissions



*1 **CO_2 emissions in/outside Japan:** CO_2 conversion factor for purchased electric power has been calculated with a fixed value of 0.407 tons of CO_2 per MWh since FY 2002 for performance reports in our Environmental Action Plan.
*2 **Emissions other than CO_2:** These are converted to equivalent amounts of CO_2 using the global warming potential (GWP) of each gas.
*3 Our FY 1995 performance is taken to be the same as emissions in FY 1990.

FY 2016-18 Targets and Plans

Achieving Targets under the Environmental Action Plan (Stage VIII)

In Fujitsu's Environmental Action Plan (Stage VIII) covering FY 2016-18, the Company has taken into account the Japanese government's pledge to the U.N. to meet Intended Nationally Determined Contributions of 26% GHG reductions by FY 2030 compared to FY 2013 levels, and we are striving for a greater than 5% reduction (over FY 2013) by FY 2018.

At our data centers and in some of our manufacturing of electronic components, increased CO_2 emissions are projected accompanying increases in energy usage. However, we will continue to invest in facilities and improve operations.

Reducing Greenhouse Gases (GHG) Emissions and Boosting Energy Intensity at Our Business Sites

Main Activities in FY 2015

Using Swirling Induction Type HVAC on Our Semiconductor Wafer Fabrication Line

Mie Fujitsu Semiconductor Limited has added a new production line at the company's Mie plant that uses advanced, environmentally friendly technologies. The cleanroom is equipped throughout with a SWIT® (Swirling Induction Type HVAC System), which will have a smaller environmental footprint than conventional systems while ensuring high-quality manufacturing. This is the world's first use of this technology in wafer fabrication cleanrooms for semiconductors. Compared to existing systems, the annual energy used is expected to be roughly 47% lower for transport power and roughly 32% lower for heat-source power.

SWIT® HVAC system

Fujitsu Augsburg Holds Energy Saving Idea Contest for All Employees

Fujitsu Technology Solutions GmbH (Augsburg, Germany) started an Energy Task Force and held a competition among all company employees to gather energy saving ideas, given that their energy expenses have risen four fold over the past 10 years.

Of the more than 400 ideas submitted through the contest, the best were adopted in FY 2015 and have contributed to energy savings. In particular, the company has become the first in Europe to adopt a flow soldering process with low-temperature solder, which affords a nearly 40% reduction in power usage over the conventional process. The new approach has already been applied in the manufacture of over one million electronic device boards.

Through a variety of energy saving measures, Fujitsu Augsburg has reduced electricity and gas utility costs by one million euros annually and has been able to meet the requirements ahead of time for energy audits stipulated by the EU Energy Efficiency Directive.*

* **EU Energy Efficiency Directive:** a set of binding measures to help the European Union reach its 20% energy efficiency target by 2020.

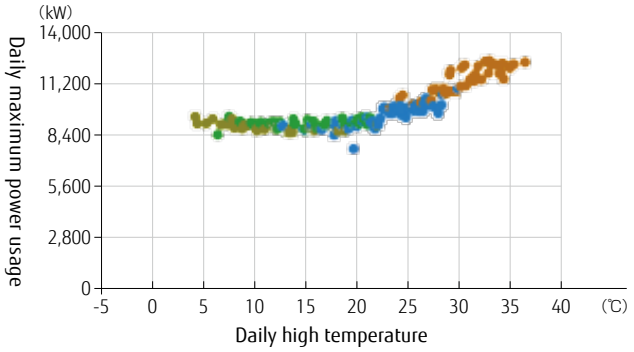
Flow soldering equipment using low-temperature solder

Improving Energy Efficiency through a System Optimizing Contracted Electric Power

The Fujitsu Group has built an Environmental Management Dashboard which has been adopted at all of our business sites in Japan, based on a variety of environmental information collected and analyzed in real time and displayed on a portal screen.

We have now added functionality to optimize electric power contracted through the power utility by visualizing peak period reduction measures and automatically transmitting recommendations. Specifically, the system encourages adjustments to equipment power usage by sending alerts indicating the expected times and amounts of power consumption exceeding the contracted power for the next day. From a graph showing the correlation of temperature and power usage, the system makes recommendations for contracted power for the next fiscal year, and displays the cost. Going forward, Fujitsu plans to utilize this system to promote energy saving and cost reductions at sites Group-wide.

Correlation between temperature and power consumption



Promoting Environmentally Conscious Data Centers

Our Approach

With the spread of cloud computing, energy use by data centers is on an upward trend and society is showing more concern over the environmental performance of data centers. Also, electricity costs are increasing with rising electric utility rates. Data centers comprised 27% of FY 2012 CO_2 emissions in the Fujitsu Group, with emission rates increasing 8.1% over the three years from FY 2010–12 at our 19 main data centers in Japan. Furthermore, our data center CO_2 emissions are expected to continue to rise as our cloud business grows, making environmentally conscious data centers a social responsibility for the Group, as well as a critical theme to address in strengthening our business foundation over the long term.

In the Fujitsu Group, we are targeting* approximately 80% of our data centers (based on server room floor space) and we are working to boost environmental performance.

* **Activity targets:** Global data centers 1,000 m^2 or larger, in principle, or specific data centers requested by data center business units.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Improve **environmental performance** of our major data centers
FY 2015 Key Performance	Improved PUE by approx. **2%** (average rate*)

* Average over three years from FY 2013 through 2015.

FY 2015 Performance and Results

Promoting the Power Usage Effectiveness (PUE)

In executing Environmental Action Plan (Stage VII), and following on from last fiscal year, Fujitsu has promoted the improvement of PUE* at its data centers inside and outside Japan, based on the policies established in the Green Datacenter Committee (GDC). Primary initiatives include improving the cooling efficiency of air-conditioning systems, expanding the hours when external ventilation is used, and maximizing utilization of free cooling options. Results have led to an average improvement of more than 2% over the period from the start of the initiatives unitil FY 2015.

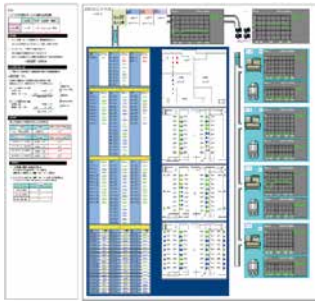
Furthermore, we are endeavoring to make speedy improvements through our Quick Win Approach. No result is unimportant, no matter how small, and this approach helps maintain these annual improvements by building a cooperative framework for sharing ideas at an early stage. Fujitsu has also striven to make improvements as quickly and optimally as possible by gathering data on electricity usage and climatic parameters (temperature, etc.), and by creating a screen that allows for easy comparisons between pre- and post-initiative measurements. This allows us to develop an improvement-oriented environment for maintaining optimal operating conditions while confirming the effects and quality of measures.

* **PUE (Power Usage Effectiveness):** an indicator showing the energy saving performance of data centers. PUE is obtained by dividing the energy usage of an entire data center by the energy usage of its servers and other ICT equipment. A PUE closer to 1.0 indicates better energy efficiency.

PUE Values and PUE Calculation Method

PUE values	PUE calculation method, etc.
Average: 1.63 Range: 1.33–2.10 Applicable DCs: 34 centers	- The Green Grid's method used - Improvement initiatives using the organization's DCMM

Quick Wins Calculator



Screen showing summaries of energy usage and other parameters

FY 2016 Targets and Plans

Formulating Activity Targets

Fujitsu has set a target of "Improving data center PUE by 8% or more (over FY 2013)" in our Environmental Action Plan (Stage VIII) for FY 2016-18. Stage VIII of the plan discloses targets outside the Company and also aims for further expansion of Fujitsu's contributions to customers and society.

Promoting Activities for Achieving Targets

Going forward, Fujitsu will continue efforts to optimize the use of external ventilation, raise air-conditioning temperatures, more thoroughly separate heating and cooling functions, and by doing so, continue to boost energy efficiency. Furthermore, we plan to work on new technologies, including ways to optimize cooling energy with air-conditioning control mechanisms linked to information about interior of ICT equipment. We are working to spread results throughout the Company by reflecting successful examples in our on-going review and revision of our Guidelines for Promoting Green Data Centers formulated in 2015.

Promoting Environmentally Conscious Data Centers

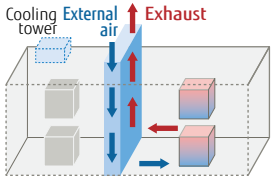
Main Activities of FY 2015

Tatebayashi Data Center Annex C (Newly Built): Environmentally Conscious Design Achieving the Top PUE in Japan

The new annex at Tatebayashi Data Center seeks to optimize its environment for air-conditioning, operations, and ICT equipment. In addition to increasing its use of external ventilation from approx. 3,250 hours to approx. 7,000 hours annually, the center has developed a new building layout and air-conditioning approach that maximally utilizes the natural flow of air. The result is a nearly 60% reduction in power used for air-conditioning and other systems. The center also achieves a PUE of 1.20 (design value), which is at the apex of Japan's standards for power efficiency.

Building Structure

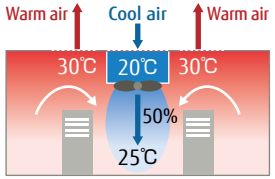
Air ducts are situated in the center of the building as part of a layout that allows efficient release and intake of external ventilation from the roof.



Building layout

New air-conditioning approach

Reduces ventilation fan operation by mixing heat from ICT equipment and external air inside server rooms.



Cutout view of server room
*Temperature example

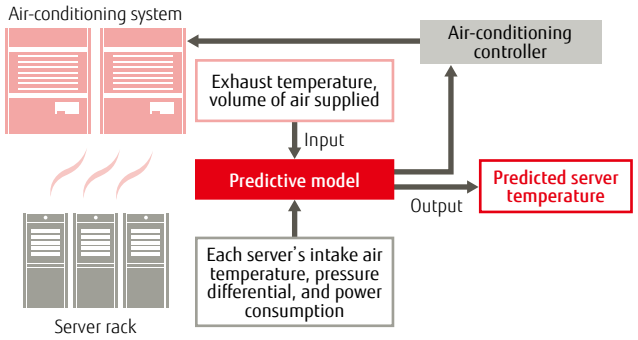

External view of the Tatebayashi Data Center's new annex

Using JIT Modeling in Air-Conditioning Controls at New Data Centers

A cooling control system using Just-In-Time (JIT) modeling was developed to further boost the efficiency of Fujitsu's large-scale data center facilities. This approach to cooling system control leverages temperature, humidity, and power data from the large centers and predicts values for temperature and humidity one hour in the future using JIT modeling. The predictions tell the control system when to switch between multiple air-conditioning units in order to reduce power usage.

Compared to conventional methods, this new approach is expected to yield a 6% reduction in power usage by air-conditioning systems. This prediction is for summer, when the use of external ventilation is most difficult. Annual reductions are estimated at 20% if the same approach is used in winter and other seasons.

Overview of JIT modeling



Data Center Environmental Efforts in Australia

The Fujitsu Group promotes the environmental contribution of its data centers in Australia. As of FY 2015, five out of six sites are certified under the National Australian Built Environment Rating System (NABERS), which is an increase of two over the previous year.

NABERS is the world's first tool that compares the energy use, environmental performance, and efficiency of ICT equipment based on actual performance and is validated by an external government department. It has been applied to buildings in Australia for over 10 years and also includes data centers.

Fujitsu is the only provider of NABERS-certified data centers in each state. These centers are 27% more efficient in power usage than the industry average and deliver savings of 13 gigawatts annually.

NABERS

Reduce CO_2 Emissions from Logistics and Transportation

Our Approach

Given the broad geographical range of Fujitsu Group companies and business sites inside and outside Japan, and the materials/parts sourced from a significant number of business partners, reducing CO_2 emissions accompanying the logistics and transportation activities of the Group is a priority issue.

To this end, the Group has strengthened its targets for CO_2 emission reductions from domestic transport. Furthermore, our Environmental Action Plan (Stage VII) expanded the scope of reductions beyond domestic targets to transport within regions overseas, as well as international transport, while the Plan is also driving forward rationalization and efficiency improvements in global logistics. In addition, the Group is working toward lowering environmental impacts along our entire supply chain, and working on cooperative efforts with business partners, such as displaying copies of the Fujitsu Group Green Logistics Procurement Directions, in order to strengthen our partnerships. Lastly, as an initiative in our distribution process overall, the Group is devoting effort to the 3Rs (Reduce, Reuse, Recycle) with respect to packaging products and materials/parts.

Summary of FY 2015 Achievements

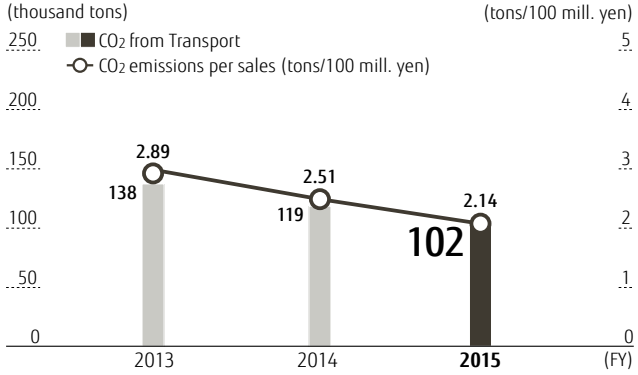
Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Reduce by over 1% on average every year CO_2 emissions per sales from transport (compared to FY 2013)
FY 2015 Targets	Reduce by over 1% CO_2 emissions per sales from transport (compared to FY 2014)
FY 2015 Key Performance	Reduced by over 15% CO_2 emissions per sales from transport (compared to FY 2014)

FY 2015 Performance and Results

FY 2015 Results Broadly Surpassed Targets

FY 2015 CO_2 emissions from transport were 102,000 tons. Of that amount, 22,000 tons were from domestic transport, while 80,000 tons were from international and overseas local transport. CO_2 emissions per sales were reduced 15% compared to FY 2014 and 13% compared to FY 2013 (on average), which broadly surpassed our Environmental Action Plan (Stage VII) targets for FY 2015.

Trends in CO_2 Emissions from Transport



Promoting Initiatives in Domestic, Overseas Local, and Overseas International Transportation

With regard to the Group's transportation inside Japan, we are continuing to effectively utilize rail transport as an ongoing modal shift initiative, while also adjusting delivery dates and promoting joint transportation with other companies in order to increase truck loading efficiency. The new efforts have led to a decrease in our number of trucks.

In addition, modal shift endeavors are also being implemented in international and overseas local transportation. The Group is shifting from air to ocean transport, shortening transport distances, utilizing low emission vehicles, reducing shipping vehicle numbers by having fewer last-minute, urgent deliveries, and engaging in other efforts such as reducing the number of times air transport is used.

Example Initiatives in FY 2015

- **Promoting joint transportation with other companies (Fujitsu)**
  Fujitsu is promoting joint transportation by combining Fujitsu cargo with the cargo of other companies. Applying to shipments between logistics terminals and from terminals to customers, this collaboration has allowed a reduction in the number of trucks used.

- **Improving truck loading efficiency by adjusting delivery dates (Fujitsu)**
  Collaboration and arrangements within Fujitsu's relevant divisions made it possible to adjust the delivery dates of mobile phones. This adjustment allowed us to reduce the number of trucks used for shipments.

- **Promoting modal shifts; utilizing ferries (Fujitsu Ten Limited, Hyogo prefecture)**
  Fujitsu Ten Limited implemented a modal shift by switching from air to ferry shipments of car navigation systems between our Chinese plant and Japan. Not only do ferries have lower environmental burdens than shipments by air, they also offer lower costs and, compared to using ocean containers, shorter lead times. The result is favorable in terms of both economics and the environment.

FY 2016 Targets and Plans

Pursuing Further CO_2 Emission Reduction

Toward achieving our FY 2016 target to "reduce CO_2 emissions per sales from transport over 2% (on average)," we are promoting CO_2 reduction measures throughout the Group.

Promoting CO_2 Emission Reductions with Our Business Partners

Our Approach

The reduction of CO_2 emissions through society-wide energy saving has become a critical theme for global warming prevention. Fujitsu Group believes that it is necessary to work toward CO_2 emission reductions along its entire supply chain, which is why we advocate measures to reduce or limit the CO_2 emissions of our business partners.

From FY 2013, we are expanding the scope of these measures to encourage business partners beyond component suppliers and to include other areas such as construction, facilities, maintenance, and software. Specifically, we are surveying the status of business partners' activities for CO_2 emissions reduction and offering support and appeals for extra efforts to business partners that do not meet standards set by our Group. Going forward, we intend to leverage the green procurement expertise of the Fujitsu Group to work with our business partners to drive forward initiatives and contribute to decreasing the environmental burden of society overall.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Expand activities of reducing CO_2 emissions to all types of suppliers.
FY 2015 Targets	Reach a **100%** of business partners implementing CO_2 reduction or limitation measures.
FY 2015 Key Performance	Reached **100%** of business partners implementing CO_2 reduction or limitation measures.

FY 2015 Performance and Results

Surveyed Status of Business Partners' Initiatives to Support Their Efforts

The Fujitsu Group has made it an objective to have business partners engage in stage 2 activities (see figure on the right) and we encourage their implementation. Specifically, we conducted a survey of business partners distributing our Group's original environmental survey sheet to our new business partners and checked the status of their activities for reducing CO_2 emissions. For business partners who have not reached stage 2 activities, we provide our own check lists featuring easily actionable case studies as opportunities for partners to start implementing activities.

We also compiled a leaflet that we supply as a guide for activities. The leaflet contains reference information and details on how companies can proceed with regard to global warming issues.

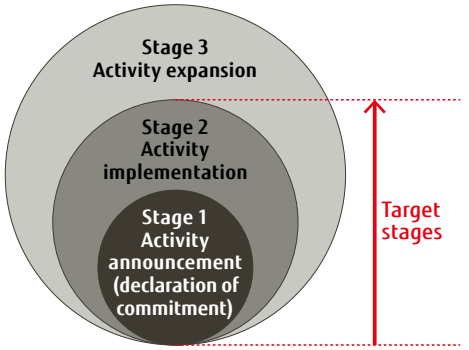
Moreover, we re-confirmed CO_2 emission reduction activities for business partners who had reached stage 2 by the end of FY 2014 and encouraged them to continue those activities.

Leaflet distributed to business partners

Achieved 100% Implementation Ratio with Business Partners Undertaking Initiatives to Reduce CO_2 Emissions

Fujitsu achieved its target of a 100% ratio of business partners undertaking initiatives to reduce CO_2 emission four months early in FY 2015, the final year of Environmental Action Plan (Stage VII). This result was due to unified, Group-wide effort and use of know-how that we accumulated inplementing these activities during FY 2013 and 2014.

Drawing Up an Activity Evaluation Index



Stage 1 Activity announcement (declaration of commitment)	The stage when the significance of reducing/limiting CO_2 is understood and a declaration of commitment is made as a company.
Stage 2 Activity implementation	The stage when initiatives are implemented, each with fixed numerical targets, policies, or plans.
Stage 3 Activity expansion	The stage when activities are expanded from inside to outside the company (such as support for the upstream supply chain or cooperative efforts to review approaches with external organizations).

FY 2016 Targets and Plans

Strengthening Activity Implementation in Our Upstream Supply Chain

In Environmental Action Plan (Stage VIII), Fujitsu is continuing to pursue the objective of "Reducing CO_2 emissions," which is an environmental challenge on a global scale.

In requests to our business partners, we are adding encouragement for them to recommend initiatives to their tier one business partners (i.e., Fujitsu's tier two business partners), and thereby aim to expand this effort in our upstream supply chain.

Through initiatives like these, we hope to broaden the circle of our activities to our entire supply chain.

Increasing Amounts of Renewable Energy Used

Our Approach

Furthering the spread of renewable energy in society has reached a new level of importance from the perspectives of combating global warming, securing stable energy supplies through diversifying our sources of energy, and growing our economy with energy as a pillar of support.

In the Fujitsu Group, we see energy supply and demand issues as one of the links of the fight against global warming. Our Environmental Action Plan (Stage VII) actively aims to expand our use of renewable energy, adopt solar panels at our business sites, and purchase power generated from renewable energy sources.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Increase generation capacity and procurement of renewable energy
FY 2015 Key Performance	Purchased green power: approx. **28,000** MWh Added the amount of electricity purchased that was generated by hydro power in Finland

FY 2015 Performance and Results

Promoted the Purchase of Green Power

We did not install new solar power generation equipment, but maintained our 865 kW of total installed capacity as of the end of FY 2015.

In addition, we purchased approximately 28,000 MWh of green power for our FY 2015 business site operation, exhibitions and events.

TOPICS

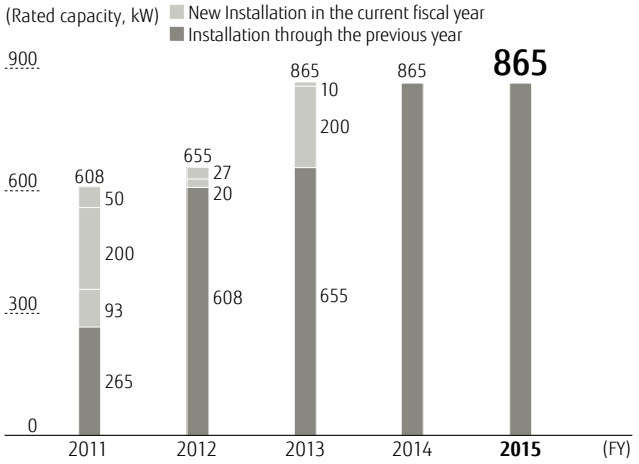
100% Renewable Energy Usage in Finland Data Centers and Offices

At Fujitsu Finland, we have been using 100% renewable energy from hydroelectric power since April 2014 in our 4 data centers, a distribution center, offices and some other facilities.

The amount of renewable energy purchased in FY 2015 was 28,000 MWh.

Green power certificate

Cumulative Total Installed Solar Power Generation (renewable energy)



FY 2016 Targets and Plans

Promote Expanded Use of Renewable Energy

Fujitsu formulated a new Environmental Action Plan (Stage VIII) for FY 2016-18.

We aim to further increase our use of renewable energy by utilizing the Guidelines for Adopting Renewable Energy and the Optimum Installation Maps & Power Generation Estimation Tools, both created in FY 2013, and by reviewing renewable energy adoption at business sites.

We will also strive to continually offset our power usage by actively reviewing the purchase of green electricity from external sources.

Efficient Use of Water Resources

Our Approach

Global water shortage risks are increasing along with climate change, destruction of forests, and economic and population growth in emerging and developing countries. For companies, as well, water shortages bear risks toward business continuity.

Reducing water usage and recycling water are critical issues. Since the Fujitsu Group uses especially large amounts of water in our semiconductor and printed circuit board manufacturing, we believe it is particularly necessary to reduce our water consumption in these areas. In addition to general water saving, to date we have been continuously striving to recirculate and reuse water by recycling pure water and reusing rainwater. From FY 2013, we established efficient water usage as a new goal and have boosted our efforts even greater than in the past.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Continue efforts for efficient use of water, e.g. water recycling and water saving
FY 2015 Key Performance	Water usage: **15,830,000 m³** reduced by **4.6%** (compared to FY 2014)

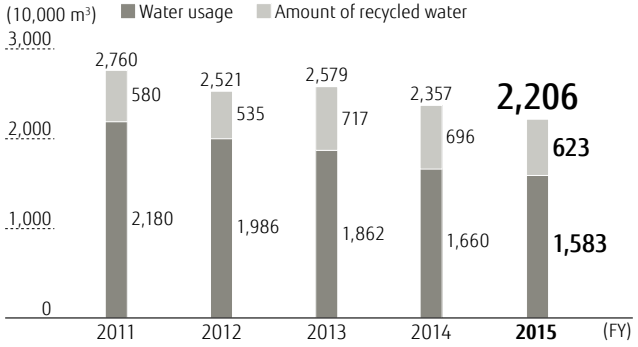
FY 2015 Performance and Results

4.6% reduction in water usage from FY 2014

Water usage for FY 2015 was 15,830,000 m³ (usage rate per unit of sales: 334 m³/100 million yen), which was a 4.6% reduction compared to FY 2014. The proportion of recycled water overall was 39.4%, which greatly contributed to efficient usage.

Each of our business sites has set water usage reduction targets and is working to meet them. Our Nagano Plant, for instance, in addition to promoting measures to increase the collection of raw water with waste water recycling facilities in FY2015, they worked on stabilizing operation and reduced water usage by 36,487 m³.

Trends in Water Usage and Amounts of Recycled Water



FY 2016 Targets and Plans

Work to Achieve the Targets of the Fujitsu Group Environmental Action Plan (Stage VIII)

To pursue our Environmental Action Plan (Stage VIII) goal to "reduce water consumption over 1% in total (128,000m³)," we will combine efforts at each of our plants, one by one, and further endeavor to efficiently use water resources following on from actions in FY 2015.

Efficient Use of Water Resources

Main Activities in FY 2015

Recycling of Production Waste Water Through Green Jishuken

PT FDK Indonesia, which manufactures and sells alkaline batteries, is endeavoring to effectively use water resources on the assembly line.

The assembly line in this factory differs from other production lines in that it has a vacuum process which uses a vacuum pump. Because this process requires a water-cooled system, it uses raw water supplied by the Industrial Park.

This cooling process uses quite a lot of water; about 1,080 m3/month (July-November 2015 average). However, the used water was not re-used and almost the same amount of water was discharged as waste leading to a large cost for water use.

Through Green Jishuken* the factory worked to improve the water-cooled system of the vacuum process in order to solve this problem. By utilizing some equipment that was not being used, and by modifying the open cycle system to be a closed cycle system it became possible to reuse water so the amount of wastewater discharged fell to close to zero. In addition to eliminating the waste of water resources, the cost of raw water consumption was also significantly decreased.

* **Jishuken:** short for Jishukenkyukai (independent research meeting), a meeting to announce the results of independently conducted improvements by each business unit.

The steps of the activity:

a: Install chiller (ex-Blister Film area) and water tank (ex-Cathode Can area)

b: Install electric feeder & connect to the vacuum pump

c : Change water inlet of vacuum pump from raw water feeder to chiller

d: Change water outlet of vacuum pump from drainage to water tank

e: Connect water tank outlet to chiller inlet and pump chilled water to pump inlet

f : Set chiller temperature to 22°C

Major achievements:

1. Reduction of Waste water

   Before: the amount of waste water was almost as much as the use of raw water for the cooling process, approx. 1,080 m^3/month

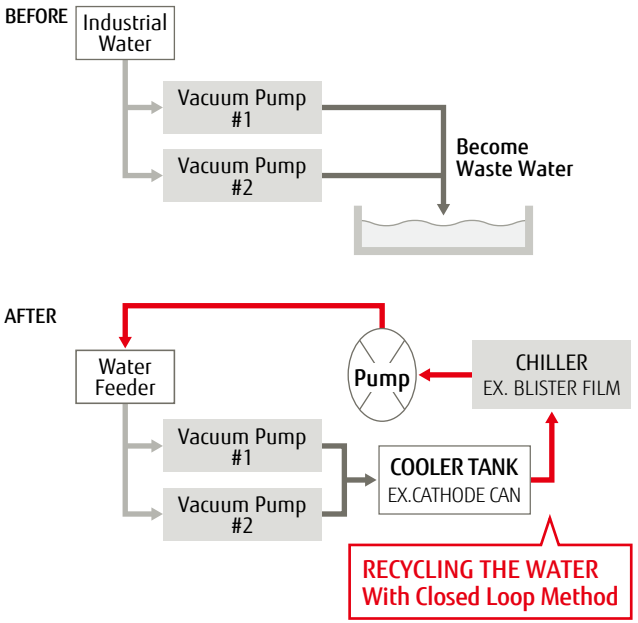
   After: almost no waste water is discharged

2. Economic effect

   Before: cost of water consumption was approx. IDR 16,357,191.8 (USD 1,160)/month

   After: almost zero for water consumption in this process. However, there is the cost of electricity as a consequence of the use of the chiller resulting in a cost saving of around 70%.

Reduction of Water Used by Improvements in the Water-cooled System



Pipe to return water to the chiller (blue pipes)

Close Loop Circulation

Reducing Chemical Substances Emissions

Our Approach

We manage the amounts used for about 1,300 chemicals in the Fujitsu Group in order to prevent environmental risks that could lead to environmental pollution or adverse health effects due to our use of harmful chemical substances. We operate a Chemical Information System called "FACE," which we use to register and monitor chemicals at every site, manage Safety Data Sheet (SDS), control income and expenditures in conjunction with purchasing data and inventory data, and strengthen our management and efficient use of chemicals.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Reduce chemical emissions to less than the average level of FY 2009–2011 (PRTR: 21 tons, VOC: 258 tons)
FY 2015 Key Performance	PRTR: 19 tons / VOC: 201 tons

FY 2015 Performance and Results

Achieved On-Going PRTR Substance and VOC Emission Targets

Group-wide chemical substance emissions for FY 2015 came to 19 tons for PRTR substances and 201 tons of VOC, thanks to efforts that included enhancing our maintenance of recovery equipment.

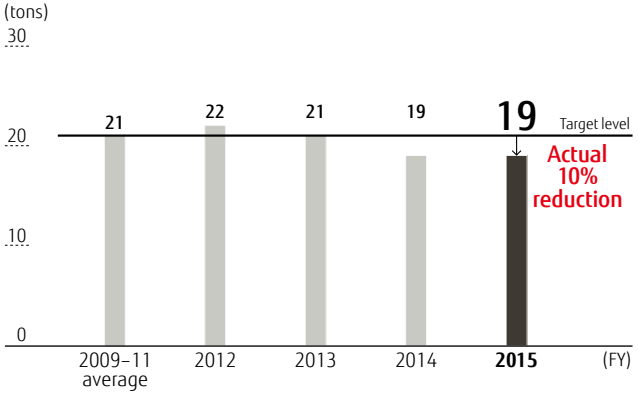
TOPICS

Reducing Chemical Use by Limiting Reuse of Ion-exchange Resin in Pure Water Production Equipment

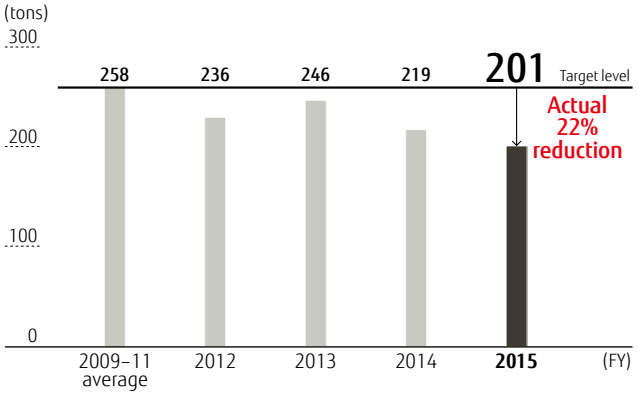
At the Fujitsu Nagano Plant, pure water production equipment is used to supply pure water to the printed circuit board production line. We noticed improvements in the quality of our raw water and have worked to reduce the number of times ion-exchange resins are recycled in the pure water production equipment. This effort reduces environmental burdens by limiting the amounts of chemicals (hydrochloric acid and caustic soda), water, wastewater, and steam used in the recycling process. We are also targeting cost reductions from this approach as well. As part of this initiative, we have exchanged information with the pure water equipment manufacturer and carried out water quality surveys. Our daily checks of the electric conductivity of the raw water and the manufactured pure water have confirmed that there has been no decline in the performance of the ion-exchange resin.

This effort has achieved annual reductions of 89 tons for hydrochloric acid and 200 tons for caustic soda. Along with these lower emissions of chemical substances, the plant has reduced wastewater by 17,000 m^3/year, steam by 185 tons/year, and electricity by 38 MWh/year. The economic benefit has saved 16.49 million yen annually.

Trends in PRTR Substance Emissions in Japan



Trends in VOC Emissions in Japan



FY 2016 Targets and Plans

Continuing to Limit PRTR Substance Emissions

Environmental Action Plan (Stage VIII) includes the target to "Reduce chemical pollutant release to less than the average level of FY 2012-2014 (20.7 tons)." In pursuing this target, Fujitsu will continue to limit PRTR emission levels following on from FY 2015.

Limiting Amounts of Waste Generated

Our Approach

The Fujitsu Group sees waste as a valuable resource and continuously works to recover resources from our waste, or to use that waste as an energy source. In Japan, we have been reducing our final disposal amounts every year. However, given the difficulty of building new disposal sites, and the limited lifespans of existing sites, the environment surrounding our waste disposal is as challenging as ever.

By proactively installing equipment and reusing waste, we are working to follow the stipulations in Japan's Fundamental Law for Establishing a Sound Material-Cycle Society to 1) reduce waste generated, 2) reuse waste, 3) recycle waste, and 4) recover heat from waste. We do this in order to reduce the amounts of waste acid, waste alkali, and sludge generated in our production of semiconductors and printed circuit boards.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)

Reduce the amount of waste to less than the average level of FY 2007–2011

(amount of waste: **31,134 tons**)

Keep Zero Emission in factories in Japan.

FY 2015 Key Performance

Waste generated: **20,660 tons**

Achieved **Zero Emissions** at Japan's business sites.

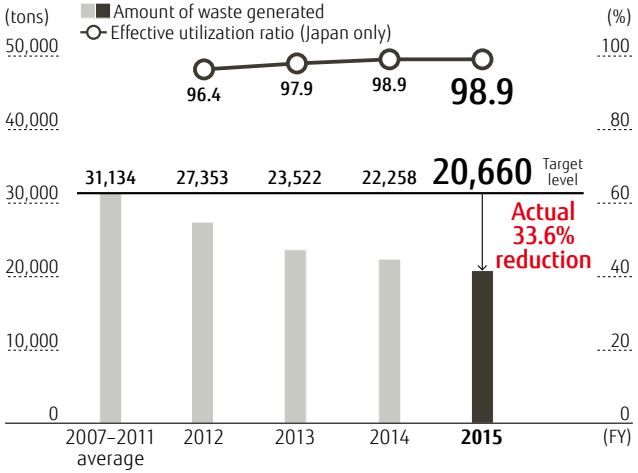
FY 2015 Performance and Results

Reduced Waste Amount and Converted Waste to Value-Added Material

We treated waste flux water in-house at Shinko Electric Industries Co., Ltd., reducing the amount by 114 tons, installed electrolysis equipment to recover copper at our Nagano plant, reducing the amount of sludge generated by 74 tons, converted concentrated organic alkali into value-added material at Aizu Fujitsu Semiconductor Manufacturing Limited, reducing the amount by 41 tons, and converted 12 tons of aluminum evaporation bags into value-added material at Shimane Fujitsu Limited.

As a result, Waste generation was 20,660 tons (generation rate per unit of sales: 0.44 tons/100 mill. yen). Additionally, we were able to maintain zero emissions at all of our Japanese business sites.

Trends in Amount of Waste Generated and Effective Utilization Ratio



Breakdown of Waste Generated, Effective Utilization, and Final Disposal

(tons)

Waste Type	Waste Generated	Effective Utilization	Final Disposal
Sludge	4,425	4,326	99
Waste oil	946	803	143
Waste acid	3,007	3,007	1
Waste alkali	3,073	3,068	5
Waste plastic	3,167	3,097	70
Waste wood	1,042	1,040	1
Waste metal	708	707	1
Glass/ceramic waste	366	363	3
Other*	3,927	3,105	822
Total	20,660	19,517	1,144

* Other includes general waste, paper waste, septic tank sludge, residue, rubble, textile waste, animal and plant residue, and infectious waste.

FY 2016 Targets and Plans

Continue to Limit Waste Generation

Environmental Action Plan (Stage VIII) covering FY 2016-18 includes the target to "Reduce the amount of waste to less than the average level of FY 2012-2014 (25,568 tons)." Following on from efforts that were part of Environmental Action Plan (Stage VII), we are aiming to achieve our low waste target by installing equipment and reusing resources.

Limiting Amounts of Waste Generated

Main Activities in FY 2015

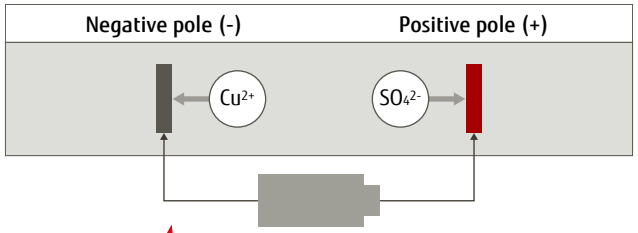
Reducing Sludge Generation by Installing Copper Recovery Electrolysis Equipment

The used stripping solution containing copper emitted during the production of printed circuit boards at our Nagano Plant has a high copper concentration above 30,000 ppm. Since we did not have an independent system for treating this used water, it was being slowly mixed and diluted with low-concentration used water, treated in our existing system and separated into sludge and water discharged into a river.

However, since a large amount of chemicals was needed in proportion to the concentration levels of the water being diluted and treated, there was still an increased amount of sludge being generated. To address this challenge, Fujitsu Facilities Limited looked into whether equipment could be developed that would effectively recover just the copper and reduce the amount of sludge. Attention focused on a copper recovery apparatus that uses electric current to cause a chemical reaction (electrolyzing the used water) so that copper could be removed. Before adopting the system, we borrowed a test device from the manufacturer and experimented with pH, temperature, and treatment time to see how the system would handle used water with different properties released from each building in the plant. With results showing a very high level of purity for the recovered copper compared to other copper recovery equipment, we judged the system optimal for addressing our existing need.

Furthermore, the initiative extended beyond simply installing the system. We collaborated with a water treatment installation company to review an integrated system that included moving raw water from used water tanks, pre-treating used water, and recovering copper. We were able to build an original, fully automated system at our Nagano plant. Installing this equipment has brought annual industrial waste reductions of 74 tons and has allowed us to decrease the types and amounts of chemicals we use.

The principle of electrolysis

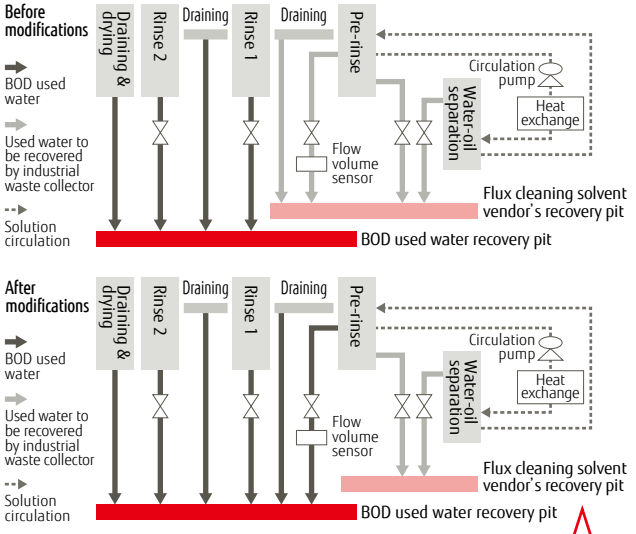


Passing voltage through the chemical compound (used water) triggers an oxidation reaction at the anode and a reduction reaction at the cathode thereby producing positively charged copper at the cathode.

Reducing Flux Used Water by Making Changes to Pipes

At Shinko Electric Industries Co., Ltd., we treated all of the flux wastewater used for cleaning circuit boards as industrial waste. By managing intake and release water so that the used water from cleaning is connected to a BOD used water recovery pit, we have been able to create in-house treatment technology. Taking care of treatment on site has led to a reduction in the amount of industrial waste by 114 tons/year.

Re-routing Flux Cleaning Water with an Electrical Conductivity Control System



The in-house treatment system takes wastewater that has been drained or has passed through the flow sensor and re-routes it to a BOD used water recovery pit instead of the cleaning solvent vendor's recovery pit.

Product Recycling

Our Approach

The Fujitsu Group's product recycling programs are based on our belief in Extended Producer Responsibility (EPR) and Individual Producer Responsibility (IPR). EPR holds that producers bear responsibility for products not only at the design and manufacturing stages, but also at the disposal and recycling stages, while IPR holds that producers bear responsibility for their own products. IPR is a major challenge for the Fujitsu Group in expanding our business globally, but we believe that responding to this challenge, and that of EPR, in collaboration with industry associations and governments will enable us to help create a recycling-minded society in which the requirements and demands of all stakeholders are met.

Given this understanding, the Fujitsu Group carries out recycling programs that comply with the waste disposal and recycling laws and regulations of the various countries in which it operates. As an authorized operator under the Industrial Waste Wide-Area Recycling Designation System based on Japan's Act for Promotion of Effective Utilization of Resources, Fujitsu accepts industrial waste for appropriate processing at Fujitsu recycling centers across Japan. Furthermore, following our belief in IPR, we also try to do as much collection, reuse and recycling as we can, even in countries where recycling is not obligatory.

Summary of FY 2015 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)

Maintain over **90%** resource reuse rate of business ICT equipment at Fujitsu recycling centers.

FY 2015 Key Performance

Achieved resource reuse rate of business ICT equipment at Fujitsu recycling centers

94.5% [Japan 92.0% / overseas 98.6%]

FY 2015 Performance and Results

Promoted Recycling of ICT Products

In Japan, the Fujitsu Group has built a recycling system that covers the entire country. While ensuring thorough traceability and security, we are steadfastly implementing Extended Producer Responsibility by providing safe and secure services that achieve high resource reuse rates in order to promote the recycling of ICT products.

Achieved a 90% or Higher Reuse Rate

We processed 5,203 tons of recycled ICT products (used ICT products for business applications) from corporate customers and achieved a resource reuse rate of 92.0%. Also, we have now collected a total of 69,801 end-of-life PCs from individual customers.

Trends in Resource Reuse Rates of End-of-Life Business ICT Products

FY	2012	2013	2014	2015
Resource reuse rate* (%)	91.5	91.3	90.9	92.0
Amount processed (tons)	5,297	5,035	5,016	5,203

* Weight percent ratio of recycled parts and materials to end-of-life products

Trends in Numbers of End-of-Life PCs Collected from Individual Customers

FY	2012	2013	2014	2015
End-of-life PCs collected (units)	85,381	98,549	103,276	69,801

FY 2016 Targets and Plans

Strive to Continually Achieve Our Targets

Going forward, we will strive to maintain a 90% or higher resource reuse rate for business ICT equipment at our Fujitsu recycling centers, and will drive forward our domestic and overseas recycling programs.

TOPICS Building a Closed Process Recycling System

Fujitsu has built a closed process recycling system that takes the plastic housings of PCs collected at Fujitsu Group Recycling Centers and uses them to make chassis of mobile devices.

When building the system, we checked information about materials in previous products, surveyed and analyzed devices, and used a risk management database to understand the chemical content of PCs with plastic from different organizations and manufacturers. By doing so, we complied with regulations on chemical substances in products. Furthermore, we carefully dismantled units, separated parts by hand, and used thorough inspection with analytic instruments. The system provides our products with high value-added re-used material that is stronger and more fire retardant than the original material, while also avoiding cost increases. Switching to the closed process recycling system has reduced our usage of raw plastic material and is expected to bring an approximately 14% reduction in CO_2 emissions during the production to modeling processes for plastic chassis material.