Chapter II

Reducing Our Environmental Burden

Since formulating the Fujitsu Environmental Protection Program (Stage I) in FY 1993, the Fujitsu Group has worked to reduce the environmental burden of its own business activities. Amid an upward trend in energy consumption at datacenters 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 datacenters. 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 2013

- Greenhouse gas (GHG) emissions Reduced by **29.4%** (compared to FY 1990)
- CO_2 emissions in transport per sales Reduced by **32%** (compared to FY 2011)
- Water usage Reduced by **6.3%** (compared to FY 2012)

About Symbols Used ✓ Examined by third-party organization ○ FY 2013 target achieved

	Theme	Target items (targets through the end of FY 2015)	FY 2013 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.	Reduced GHG emissions by 29.4% compared to FY 1990 ✓	○	P.27
	Efficient Business Operations: Energy Intensity	Improve energy intensity in our business facilities over 1% each year.	Improved energy intensity in our business facilities 1.6%	○	P.27
	Efficient Business Operations: Data Centers	Improve environmental performance of our major data centers.	Established the Green Datacenter Committee Set internal targets (common and individual targets)	○	P.29
	Efficient Supply Chain: Logistics	Reduce CO_2 emissions *1 per sales from logistics over 4% compared to 2011. *2	Reduced CO_2 emissions per sales from logistics by 32% compared to FY 2011 ✓	○	P.31
	Efficient Supply Chain: Procurement	Expand activities of reducing CO_2 emissions to all types of suppliers.	Reached 95.9% of business partners implementing CO_2 reduction or limitation measures	○	P.33
	Efficient Use of Resources: Renewable Energy	Increase generation capacity and procurement of renewable energy.	Installed 210 kW of new solar power generation facilities Purchased approx. 23,000 kWh of green power ✓	○	P.34
	Efficient Use of Resources: Water	Continue efforts for efficient use of water, e.g. water recycling and water saving.	Water usage: 18,620,000 m^3 (reduced by 6.3% compared to FY 2012)	○	P.36
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: 21 tons; VOC: 246 tons ✓	○	P.37
	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: 23,522 tons ✓ Achieved zero emissions at domestic business sites	○	P.38
	Reduced Environmental Impact: Recycling	Maintain over 90% resource reuse rate of business ICT equipment at Fujitsu recycling centers.	Achieved 92.7% resource reuse rate of business ICT products at Fujitsu recycling centers ✓	○	P.40

*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 to "reduce CO_2 emissions per sales from transport over 1% (on average) compared to FY 2013." *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, datacenters, 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 2013 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%** (each year)
FY 2013 Targets	Reduce greenhouse gas emissions in our business facilities by **19%** or more (compared to FY 1990) Improve energy intensity in our business facilities by an average **1%** or more (each year)
FY 2013 Key Performance	Reduced greenhouse gas emissions in our business facilities by **29.4%** (compared to FY 1990) Improved energy intensity in our business facilities **1.6%**

FY 2013 Performance and Results

Promoted Reductions of CO_2 Emissions Accompanying Energy Consumption

As CO_2 reduction measures, we are continuing energy saving practices with the machinery at each business site (including installing energy efficient models, free cooling systems, and inverters, as well as switching fuels, 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.

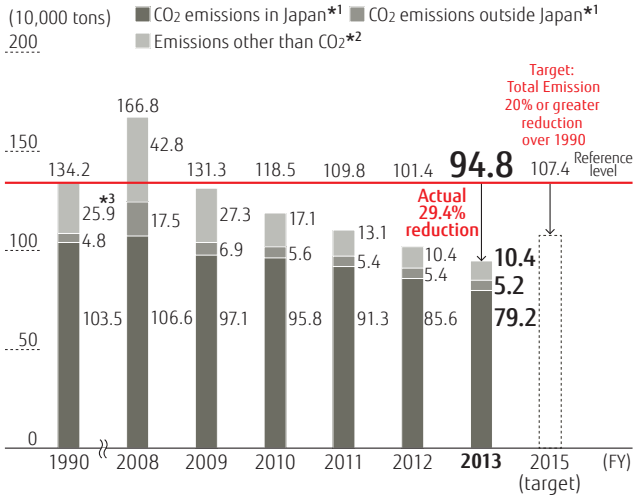
In addition, to reduce emissions of gases other than CO_2 (such as PFC, HFC, SF_6, and NF_3), we are switching to low global warming potential (GWP) gases, and installing abatement systems on production lines.

66,000-ton Year-On-Year Reduction of GHG

FY 2013 overall GHG emissions were approximately 948,000 tons (emission rate per unit of sales: 19.9 tons/100 mill. yen), which was a 29.4% reduction compared to FY 1990. The transfer of some businesses greatly affected reductions, bringing a 66,000-ton YoY reduction.

The breakdown of GHG was approximately 844,000 tons of CO_2 (792,000 tons emitted in Japan, 52,000 tons outside Japan) and approximately 104,000 tons of gases other than CO_2.

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 2014 Targets and Plans

Continually Strengthen Facility Investment and Operational Improvements

At our datacenters and in some of our manufacturing of electronic components, increased CO_2 emissions are projected accompanying increases in energy usage. However, we will strive for 20% or greater reductions, compared to FY 1990, through continual efforts to invest in facilities and improve operations.

Main Activities in FY 2013

Energy Savings By Changing Humidification in Clean Rooms

At Fujitsu Component Limited's technology development center, we are working to save energy by changing the way we humidify clean rooms, and by efficiently using waste heat from compressors.

Previously, we humidified our clean rooms at touch panel manufacturing plants by using steam from heating and cooling system boilers. This method, however, was insufficient, so we switched to a humidification system using pure water vaporizers inside the rooms. This allowed us to better regulate the humidity and also reduced our use of boiler fuel. Furthermore, although air-conditioning runs in the clean rooms year round, the pure water mist lowers room temperatures as the mist evaporates. This leads to lower loads on our air-conditioners, and reduces the electricity they use.

With regard to compressors, we are using coolers to lower room temperatures affected by the compressors' waste heat and to mitigate effects of high temperature on the efficiency of machinery. At the same time, we had been using steam from boilers to heat intake water in our water purifying machines. To address this, we started using heat exchangers and started heating intake water with waste heat from compressors. This allowed us to simultaneously reduce cooler electricity usage and boiler fuel consumption. These measures resulted in annual CO_2 emission reductions of approximately 650 tons (close to 20% less YoY).

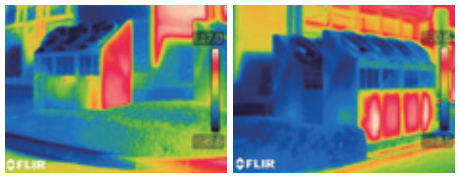
Humidification with pure water mist

Deploying Our Energy Saving Caravan to Share Energy Reduction Measures Inside Fujitsu

In order to work toward ever greater energy saving, we initiated the Energy Saving Caravan at Fujitsu Facilities Limited, which is a company especially skilled at facility management. Employees from the leading ranks of each business site are appointed to the Caravan.

In FY 2013, the Caravan conducted crosschecks between eight target Fujitsu business sites. We examined the extent to which the energy saving measures we have accumulated and shared up to this point have been spread and adopted at each site, and we worked to pinpoint areas for improvement by offering multiple observations from new points of view. In order to make detailed checks of appropriate operations in different seasons of the year, inspections were carried out at three different times: in the hot period of summer, in an intermediate season, and in the cold period of winter. Expected benefits from deploying the Caravan, including benefits from the adoption of improvement proposals, brought a decrease in electricity usage of approximately 1,390 MWh.

Caravan members use a thermograph to check machinery outside of a heating/cooling room



Acquiring ISO 50001 Certification at FTS Augsburg (Germany)

Fujitsu Technology Solutions GmbH in Augsburg Germany and its Energy Management System have been certified in accordance with ISO 50001* in May 2014.

The scope of the established Energy Management System includes design, production, purchasing, supply chain, sales, service and data centers for ICT products and ICT solutions. The requirements of ISO 50001 are met based on energy policy, energy planning and continuous activity.

This certification ensures continuous efforts to improve energy efficiency and energy performance of our products and also their development and manufacturing in Europe.

ISO 50001 Certificate

* ISO 50001: An international standard for energy management systems for encourageing continuous improvement of energy performance, energy efficiency and energy saving measurements.

Promoting Environmentally Conscious Datacenters

Our Approach

With the spread of cloud computing, energy use by datacenters is on an upward trend and society is showing more concern over the environmental performance of datacenters. Also, electricity costs are increasing with rising electric utility rates. Datacenters 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 datacenters in Japan. Furthermore, our datacenter CO_2 emissions are expected to continue to rise as our cloud business grows, making environmentally conscious datacenters 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 datacenters (based on server room floor space) and we are working to boost environmental performance.

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

Summary of FY 2013 Achievements

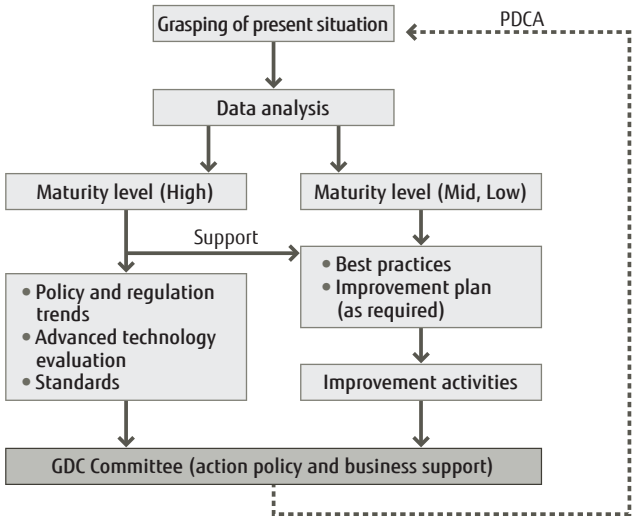
Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Improve **environmental performance** of our major datacenters.
FY 2013 Key Performance	Established the Green Datacenter (GDC) Committee. Set internal targets (common and individual targets).

FY 2013 Performance and Results

Established the Green Datacenter (GDC) Committee

We established the Green Datacenter (GDC) Committee and set an action policy toward implementing the Fujitsu Group Environmental Action Plan (Stage VII). We established the GDC Working Group (GDCWG), which plans and implements activities under the GDC Committee, and the Domestic and Overseas Sub-Working Groups (SWGs), while proceeding with activities that have produced the target results.

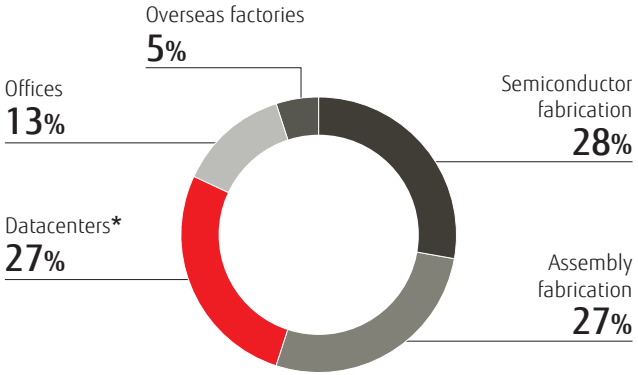
Activity Flow of GDC Committee



Setting Internal Objectives

We set internal objectives, consisting of common and individual objective items, for the target datacenters. For the common objectives, we used internationally recognized datacenter energy indices (PUE, etc.) and set targets for improvement rates. For the individual objectives, each site selected indices individually and decided to measure these indices regularly.

Percentages of CO_2 Emitted by Various Businesses (FY 2012)



* "Datacenters" indicate 47 datacenters in Japan and overseas (19 in Japan, 28 in overseas)

FY 2014 Targets and Plans

Promote the achievement of internal targets

First, with regard to common targets, along with assessing the level of progress since the benchmark year, FY 2012, we plan to adopt outside-air cooling, "visualize" air-conditioning temperatures and energy, improve full usage of rack space, increase air-conditioning temperatures, and implement hot/cold air separation. Additionally, with regard to individual targets, we plan to set guidelines for promoting policies suited to the characteristics of each datacenter, and work on improvement activities in line with those guidelines.

Main Activities of FY 2013

Open New Facilities at the Akashi System Center, Making it an Environmentally Conscious Datacenter Using Outside-air

At the Akashi System Center, our main datacenter in Western Japan, we opened two new modular datacenters (a seismic isolation datacenter and an earthquake-resistant datacenter). Along with adopting high efficiency equipment and a server room layout that was designed using thermodynamic simulations, these new facilities utilize Fujitsu's existing environmentally conscious datacenter expertise, while being our first facilities to use outside-air for the primary air-conditioning.

Outside-air is used for cooling during winter, intermediate seasons, and as much as possible in summer, while electric cooling is only used to supplement the outside-air, maximizing air-conditioning efficiency. In addition, we have developed and adopted new cooling technology (patent pending) that combines packaged air-conditioners (PAC) for general use computing rooms as supplemental cooling equipment in summer to make cooling with outside-air possible throughout the year, even in warm climates.

Exterior view of the Akashi System Center

New facility (seismic isolation datacenter)

This technology can be easily deployed regardless of the datacenter's scale or building's specification, promising to improve the energy efficiency of existing datacenters.

In the new facilities of the Akashi System Center, our design goal is a PUE value of less than 1.2 at times of full operation.

Contributing to Verification Projects for Using Datacenter Waste Heat to Achieve Exceptional Reductions in CO_2 Emissions

Fujitsu is pushing forward environmental consciousness in existing datacenters and participating in the Keihanna (Kyoto) Datacenter Verification Tests of the Ministry of the Environment's FY 2013 project for developing and demonstrating technologies for reducing CO_2 emission. This project emphasizes the reuse of datacenter waste heat, aiming for exceptional reductions in CO_2 emissions.

Since it is crucial to raise the temperature of waste heat as much as possible in order to increase the efficiency of its utilization, servers that can operate safely in high heat environment are necessary. Fujitsu provided the datacenter with 154 of its FUJITSU Server PRIMERGY RX200 S7 servers, which can operate in 40°C environment. The servers have been operated one side only to create a concentrated, high heat environment. Moreover, power conversions were cut to one third of normal levels due to the PRIMERGY RX200 S7's use of DC (direct current) power. This made it possible to boost the power usage effectiveness rate (thermal conversion efficiency) to 90%, as opposed to the existing rate of 70-80%.

At the Keihanna Datacenter, they realized a 30% cut in power consumption in FY 2013, aiming for a final overall reduction of 70%. Along with actively contributing to this project going forward, Fujitsu will further promote environmental consciousness at our existing datacenters.

A Message from a Joint Collaborator in Verification Projects at the Keihanna Datacenter

Current datacenters are mainly built with an enclosed, vertically integrated system structure. Since the datacenters themselves have a system design comprised of combinations of multiple devices, reducing power consumption for ICT equipment only (such as servers, etc.), or for air-conditioning only, does not optimize energy savings for the entire datacenter.

In order to solve this, we are bringing together experts in each layer or component of the datacenters, such as air-conditioning, servers, datacenter management, etc., and are working to achieve efficiency for the overall system.

Osaka University Cybermedia Center
Professor Morito Matsuoka
(right)

(Left: Hideaki Fujimaki, Product Marketing Unit, Fujitsu Limited

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) has 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 Procurement Direction, 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 2013 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Reduce CO_2 emissions per sales from logistics over **4%** (compared to FY 2011)
FY 2013 Targets	Reduce CO_2 emissions per sales from logistics over **2%** (compared to FY 2011)
FY 2013 Key Performance	Reduced CO_2 emissions per sales from logistics by **32%** (compared to FY 2011)

Overview of Initiatives

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

With regard to the Group's transportation inside Japan, we are effectively utilizing rail transport and shifting from air to ground transport as an ongoing modal shift initiative. In addition, relaxing specific delivery times and making transport boxes more compact has led to increased truck loading efficiency rates and a decreased number of trucks.

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, raising container loading ratios, and engaging in other efforts such as reducing the amount of air transport.

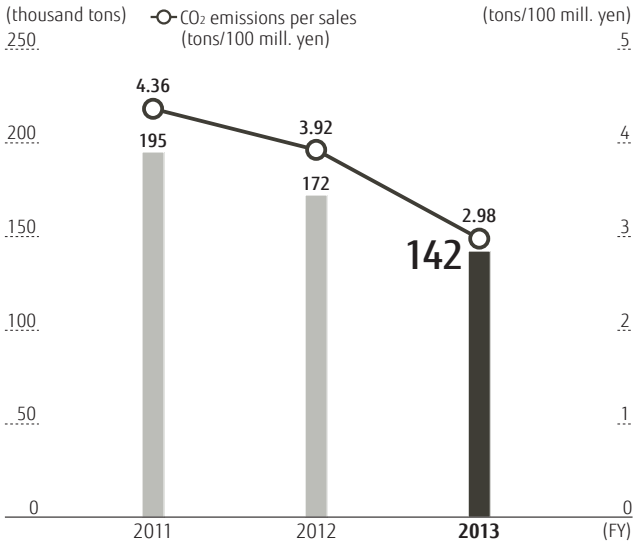
FY 2013 Performance and Results

Results Broadly Surpassed Targets

FY 2013 CO_2 emissions from transport were 142,000 tons. Of that amount, 25,000 tons were from domestic transport, while 117,000 tons were from international and overseas local transport. CO_2 emissions per sales were reduced 32% compared to FY 2011, which broadly surpassed our Environmental Action Plan (Stage VII) targets.

Major contributors to this achievement were a 22% reduction from expanded shifts from air to ocean transport in our overseas transport practices and a 10% reduction from reassessing the GHG protocol coefficient used in our calculations.

Trends in CO_2 Emissions from Transport



FY 2014 Targets and Plans

Setting New Targets and Pushing Forward

Given our achievement of FY 2013 targets, the Fujitsu Group reassessed its targets from FY 2014 to FY 2015.

We set a new target to "reduce CO_2 emissions per sales from transport over 1% (on average) compared to FY 2013" and will promote green logistics throughout the Group.

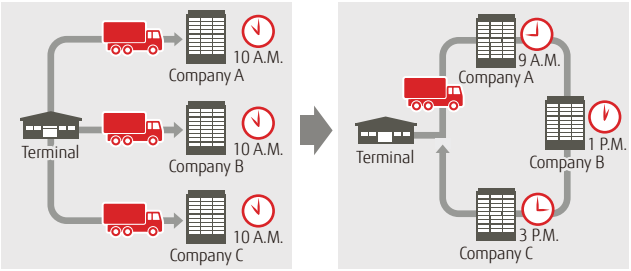
Report on Main Activities in FY 2013

Reducing the Number of Trucks Used for Domestic Shipments

Fujitsu cooperated with its Sales Unit to relax specified delivery times to customers with regard to network products (base stations) shipped domestically. Rather than specifying A.M. delivery, we switched to delivery "within the day." This resulted in the better patterns for truck loading and a reduced number of trucks used.

In addition, we were able to all but eliminate specified delivery times of corporate PCs to customers of Fujitsu Isotec Limited (in Fukushima Prefecture) and Shimane Fujitsu Limited (in Shimane Prefecture). Negotiations with customers minimized the number of individual charter shipments. With regard to consumer PCs, we also strove to reassess delivery times and limit the number of trucks used.

Relaxing Specified Delivery Times to Reduce Truck Numbers



Promoting and Expanding Modal Shifts

The Fujitsu Group is working to reduce CO_2 emissions through an ongoing modal shift. This entails effectively utilizing rail transport and shifting from air to ground transport.

Our rate of modal shift (the rate of rail usage for transport) within Fujitsu domestically as of March 2011 topped 15%, for which we received the Eco Rail Mark certification, as defined by the Railway Freight Association and the Ministry of Land, Infrastructure, Transport and Tourism. In 2013 as well, we continued to hold the certification.

Eco Rail Mark

At Fujitsu Ten Limited, we are working to reduce transport CO_2 emissions through a modal shift in international transport, by for example, switching from air transport to ocean ferry transport between our Chinese plant and Japan. Ocean ferry transport has a lower environmental burden than air transport and also carries half the cost. In addition, compared to typical ocean container shipping, we are able to ship the cargoes at the half lead time than ordinary shippings. Utilizing ocean ferry shipments realized efficiencies both economically and environmentally.

Reducing Packaging Materials through Downsizing Efforts

To reduce the whole environmental burden of the distribution process, the Fujitsu Group are promoting 3R efforts for packaging products and parts.

At Fujitsu Isotec Limited, we downsized boxes for PC servers by using dedicated boxes in place of the previous ones shared with other equipment, which led to reductions in packaging material. In addition, for ODM* laptop computers made overseas, downsizing boxes helped reduce the usage volumes of cardboard, cushioning, and other packaging.

* **ODM:** An abbreviation for Original Design Manufacturer, refers to work, from product design to manufacturing, carried out under another company's brand. OEM (Original Equipment Manufacturer), on the other hand, refers to subcontracted manufacturing.

Dedicated PC server boxes (returnable containers) that can be reused

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 reductions in-house, as well as along its entire value chain, which is why we advocate measures to reduce or limit the CO_2 emissions of our business partners.

To date, we have made component suppliers part of this effort, however, from FY 2013, we are expanding the scope to business partners in various other areas, including 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 environmental expertise of the Fujitsu Group to work with our business partners on initiatives and contribute to decreasing the environmental burden of society overall.

Summary of FY 2013 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 2013 Targets	Reach a **60%** or higher ratio of business partners implementing CO_2 reduction or limitation measures.
FY 2013 Key Performance	Reached **95.9%** of business partners implementing CO_2 reduction or limitation measures

FY 2013 Performance and Results

Surveyed and Supported Initiatives at Business Partners

Under our Environmental Action Plan (Stage VII), we are encouraging business partners in the solutions segment and others, in addition to parts business partners. We are distributing our Group's original environmental surveys to our business partners and checking the status of their activities for reducing CO_2 emissions. For business partners who have not reached stage 2 activities (the implementation of CO_2 reduction and limitation activities with numerical targets), we provide our own check lists featuring easily actionable case studies as opportunities for partners to start implementing activities.

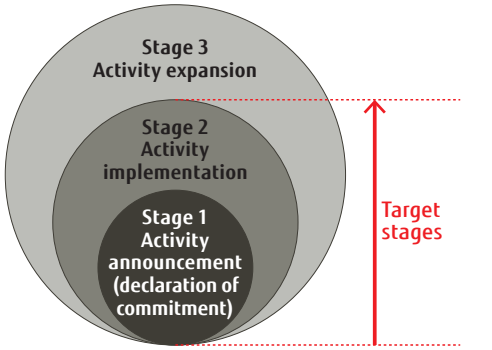
Accomplished of First FY Target

With 64.1% of all business partners reaching stage 2 activities as of the end of September 2013, we achieved our FY 2013 target of 60%. After achieving that target, we continued our support, as a Group, to encourage business partners who had not met stage 2. Our compounded efforts achieved a result of 95.9% as of the end of March 2014.

Examples of Encouragement for Business Partners

- We provided tools that were able to calculate CO_2 emissions from electricity usage and to monitor progress toward numerical goals.
- We provided the Fujitsu Group's original materials and checklists that clearly explain steps business partners can use for setting targets and carrying out CO_2 reduction programs.

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 2014 Targets and Plans

Strive for 100% Achievement ahead of Schedule

While we earned the understanding and cooperation of many business partners committed to our initiatives as a Group in FY 2013, still a portion of business partners, overseas and in the non-components businesses like solution services, have not committed to the initiatives due to differences in each country or differences between industries. We will strive to address these challenges across the Group, to continuously seek the understanding of business partners, and to support CO_2 reduction activities in order to reach the 100% level (set for achievement by FY 2015) ahead of schedule in FY 2014.

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 2013 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2015)	Increase generation capacity and procurement of renewable energy
FY 2013 Key Performance	Installed new solar power generation facilities: **210 kW** Purchased green power: **approx. 23,000 kWh**

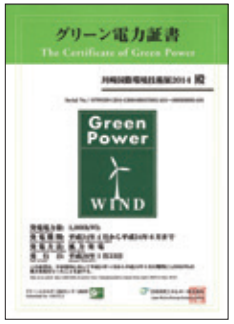
FY 2013 Performance and Results

Created Guidelines for Adopting Renewable Energy

In trying to increase our adoption of renewable energy, we set up an in-house working group to survey changes in new technology and equipment, and to conduct a review of whether these could be installed at our businesses sites. We summarized these results and findings in our Guidelines for Adopting Renewable Energy, and standardized the process toward adoption at each business site. In addition, we created Optimum Installation Maps & Power Generation Estimation Tools based on the conditions (environmental parameters such as amount of sunshine, wind, etc.) for each business location.

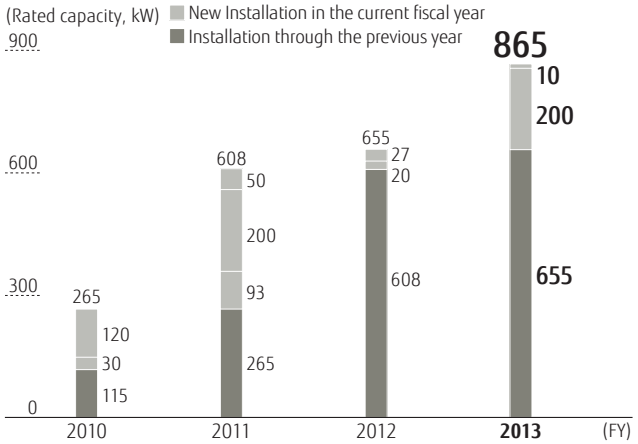
Installed Solar Power Generation Facilities at Two Business Sites

We adopted solar power facilities capable of generating 200 kW at Fujitsu Wireless Systems Limited and 10 kW at the Fujitsu Akashi Plant. As a result, we have 865 kW of cumulative generation capacity as of the end of FY 2013. In addition, we purchased green power of approximately 23,000 kWh for our FY 2013 exhibitions and events.



Green power certificate

Cumulative Total Installed Solar Power Generation (renewable energy)



FY 2014 Targets and Plans

Promote Expanded Use of Renewable Energy

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, and by reviewing renewable energy adoption at business sites. We will also strive to continually offset our power usage by actively using green electricity at our exhibitions and events.

Main Activities in FY 2013

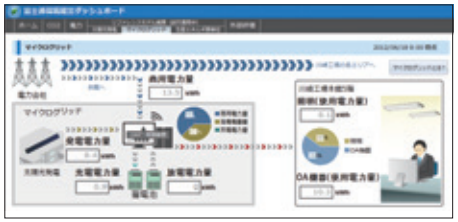
Microgrid Verification Tests at the Kawasaki Plant

Solar power generation that has rapidly spread in recent years has the advantage of addressing peak periods of power consumption because it generates more power during the high demand times of mid-day and during the summer. However, power output changes greatly with fluctuations in the weather, making it difficult to effectively use solar power to meet demand. With this challenge in mind, Fujitsu developed technology for optimizing battery usage so that solar power can be effectively used to mitigate peak periods of power consumption.

This technology predicts over 10,000 scenarios simulating a variety of possible supply and demand situations based on the weather. Using these scenarios, plans for optimum battery usage are created in advance and stored in a database that selects and changes plans in response to supply and demand for power. In verification tests of the system at the Kawasaki Plant, peak periods of power consumption were mitigated an average of 23% during the operation period from July 2012 to June 2013. We were also able to confirm that repeatedly altering battery usage plans can steadily improve the effects of mitigating peak periods.

This battery optimizing and control technology is one of the results of projects that Fujitsu has quickly adopted in-house as part of our effort to effectively utilize a microgrid for bringing about local production and local consumption of green energy. The microgrid makes use of small, dispersed power sources, combined with batteries and other technology. Going forward, we will strive to develop further technology for effectively utilizing inherently intermittent natural energy.

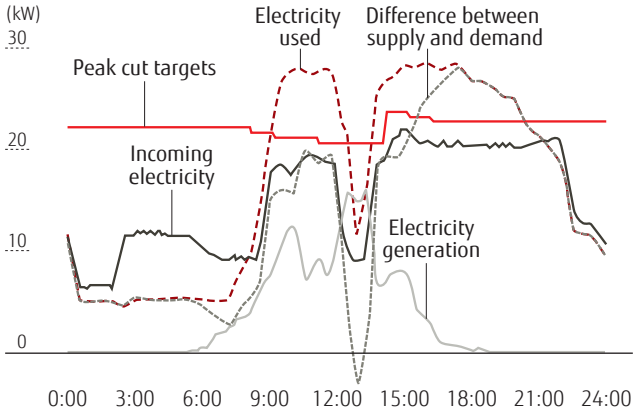
Solar panels and batteries used in the verification tests



Dashboard showing the operating status of our microgrid

The Verification System in Operation

Despite two instances of marked decrease in generation due to fluctuations in the amount of sunlight, the system was able to achieve an approximate 23% decrease in peak electricity consumption, and an approximate 8% reduction in incoming electricity, through the control system's use of the operating plan database to adjust "peak cut" targets.



Installing Solar Power Generation Facilities

In October 2013, we installed solar power generation facilities with generation capacity of 200 kW at the Kumagaya Plant, Fujitsu Wireless Systems Limited, in order to reduce our amount of power consumption and limit peak periods of consumption. We are trying out various approaches, such as spreading water on the solar panels to keep their surfaces from overheating, to maintain maximum power generation efficiency. As a result of installing the facilities, we have been able to reduce power usage at the entire plant by approximately 10%.

Solar panels at Fujitsu Wireless Systems Limited

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 2013 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 2013 Key Performance	Water usage: **18,620,000 m³** reduced by **6.3%** (compared to FY 2012)

FY 2013 Performance and Results

Collectively Rolling out Reduction Activities at Our Semiconductor Plants

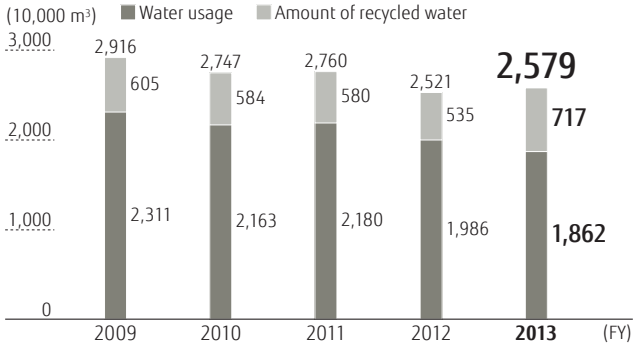
We bolstered our reduction of water usage at our semiconductor plants. To reduce usage of pure water, which is indispensable for semiconductor manufacturing, we adjusted the amount of water flowing to each piece of machinery while confirming that the change would not affect the manufacturing process. This allowed us to optimize our water consumption for more than 1,000 machines overall.

Adjusting pure water flow to manufacturing machinery

6.3% Reduction in Water Usage From FY 2012

Water usage for FY 2013 was 18,620,000 m³ (usage rate per unit of sales: 391 m³/100 mill. yen), which was a 6.3% reduction compared to FY 2012. The proportion of recycled water overall was 38.5%, which greatly contributed to efficient usage.

Trends in Water Usage and Amounts of Recycled Water



TOPICS

Promoting Efficient Water Use at Semiconductor Plants

Pure water is indispensible for semiconductor manufacturing. Up to this point, we have focused our concern on the manufacturing process, which meant keeping pure water continuously flowing to machinery even when it was idle and not processing any products. This used voluminous amounts of water. In response, we formed a cross-divisional team of members from the manufacturing, design technology, administration, and plant management divisions at our semiconductor plant in Aizuwakamatsu, Fujitsu Semiconductor Limited, and the main plant of Fujitsu Semiconductor Technology Inc., and began efforts to reduce our usage of pure water.

We optimized the precise amount of water that could be fed to each piece of machinery so that water flow could be reduced while water temperature would still remain within permissible levels and no impact would be felt in the manufacturing process. For machinery that did not have flow meters, we devised approaches to adjust the flow rate, such as using a stopwatch to measure the flow time. As a result, we were able to optimize usage for more than 1,000 pieces of machinery overall and achieve an annualized water usage reduction of 212,000 m³ without any financial investment.

FY 2014 Targets and Plans

Strive to Continually Achieve our Targets

To pursue our Environmental Action Plan (Stage VII) goal to "continue efforts for efficient use of water, e.g. water recycling and water saving," we will combine efforts one by one at each of our plants and further endeavor to efficiently use water resources following on from actions in FY 2013.

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 Sheets (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 2013 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 2013 Key Performance	PRTR: 21 tons / VOC: 246 tons

FY 2013 Performance and Results

Ensured Stronger Control of Chemical Substances by Linking Our Chemical Information and Purchasing Data Systems

As a new initiative to strengthen our legal compliance regarding chemical substances, we linked our FACE Chemical Information System with our Purchasing Data System, such that it is now impossible to purchase chemical substances that are not registered in our systems.

Achieved On-Going PRTR Substance and VOC Emission Targets

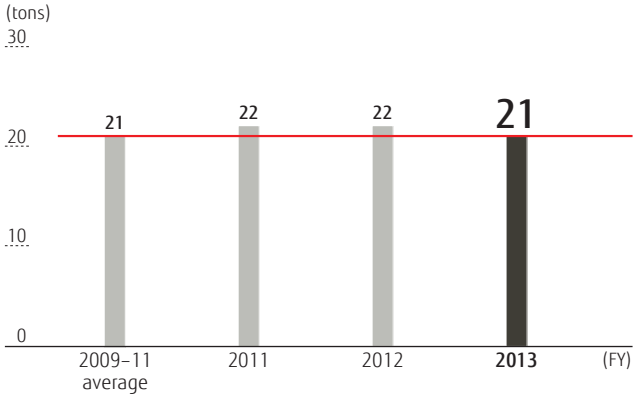
As we work to improve our recovery rate of chemical substances, we were able to hold FY 2013 emission amounts below the average from FY 2009-2011. Group-wide chemical substance emissions for the year came to 21 tons for PRTR substances and 246 tons of VOC, thanks to efforts that included enhancing our maintenance of recovery equipment.

FY 2014 Targets and Plans

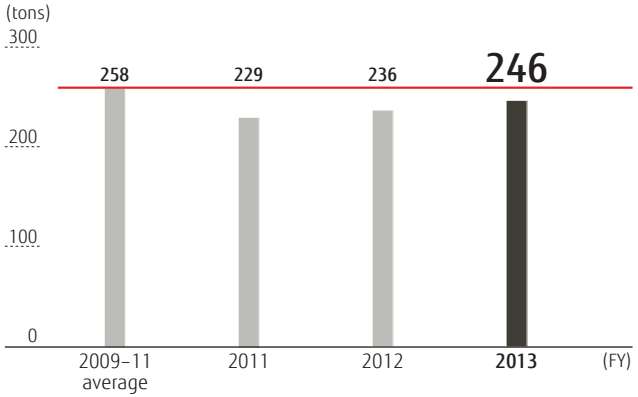
Continue to Limit PRTR Substance and VOC Emissions

We will continue holding the Fujitsu Group-wide emissions of chemical substances below the average from FY 2009-2011 in Japan. In particular, we plan to review new reduction measures for plating processes, which involve high emissions of chemical substances.

Trends in PRTR Substance Emissions in Japan



Trends in VOC Emissions in Japan



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 2013 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 2013 Key Performance

Waste generated: **23,522 tons**

Achieved **Zero Emissions** at domestic business sites.

FY 2013 Performance and Results

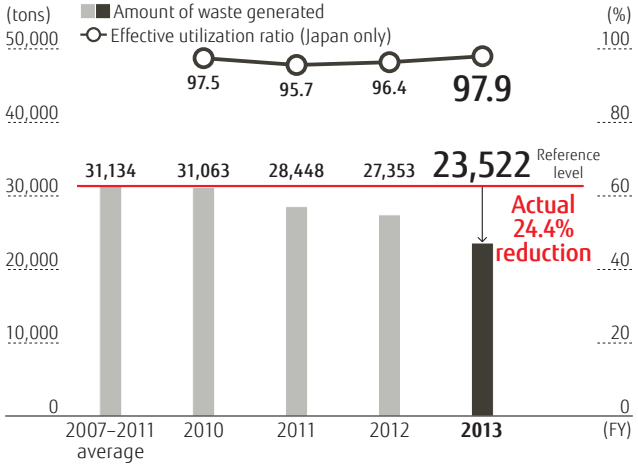
Installed Equipment, Treated Waste In-House, and Converted Waste to Value-Added Material

We implemented measures including installing vacuum dehydration dryers at our Nagano Plant to reduce (by 595 tons) electroless copper plating wastewater, using in-house treatment at Shinko Electric Industries to reduce alkali wastewater (by 300 tons), and converting sulfuric acid waste (228 tons), used at Fujitsu Semiconductor Technology, Inc. in the cleaning steps of the semiconductor manufacturing process, into value-added material.

Achieved Zero Emissions at All Business Sites

We were able to meet our target by holding waste generation to 23,522 tons (generation rate per unit of sales: 0.49 tons/100 mill. yen). Additionally, we were able to achieve zero emissions at all of our domestic business sites by bringing a portion of business sites that had not achieved zero emissions by FY 2012, up to zero emission levels.

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	4,750	4,544	206
Waste oil	1,670	1,503	167
Waste acid	2,832	2,831	1
Waste alkali	3,516	3,514	2
Waste plastic	3,720	3,637	83
Waste wood	1,228	1,228	0
Waste metal	570	568	2
Glass/ceramic waste	371	371	0
Other*	4,865	3,492	1,373
Total	23,522	21,688	1,834

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

FY 2014 Targets and Plans

Continue to Limit Waste Generation

We will strive to "Reduce the amount of waste to less than 31,134 tons," and "Keep Zero Emissions in factories in Japan" as we work to limit waste generation by continuously installing equipment and reusing resources.

Main Activities in FY 2013

Separating Heavy Metals from Electroless Copper Wastewater with Vacuum Dehydration Dryers

At our Nagano Plant, the conventional wastewater processing technology faced difficulties in separating solids from liquids through chemical processing of electroless copper wastewater.

In response, Fujitsu Facilities Limited started working on a vacuum dehydration dryer that can separate solids from distilled water, regardless of the ingredients of the wastewater, by utilizing a principle whereby depressurized (approximately -0.1 MPa) water reaches a boiling state around 50ºC. Expecting that this technology could be applied to electroless copper wastewater, tests were carried out on actual wastewater. Results showed that the solid constituents, such as heavy metals, etc., contained in electroless copper wastewater could be separated. We decided that the system, which also had the benefit of low daily maintenance needs due to its simple design, would be adopted at the Nagano Plant.

When installing the system, we incorporated some operational upgrades and customizations so that raw wastewater, from wastewater tanks in each building, and distilled water are automatically transferred. In addition, we added features that measured the solids, automatically notified when drums needed changing, simplified the way drums are moved, and simplified the transportation of the solids. Installing this equipment has brought annual industrial waste reductions of 595 tons.

Vacuum Dehydration Dryer


External view


Recovered solids


Wastewater | Solids 10% | Distilled water 90%

Reusing Sulfuric Acid for the Neutralization Treatment of Wastewater

Fujitsu Semiconductor Technology, Inc. uses sulfuric acid in the cleaning steps of semiconductor manufacturing at its main plant.

Since there are high concentrations of hydrogen peroxide in the sulfuric acid drained from the first cleaning line, we have, up to now, treated this as an industrial waste product and outsourced processing to an external company. At the same time, we were using industrial-grade sulfuric acid in the neutralizer of our wastewater treatment facility.

As a result of examining whether we could reuse the drained sulfuric acid as a neutralizer in the wastewater treatment facility, we found that it was indeed possible, however, the hydrogen peroxide caused ill effects (corrosion) in the facility and pipes. We realized that further measures were needed. In response, in FY 2012, we switched wastewater treatment facilities and pipes, etc. to components with high chemical resistance, in order to combat the corrosion. After running tests and checks, we began reusing the drained sulfuric acid, repurposed as the neutralizer, from April 2013. As a result, we were able to achieve reductions of 228 tons annually in both the amount of waste generated we emitted and the industrial sulfuric acid we purchased.

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 2013 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 2013 Key Performance

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

92.7% [Japan 91.3% / overseas 95.3%]

FY 2013 Performance and Results

Promoted Recycling of ICT Products in Each Country

The Fujitsu Group carries out recycling in Japan, EMEA (Europe, the Middle East, Africa), the Americas (the United States, Canada, and Brazil), and Asia (Singapore, the Philippines, Australia, Hong Kong, Taiwan and South Korea). In Japan, we have 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. We also partner with recycling companies near our hubs outside Japan to promote recycling of ICT products.

Achieved a 90% or Higher Reuse Rate

We processed 5,035 tons of recycled ICT products (used ICT products for business applications) from corporate customers and achieved a resource reuse rate of 91.3%. Also, we have now collected a total of 98,549 end-of-life PCs from individual customers.

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

FY	2010	2011	2012	2013
Resource reuse rate* (%)	90.6	90.9	91.5	91.3
Amount processed (tons)	6,406	5,487	5,297	5,035

* 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	2010	2011	2012	2013
End-of-life PCs collected (units)	74,231	83,358	85,381	98,549

FY 2014 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.

Fujitsu Integrated Recycling Process