FUJITSU

Fujitsu Group
Environmental
Report
2017

shaping tomorrow with you

Fujitsu Group Environmental Report 2017

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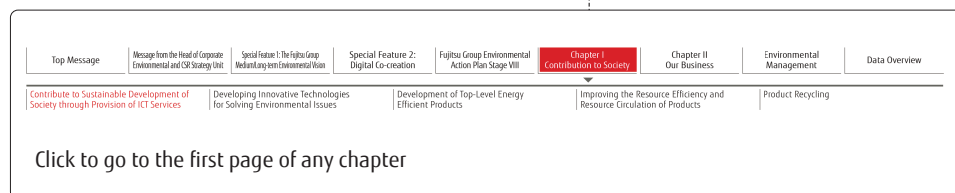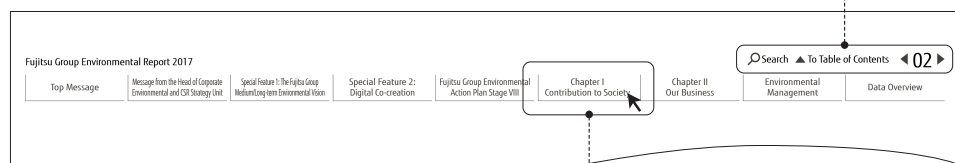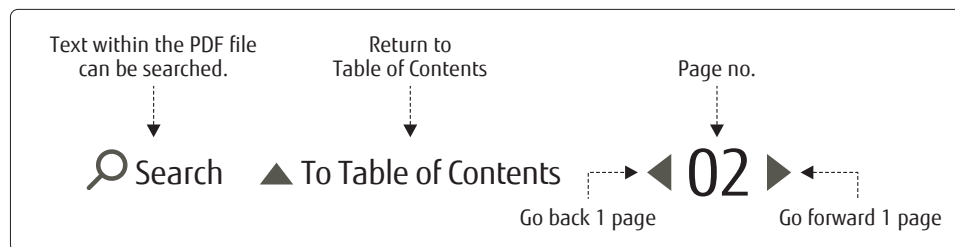
Editorial Policy

The Fujitsu Group Environmental Report 2017 offers a report on our recognition of environmental initiatives, our approach to initiatives, and our performance and major activities in FY 2016, in line with the Fujitsu Group Environmental Action Plan (Stage VIII, FY 2016 – FY2018) that was formulated on the basis of expectations and requests from society and of important environmental aspects of the Fujitsu Group. The report also explains the "FUJITSU Climate and Energy Vision," Fujitsu's medium/long-term environmental vision that was announced in May 2017. Fujitsu Group strives to improve the reliability and transparency of the content of reports, through means including subjecting major data to examination by third-party organizations and publishing third-party opinions concerning indicators. In addition, we have taken ease of reading on PCs and tablets into account through a horizontally oriented page layout.

■ Reporting Period
This report focuses on activities in FY 2016, from April 1, 2016 to March 31, 2017, and the data presented is actual performance data from that period. Content from times outside that period, however, is also presented.

■ Target Readership
This report is written assuming the following readership: All Fujitsu stakeholders, with high interest in environmental topics, including customers, employees, stockholders and investors, suppliers and business partners, international society and local communities, public institutions, and governments and specialists such as CSR survey institutions.

■ Organizations Covered
The coverage is of Fujitsu itself plus a total of 117 companies (including companies outside Japan) centering on consolidated subsidiaries that have built environmental management systems.

≫ List of Organizations Covered by the Report on Environmental Activities (See Page 58)

≫ Environmental Performance Data Calculation Standards (See Page 55)

■ Significant Changes in Coverage
• Fujitsu spin-offs Fujitsu Client Computing Ltd. and Fujitsu Connected Technologies Ltd. were added to reporting.

• In conjunction with the partial absorption of Fujitsu Wireless Systems Ltd. (FWL) into Fujitsu and consolidation with Fujitsu Telecom Networks Ltd., FWL was removed from reporting.

• Fujitsu Group companies worldwide beginning with No. 32 in the List of Organizations Covered by the Report on Environmental Activities (p.58) were added to reporting in conjunction with expansion of the range of coverage stipulated in the Environmental Action Plan (Stage VIII).

■ Guidelines Used and Referenced
• GRI G4 Sustainability Reporting Guidelines
• Ministry of the Environment: Environmental Reporting Guidelines (2012 edition) (Japanese)
• Ministry of the Environment: Environmental Accounting Guidelines (2005 edition) (Japanese)

■ Published
August 2017 (The next report will be published in August 2018 and the previous report was published in August 2016.)

A Note Concerning Future Projections, Forecasts and Plans
This report not only describes past and present facts related to the Fujitsu Group but also includes future projections, forecasts and plans. Such projections, forecasts and plans are based on data available when the report was prepared, and therefore involve a degree of uncertainty.
Accordingly, future results of operating activities and other new developments may differ from the projections, forecasts and plans included in this report. We ask our readers' understanding of the fact that the Fujitsu Group cannot be responsible for such eventualities.

We welcome your feedback

Fujitsu welcomes readers' comments on this report, which are used as statistical data to help us create better reports. We thank you in advance for your cooperation.

WEB http://www.fujitsu.com/global/about/environment/management/communication/report/

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Top Message

Digital Co-creation
for a better future and a sustainable society

Global Trends: The Shift from a Low-Carbon Society to a Decarbonized Society

With the November 2016 entry into force of the Paris Agreement, the global community embarked on creation of a decarbonized society. We must strive to minimize climate change so future generations have a safe and prosperous living environment. The circumstances demand a shift toward cleaner sources of energy in addition to saving energy.

Climate change is an issue with global implications; the effects stretch beyond individual countries and specific regions. For a global company, addressing the problem is both a social obligation and an important element of the company's management strategy. The Fujitsu Group will continue to apply its ICT capabilities toward solutions to the climate change issue.

Leveraging Our Technology and Expertise into Solutions for Customers and Society

In this context, the Fujitsu Group established the FUJITSU Climate and Energy Vision, a plan for achieving net-zero CO_2 emissions from in-house business activities by 2050, contributing to the realization of a decarbonized society, and making a difference in adapting to climate change. Fujitsu's effort to eliminate CO_2 emissions—an ambitious endeavor—will spur creative thinking and cultivate innovation. In addition to taking thorough steps to save energy and decarbonize

internally, Fujitsu will use the technology that comes out of those in-house efforts and act as leaders to help customers and society achieve decarbonization.

From climate change-related energy issues to disappearing supplies of natural resources and shortages of food and water, the world faces problems that jeopardize the potential for a sustainable society. The Fujitsu Group, positioning the environment as one of its most important management concerns, has fused environmental activities together with its business activities. Every three years, we formulate an Environmental Action Plan that lays out the goals for our activities. Last fiscal year, we launched our Environmental Action Plan Stage VIII. As we work to drive steady progress in our environmental activities and realize our environmental vision, we will continue accelerating internal action.

Building a Sustainable Society through Digital Co-creation

Fujitsu's digital technologies, which include assets for artificial intelligence, the IoT, and big-data processing, represent a powerful engine for forging collaborative relationships across boundaries—industries, sectors, and business categories—and driving innovation in business and society. That technological foundation gives us the ability to spark change. I know that we can solve the many issues affecting society and the environment by co-creating new value with our customers and partners.

Tatsuya Tanaka
Representative Director and President
Fujitsu Limited

Message from the Head of the Corporate Environmental and CSR Strategy Unit

As a global ICT enterprise, Fujitsu will continue to contribute to the formation of a sustainable society—and a sustainable world—through its new medium- to long-term environmental vision for 2050.

Hideyuki Kanemitsu
VP, Head of the Corporate Environmental and CSR Strategy Unit

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Fujitsu's new medium- to long-term environmental vision stands as a clear guide, laying out the Company's values and mindset.

In May 2017, Fujitsu established the FUJITSU Climate and Energy Vision for 2050. In addition to contributing to achieving a decarbonized society and climate change adaptation through our technologies and services for supporting digital transformation, we are also aiming to bring the Fujitsu Group's CO_2 emissions to zero by 2050. We narrowed that focus to climate change for two key reasons. First of all, we understand our position as a provider of products and services that use electricity. Second, we recognize the hopes that society has for ICT—an asset that people expect to play a major role in coping with changing climatic conditions. Given that context, we made climate change one of the material issues of our entire approach. By specifically targeting climate change, we can send clearer, stronger messages and make it easier to generate collaborative connections both internally and externally.

One of the factors shaping the FUJITSU Climate and Energy Vision is the Paris Agreement. The value of an international consensus on the environment is evident in the Agreement. With that shared awareness, countries now have a composite picture of problems from around the globe, making it easier to see the issues, and have a common understanding of how important it is to pool their wisdom in aspiring toward solutions. Moving forward, I think that approaches to climate change and other social issues are going to be broader and more inclusive. Instead of tackling problems locally through individual, separate technology projects, the various elements

of society—on the community, national, and global levels—are going to pool their information, work from a more comprehensive perspective, and analyze conditions at a deeper level to arrive at optimal solutions through new angles and new technologies. That process will require more than just government involvement. Companies will have to live up to growing expectations and exhibit stronger leadership in the process, where ICT will play an enormous role.

Economically vulnerable countries and regions will be the ones harmed by the impact of climate change. For the global community to tackle these issues and bring hope to the world, we need shared goals. The FUJITSU Climate and Energy Vision lays out our common guide—our "North Star"—for the future.

The Vision has three pillars. The first one is "Bringing Fujitsu's CO_2 emissions down to zero," which centers our focus

on both addressing emission-related issues internally and encouraging our business partners to do the same. Through our efforts in pursuing that first goal, we will also be able to use the insight we gain from internal measures to assist our customers and benefit society. The other two pillars are "Contributing to a decarbonized society" and "Contributing to adaptation to climate change." Fujitsu is currently aiming to create new value through Digital Co-creation with stakeholders, a part of the "Connected Services" concept in our Technology and Service Vision. Grounded in that approach, we will work to engage with new solutions and approaches by forming connections with a wide array of companies, industries, and communities. We will continue to provide new value, taking full advantage of the digital technologies that give Fujitsu its unique identity.

The Paris Agreement was first adopted at the 21st United Nations Climate Change Conference (COP 21) in December 2015. Countries around the world are now bolstering their efforts to reduce greenhouse-gas emissions in hopes of meeting concrete targets by 2050.

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In the first year of our Environmental Action Plan (Stage VIII), we met nearly all of our single-year goals and got off to a great overall start.
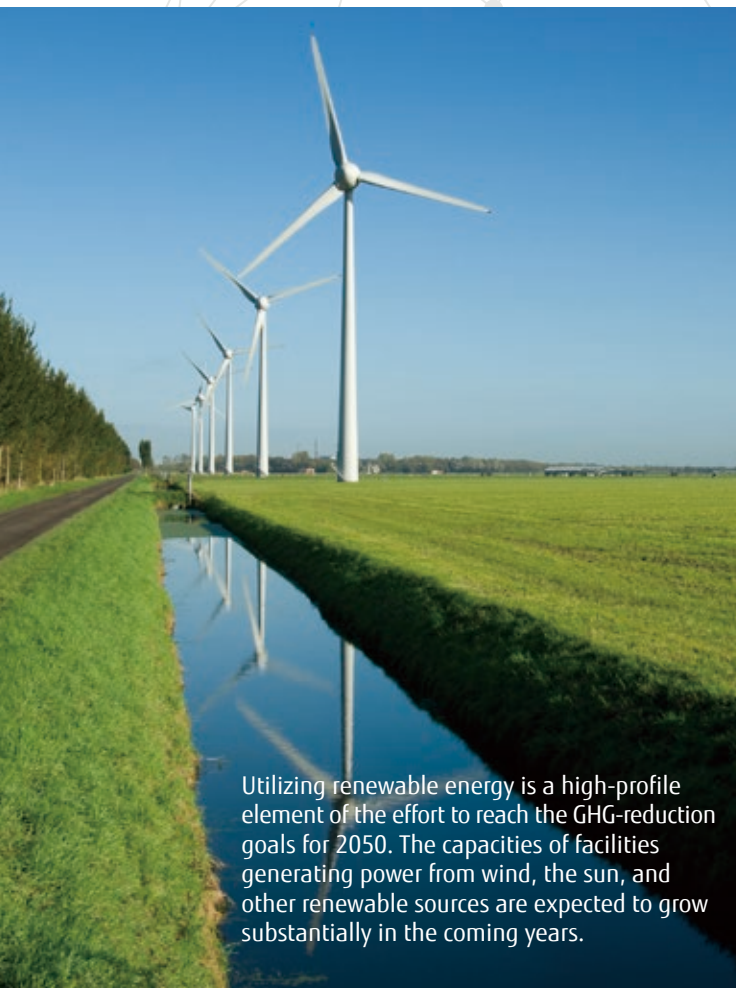
Utilizing renewable energy is a high-profile element of the effort to reach the GHG-reduction goals for 2050. The capacities of facilities generating power from wind, the sun, and other renewable sources are expected to grow substantially in the coming years.

The Environmental Action Plan distills our plan of action for tackling the global environment-related issues that affect the Fujitsu Group, including climate change—a key theme in the FUJITSU Climate and Energy Vision. Adhering to the Environmental Action Plan, we continue to implement activities in pursuit of specific goals. The Environmental Action Plan (Stage VIII), which started in FY 2016, organizes various activities from two standpoints: "Our Business" and "Our Society." (See Page 19.) We achieved 12 of the 14 targets for FY 2016, giving us a great start moving forward.

If you look at our successes in the "Our Society" area, several targets stand out. Our efforts to boost the energy efficiency of new products and increase the resource efficiency of new products, for example, exceeded targets by significant margins. One example of our determination to develop energy-saving products that help customers and society use less energy is the PRIMERGY CX600, a high-performance server. For the product, we developed a new water-based cooling technology that reduces overall energy consumption. A supercomputer using this new water-cooled PRIMERGY server placed sixth in the "Green 500" (as of November 2016)—a ranking of the most energy-efficient supercomputers in the world. The LIFEBOOK UH75/B1, meanwhile, showcases our commitment to creating products that both enhance customer convenience and save resources. Released in February 2017, the new notebook computer packs long-lasting drive capabilities and a robust design into the world's lightest unit. The end result is an environmentally conscious product with profit-earning power.

The "Our Business" category now includes a new numerical target: boosting our usage of renewable energy to at least 6%. The FUJITSU Climate and Energy Vision also emphasizes our goals of reducing energy usage across the board by 2050 and making strategic increases in our usage of renewable energy, both of which will help us bring our CO_2 emissions to zero. We will continue to set numerical targets and bolster our management efforts, aiming to see those aims to fruition. While promoting renewable energy usage is a challenging task in Japan, we are proactively implementing solutions at European data centers and other locations abroad. Sites in Finland and New Zealand are making especially important strides: Their operations—including tasks at office facilities—run entirely on renewable energy. We look forward to expanding those approaches across the whole Fujitsu Group.

As the social demand for a "Circular Economy" (recycling-oriented economy) grows, the biggest, most challenging needs moving forward will be encouraging cooperation in our supply chains, establishing shared values to cultivate a better understanding of resource circulation, and energizing efforts to make improvements.

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Fujitsu is working to create environments where every employee can take independent action in shaping environment-related initiatives.
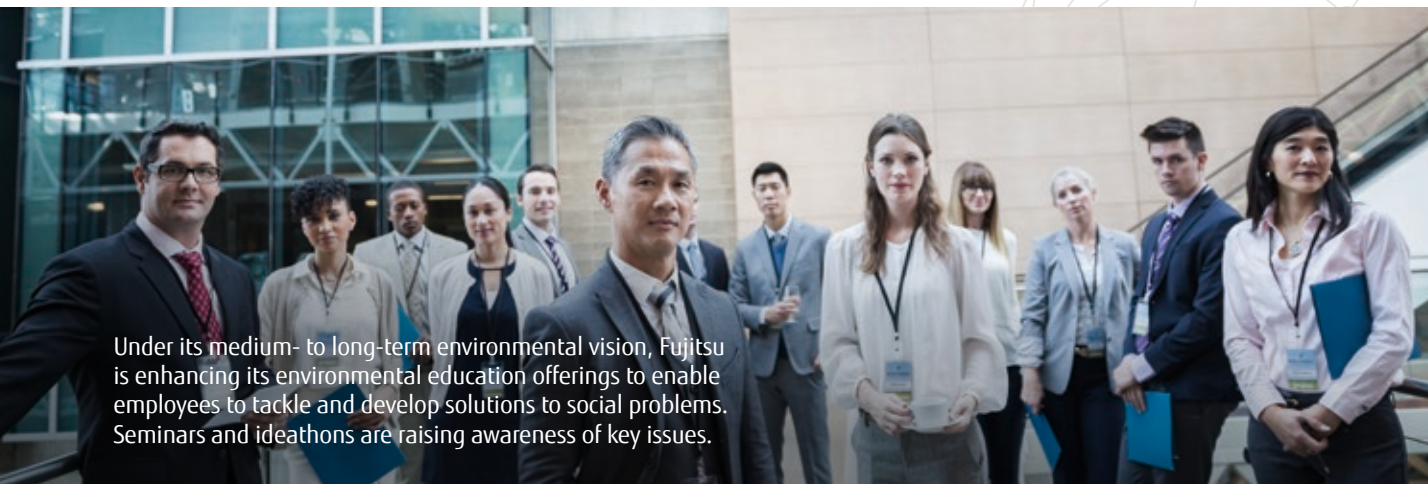
Under its medium- to long-term environmental vision, Fujitsu is enhancing its environmental education offerings to enable employees to tackle and develop solutions to social problems. Seminars and ideathons are raising awareness of key issues.

Nurturing independence is important for strengthening environmental management. From shifts in the international state of global environmental issues to rapid advances in digital technologies, and reforms in the Fujitsu Group's business model, we are now embarking on a period of major change. All of our Group employees need to think about what they can do—for people and, by extension, society and the world at large—and take action.

In the Corporate Environmental and CSR Strategy Unit, we are offering better and better environmental education offerings for Group employees. The key goal is forming motivation—but simply going by the book saps that precious motivation. Instead of just creating rules as manuals dictate, we need to enable employees to see the big picture first and then use that perspective to craft their own strategies for specific situations. That "outside-in" approach will help people see environmental issues from a broader viewpoint and grasp their essence. We also focus on "positive motivation," which encourages people to think openly about how environmental themes relate to their own jobs, use their creative capacities, and take independent action.

Elevating overall awareness of environmental issues has been a core goal for us. Our seminars have given attendees a basic overview of international affairs in the environmental segment, for example. We have held "Ideathons," giving participants opportunities to brainstorm ideas for future services, and also created an animated video that lays out the connections between environmental issues and business operations. These efforts are not exclusively in-house projects, either. We are also encouraging stakeholders in the supply chain to apply similar measures. Expanding the scope helps establish a stronger understanding of the Group's environmental policy and share our values on a broad scale. We regularly host "Environmental Dialogues" with experts in a variety of fields. As a result, not only are Fujitsu Group employees showing a stronger awareness, but our various activities have also garnered praise from outside organizations.

People often say that top-down efforts are vital to environmental management. However, I believe that the bottom-up approach—starting with employees—is just as essential. A truly strong organization, in my view, blends both approaches to create an environment where ideas can really spread. I look forward to working with everyone to push the Group's environmental management to an even higher standard and keep establishing our identity as an ICT enterprise with an even bigger impact on the global community.

Special Feature 1

The Fujitsu Group Medium/Long-term Environmental Vision

FUJITSU Climate and Energy Vision

Fujitsu Group has established the "FUJITSU Climate and Energy Vision,"
a medium- to long-term environmental vision through 2050, with the goal
of bringing the Fujitsu Group's CO_2 emissions to zero, and achieving a
decarbonized society, as well as contributing to the response to
climate change, through technology supporting digital transformation.
The following is an explanation of the thinking behind the newly established
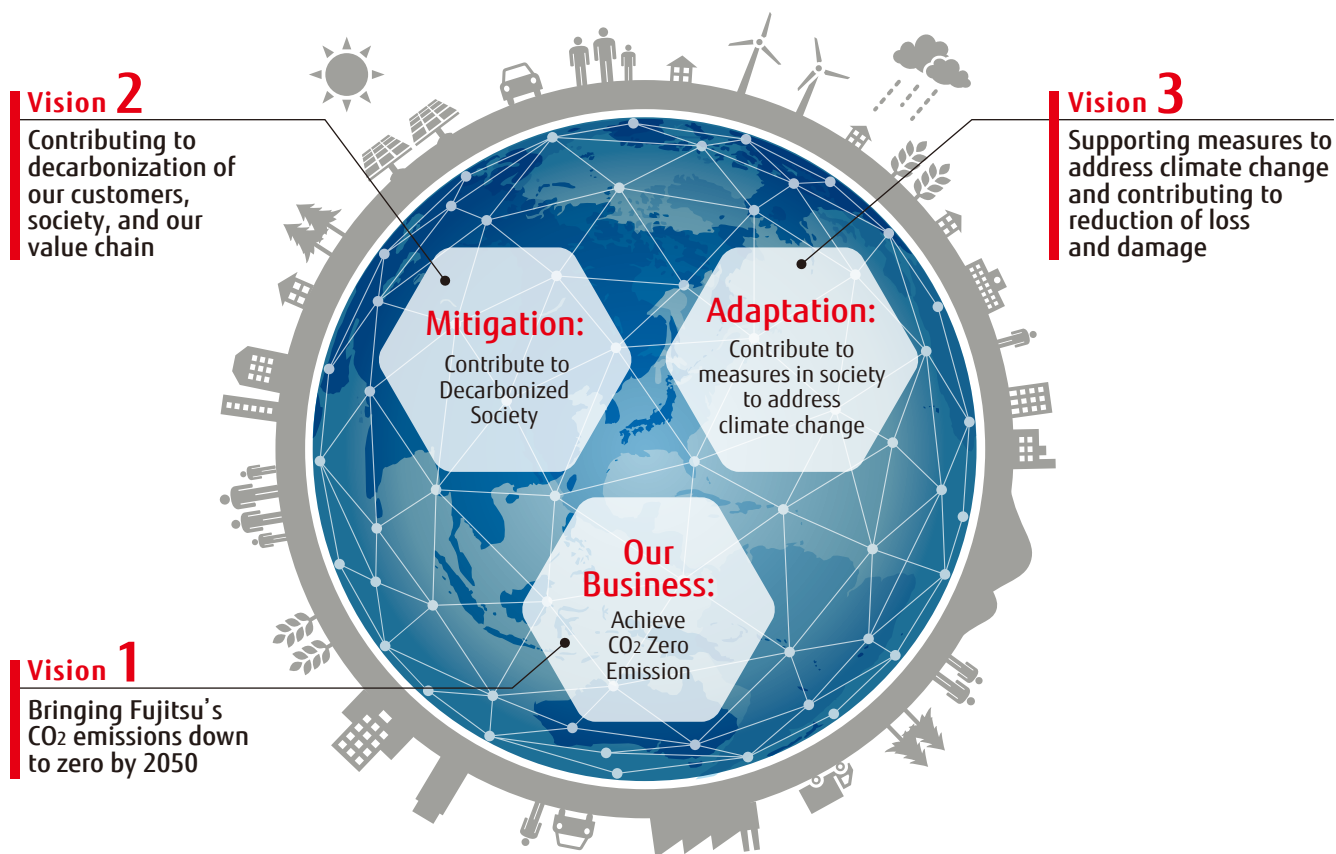vision and our approach to its implementation.

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The Fujitsu Group Medium/Long-term Environmental Vision
Basic Concept of the FUJITSU Climate and Energy Vision

Fujitsu's vision is to "contribute to creation of a decarbonized society and to address climate change" and to "achieve zero CO_2 emissions from Fujitsu by 2050."

Vision 2
Contributing to decarbonization of our customers, society, and our value chain

Vision 3
Supporting measures to address climate change and contributing to reduction of loss and damage

Mitigation:
Contribute to Decarbonized Society

Adaptation:
Contribute to measures in society to address climate change

Our Business:
Achieve CO_2 Zero Emission

Vision 1
Bringing Fujitsu's CO_2 emissions down to zero by 2050

The Paris Agreement, which came into effect in December 2015, established a goal of limiting the rise in global average temperatures to less than two degrees above the average temperature prior to the industrial revolution. In order to achieve this, the goal to "achieve a balance between emissions and removals of greenhouse gases (GHG) in the second half of this century" has been set, and a shift to a decarbonized society will be necessary beginning in 2050.

It is expected that regulations of CO_2 emissions will be strengthened, and that carbon prices will rise sharply. In addition, investment taking into account Environmental, Social and Governance (ESG) factors*, and a pullback in investment in fossil fuel industries, will continue.

In light of this background, the Fujitsu Group established "FUJITSU Climate and Energy Vision," a medium- to long-term environmental vision that clarifies the role it should play in climate change countermeasures, as well as how it sees itself in the future, as a global ICT company.

This vision has three pillars, namely, "Our Business: Achieve Zero CO_2 Emissions," "Mitigation: Contribute to a Decarbonized Society," and "Adaptation: Contribute to Measures in Society to Address Climate Change." The Fujitsu Group aims to use ICT effectively to accelerate its own efforts to shift away from carbon, and by providing the knowledge gained from such efforts to customers and society as solutions, leverage its own business activities as a way to mitigate and respond to climate change.

* **ESG investment:** to invest in companies that are highly rated in terms of environmental, social and governance criteria

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Vision 1 Achieving Zero CO₂ Emissions in the Fujitsu Group

Fujitsu has formulated a roadmap to reduce its CO₂ emissions to zero by 2050.

According to a report by the Intergovernmental Panel on Climate Change (IPCC), it is likely that keeping the temperature increase at 2°C or less until the end of this century will require worldwide GHG emissions to be reduced by 41% to 72% by 2050, and to close to zero by 2100. In light of this report, each country of the developed world has established a goal to reduce CO₂ emissions by at least 80% by 2050, and is moving forward with tightening restrictions, promoting technological development strategies, and establishing an investment environment, etc. Japan has also established a goal to reduce domestic CO₂ emissions by at least 80% by 2050 in the Plan for Measures against Global Warming adopted in May 2016 through a cabinet resolution.

In light of such circumstances, the Fujitsu Group established the challenging goal of reducing its CO₂ emissions to zero by 2050, with its intention to take the initiative as a global ICT company to strive to create a decarbonized society. This goal has been established with scenarios recommended by the Science Based Targets (SBT) initiative, and it is also consistent with the 2°C goal.[1] We will promote measures to reduce CO₂ emissions that combine "further encouragement of energy conservation," "strategic use and expansion of renewable energy," and "utilization of carbon credits" to achieve this.

In addition, the Fujitsu Group's roadmap to zero CO₂ emissions will consist of a shift away from carbon in three phases from now until 2050, with consideration given to the dissemination of technology and the perspective of economic

efficiency, etc. In Phase I (until 2020), from the perspective of usability and economic efficiency of the technology, in Japan, we will horizontally deploy energy conservation technologies that already exist, verify new energy conservation technologies that use AI, etc., and move forward with the use of low-carbon energy. Overseas, we will proactively implement renewable energy, focusing on the EU. We will also prepare for the following phases. In Phase II (until 2030), the Fujitsu Group will work to establish and spread a transition to AI and ZEB[2], etc., to accelerate the reduction of emissions. Further, we will expand strategic implementation of renewable energy, which

is expected to be easier to use in Japan as well, with consideration given to local characteristics and economic efficiency. In Phase III (2030 and after), we will accelerate implementation of increasingly easy-to-use renewable energy, while supplementing with offsets from carbon credits, with an eye toward deploying and deepening innovative energy conservation technologies and shifting away from carbon.

[1] The GHG reduction target, with the Group's carbon credits subtracted, was approved by the SBT initiative in June 2017.
[2] ZEB: Zero Energy Building. A building with significantly reduced yearly energy consumption achieved through conservation of energy in its structure and facilities, and through creation of energy through using solar power generation, etc.

The Roadmap to Reduce the Fujitsu Group's CO₂ Emissions to Zero by 2050

CO₂ emissions indicators
(2013 = 1)

2020 2030 2040 2050

0% 33% 100%

100%
50%
0%

Energy conservation
Energy conservation or renewable energy
Renewable energy credits

Phase 1 Phase 2 Phase 3

Horizontal deployment of existing energy conservation/Use of low-carbon energy
Innovative energy conservation
Strategic use of renewable energy Increased use of renewable energy/Utilization of credits

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Vision **1** Achieving Zero CO_2 Emissions in the Fujitsu Group

Fujitsu will promote zero emissions at "data centers," "factories," and "offices."

With its nature as both an ICT manufacturer and an ICT services company, the Fujitsu Group has implemented measures to reduce CO_2 emissions at "data centers," "factories," and "offices."

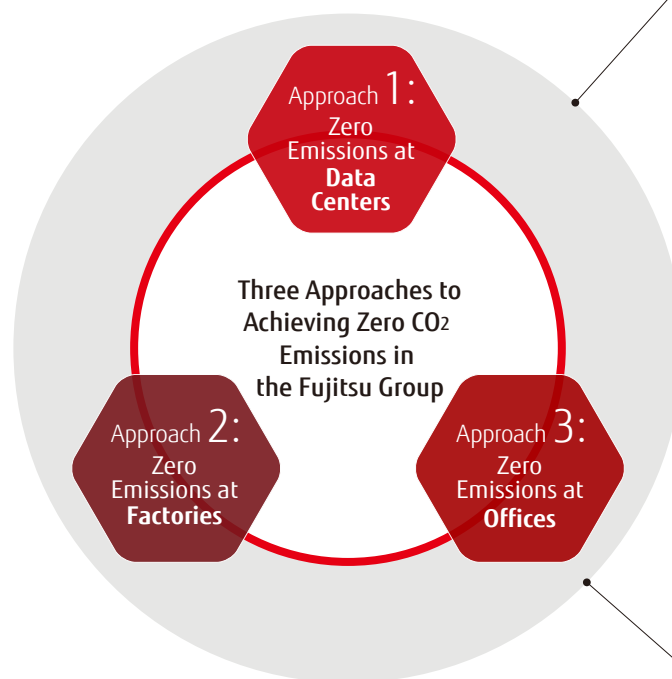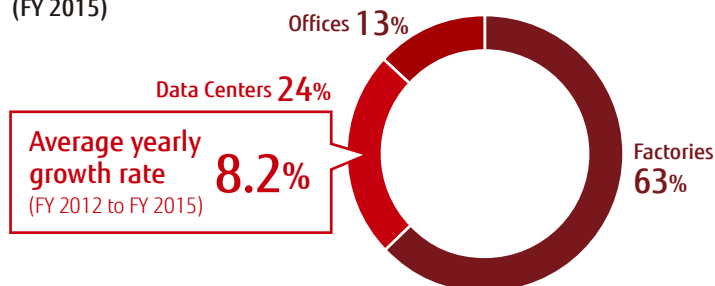Measures to reduce CO_2 emissions at "data centers" are of particular importance. With the rapid diffusion and expansion of cloud computing, energy consumption at data centers is on an increasing trend. Energy usage at Fujitsu Group data centers has increased 8.2% each year during the four years since FY 2012. With the demand for society to transition to IoT and for the advanced use of AI, etc., strengthening the cloud business infrastructure is a key factor in the Fujitsu Group's growth strategy, and we recognize that measures to conserve energy at data centers are a particularly important matter.

Energy Usage Rate by Sector
(FY 2015)

Offices **13%**
Data Centers **24%**
Factories **63%**

Average yearly growth rate **8.2%**
(FY 2012 to FY 2015)

Approach **1:**
Zero Emissions at **Data Centers**

Three Approaches to Achieving Zero CO_2 Emissions in the Fujitsu Group

Approach **2:**
Zero Emissions at **Factories**

Approach **3:**
Zero Emissions at **Offices**

1 Zero Emissions at **Data Centers**

At data centers, electric power is mainly consumed by ICT equipment and air conditioning. We significantly reduce power consumption by utilizing AI to control the load on those ICT devices, the rotational speed of fans, and data center air conditioning. In addition, we utilize our strengths as an ICT vendor to promote energy conservation in the hardware and software built into the ICT platform, including development of element technology for hardware such as AI chips and energy-conserving power supplies that use GaN-HEMT, and development of software for the mutual accommodation of ICT device resources according to the workload.

2 Zero Emissions at **Factories**

We utilize VR, AR, robotics, AI, and other digital technologies in the design, development, and manufacturing processes to improve productivity in a variety of processes, thereby conserving energy. In addition, we aim to increase energy conservation and the use of renewable energy further by expanding the use of energy that in the past has been optimized only within the factory to surrounding areas, and accommodating others with renewable energy and thermal energy.

3 Zero Emissions at **Offices**

In addition to relocating to buildings that are highly energy-efficient, it is important to conserve energy through "workstyle reform" in offices. For example, streamlining communication and sharing knowledge by utilizing ICT, and utilizing AI to support work, etc., make it possible to reduce overtime and achieve greater energy conservation in air conditioning, office automation, and lighting, etc. Further, controlling air conditioning to match the decreased use of offices due to the spread of teleworking also makes it possible to reduce energy use.

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Vision 2 and 3 "Contributing to a Decarbonized Society" and "Contributing to Measures in Society to Address Climate Change"

Fujitsu provides social innovation to support "mitigation" and "adaptation" of climate change.

To control the increase of global warming, it is important to reduce emissions of GHG, one of the causes of global warming, to "mitigate" it. At the same time, global warming has started to impact regions around the world in the form of natural disasters, so "adaptation" measures to radically minimize loss and damage are needed.

The Fujitsu Group believes that ICT has the potential to contribute to the "mitigation" and "adaptation" of climate change. To that end, we have established "Mitigation: Contribute to a Decarbonized Society," and "Adaptation: Contribute to Measures in Society to Address Climate Change" as pillars of Fujitsu's medium/long-term environmental vision, and are utilizing advanced ICT to create social innovation that contributes to resolving global environmental issues.

Potential to Reduce CO₂ through ICT —SMARTER2030—
(Unit: Gt CO₂e)
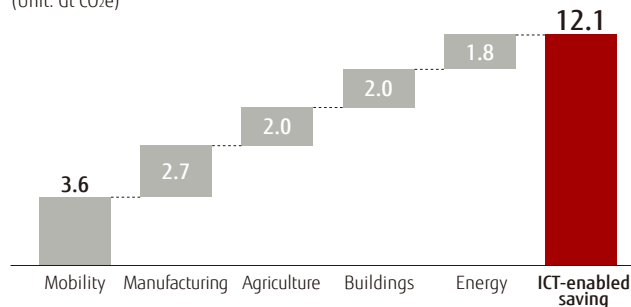
出典:"#SMARTer2030", Global e-Sustainability Initiative
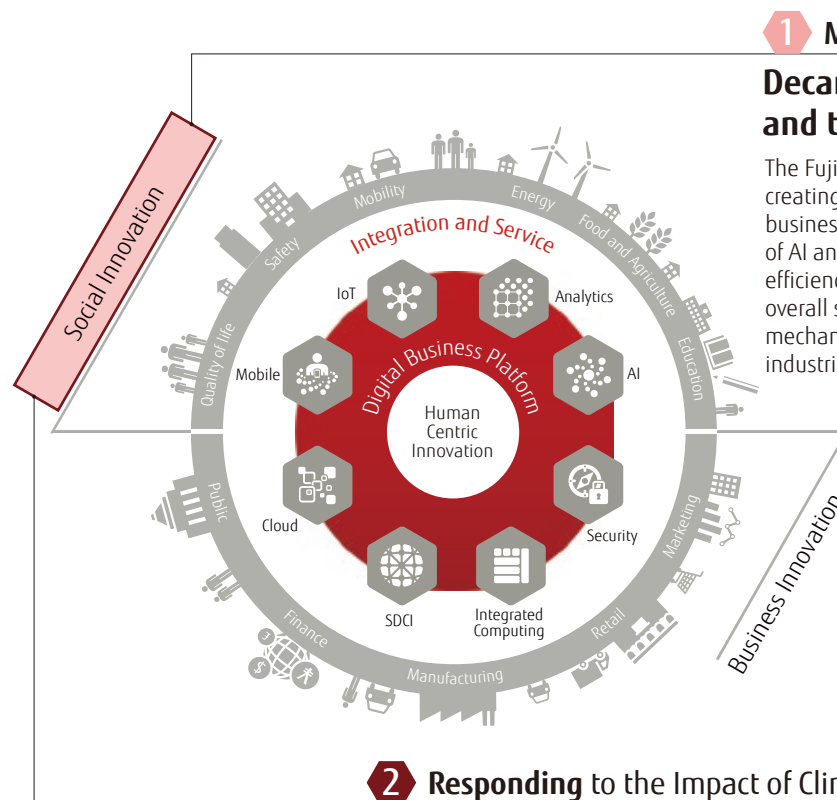
1 Mitigation of Climate Change

Decarbonization of Customers, Society, and the Value Chain

The Fujitsu Group contributes to the decarbonization of society by creating ecosystems with customers in a variety of industries and business types. The key point of mitigation measures is utilization of AI and other advanced digital technology to maximize energy efficiency. We will achieve the optimal usage of energy and an overall societal system by building that technology into a mechanism that crosses the boundaries between business, industries, and regions.

2 Responding to the Impact of Climate Change

Supporting Measures to Address the Impact of Climate Change

The key point of measures to address the impact of climate change is advanced measuring technology using AI, big data, and simulations through sensing technology and high-performance computing (HPC), etc. Fujitsu will utilize these to create solutions to enable creation of a resilient societal infrastructure, stable supply of agricultural products, and minimization of food product loss, thereby contribute to minimization of damage to our customers and society caused by climate change.

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Co-creation 1

An IoT-Driven Factory Optimization Solution

Visualizing equipment operating status and environmental data through IoT

Special Feature 2

Digital
Co-creation
for Sustainable Development

Co-creation 2

A Traffic-Monitoring System That Uses AI-Driven Image-Recognition Technologies

Cutting CO_2 emissions by enabling accurate detection of congestion and accidents

Special Feature 2

Co-creation 1

An IoT-Driven Factory Optimization Solution

Visualizing equipment operating status and environmental data through IoT

Manufacturers across the board want to enhance factory production efficiency. Of all the different approaches to streamlining production, the Internet of Things (IoT) holds enormous potential. Fujitsu recently teamed up with Intel Corporation to create a solution that leverages the IoT into visualizing status information on a factory-wide scale. By rolling the solution out across the world, Fujitsu is looking to make a positive contribution to the global environment.

Digital Co-creation for Sustainable Development

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Co-creation **1** **An IoT-Driven Factory Optimization Solution**   *Special Feature 2*

Visualizing equipment operating status and environmental data through IoT

In the effort to create a sustainable society, manufacturers of all kinds are faced with the challenges of improving factory production efficiency and minimizing their environmental impact. Since 2015, Fujitsu has been working with Intel Corporation (Intel), a leading American semiconductor manufacturer, to develop IoT-driven solutions for optimizing factory operations. As part of that effort, Fujitsu and Intel began a collaborative verification of the new system in April 2017 at Intel's Penang factory (Malaysia), the company's largest semiconductor factory outside the United States. The system uses IoT to visualize the factory's overall status, including energy usage and the operating status of semiconductor production lines.

The Penang factory used to collect information on energy consumption and other environmental data on a monthly basis, gather data on production line operations by the equipment unit, and apply the information in various capacities, including efforts to improve production efficiency and identify the causes of equipment problems. However, management could not get a timely grasp on that data, which delayed responses. Management also lacked information on energy consumption and related costs, making it hard to establish a comprehensive, integrated understanding of all the data. The factory had trouble turning that information into facility-wide efficiency improvements.

The new system uses Intel® IoT Gateway and other

offerings to collect a variety of environmental data from on-site electricity and water meters, gather operational status data from the production lines, and then manage the information in a centralized fashion. Incorporating Fujitsu's analysis and visualization tools, the system also displays cohesive visualizations of key indicators on user monitors. The system thus enables up-to-the-minute monitoring of production lines facing problems and provides users with daily detailed updates on multiple indicators, giving management the ability to implement countermeasures in real time.

Fujitsu has developed the system into a factory optimization solution, which it began offering on a global scale in May 2017.

Integrated visualization of environmental data and production line operating status
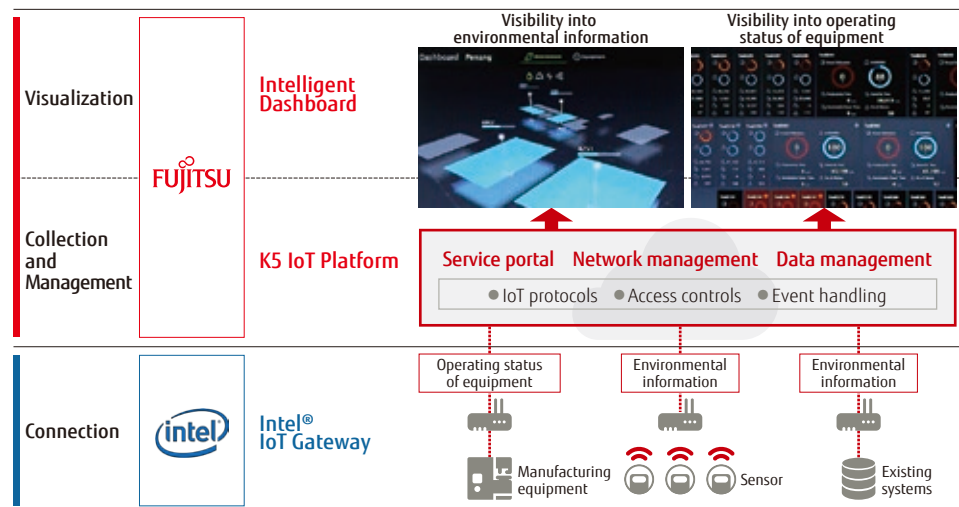
Production efficiency visualization system using IoT

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Special Feature 2

Co-creation 2

A Traffic-Monitoring System That Uses AI-Driven Image-Recognition Technologies

Cutting CO$_2$ emissions by enabling accurate detection of congestion and accidents

Traffic congestion is becoming an increasingly serious social problem in many countries, especially emerging nations. Not only do crowded streets hamper economic development, but congestion also endangers the environment. To help mitigate these traffic issues, Fujitsu developed a traffic-monitoring system that uses AI-driven image-recognition technologies to accurately detect road congestion and accidents in real time.

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Co-creation 2   A Traffic-Monitoring System That Uses AI-Driven Image-Recognition Technologies   Special Feature 2

Cutting CO$_2$ emissions by enabling accurate detection of congestion and accidents

In emerging nations, burgeoning populations and fast-moving urbanization are creating the social issue of traffic congestion. Congestion does more than simply impede economic growth; it also hurts the natural environment by contributing to air pollution, and climate change. To help mitigate these traffic issues, Fujitsu developed a traffic-monitoring system that uses image-recognition technologies—which draw on Zinrai, Fujitsu's unique AI technology—to accurately detect road congestion and accidents in real time.

The issue with conventional image-recognition technologies was that they were affected by the environmental, including headlights, sunlight, and shadows, which made it hard to analyze video from monitoring cameras. It was also difficult to efficiently and accurately recognize such varied and complex incidents as traffic accidents and violations.

Fujitsu's technology boosts recognition accuracy through AI technology, which learns a large, pre-assembled library of images. Leveraging that asset, Fujitsu's new technology can identify vehicle positions—even at night or under foggy conditions. The technology also observes changes in vehicle movement and speed. The technology quantifies the corresponding anomaly to make the process of detecting accidents and violations more efficient. In 2015, Fujitsu conducted collaborative field trials with the Tsingha University

Suzhou Automobile Research Institute to test the technology in China. The joint effort achieved high levels of recognition accuracy at 90% to 95%.

With the new technology, users can gather congestion-related information that not only provides insight into the strategies for placing and controlling traffic lights but also helps identify ways of curbing the accidents and violations, leading to improvements in many areas, including safer urban transportation and fewer CO$_2$ emissions. Organizations in Japan, China, and Europe are planning to implement the system and start using the service, which Fujitsu will launch services for in FY 2017.

Detecting a wide variety of conditions in real time

The system can detect congestion, accidents, and many other abnormalities at high accuracy levels.

Enabling efficient, centralized management of conditions and incidents on a large geographical scale

By giving users the ability to assess the scope and effects of various incidents, the system helps facilitate environmental measures, improve traffic safety, and alleviate road congestion.

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Fujitsu Group Environmental Action Plan (Stage VIII) (FY 2016–2018)

The Fujitsu Group views contribution to global sustainability as a corporate responsibility. Under this belief, since 1993 we have formulated environmental action plans on a three-year basis and have expanded activities aimed at reducing environmental impacts. The United Nations approved a set of SDGs in 2015. That December, the nations at COP21 adopted the Paris Agreement—a new framework for addressing climate change. With shared, global goals taking clearer shape, companies are also responsible for playing an active role in tackling issues through their business strategies and various initiatives.

Against this background, the Fujitsu Group formulated Environmental Action Plan (Stage VIII), covering environmental targets for FY 2016 to FY 2018. This action plan is constructed from two standpoints: contribution to society and reducing the environmental impacts of our business. Under contribution to society, we take actions including expanding the development and provision of solutions that will help realize the SDGs. Under reducing the environmental impacts of our business, we will reduce environmental impacts along the entire value chain in order to achieve long-term zero emissions.

Through our Environmental Action Plan (Stage VIII), we will work to meet the objectives of the FUJITSU Climate and Energy Vision, our medium- to long-term environmental vision through 2050. Looking ahead, we will continue contributing to the resolution of social and environmental issues through the utilization of ever-evolving ICT, as we work to achieve a sustainable and affluent society.

Contribution to resolving social and environmental issues through ICT

Reduction of environmental impacts along the entire value chain
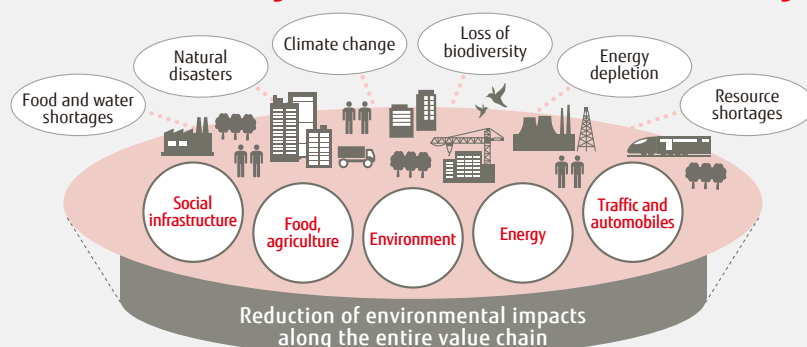
Target items

Our Society	Contribute to sustainable development and preservation of biodiversity through provision of ICT services	(1) Contribute to sustainable development of society through provision of ICT services.
		(2) Develop innovative technologies that address environmental issues.
	Improve environmental performance of products throughout their lifecycle	(3) Achieve top-level energy efficiency for 50% or more of the new products.
		(4) Promote eco design for resource saving and circulation and increase resource efficiency of newly developed products by 15% or more.
		(5) Maintain over 90% resource reuse rate of business ICT equipment.
Our Business	Reduce greenhouse gas emissions throughout the value chain	(6) Reduce greenhouse gas emissions in our business facilities.
		(6)-1 Reduce greenhouse gas emissions by 5% or more compared to FY 2013.
		(6)-2 Improve PUE of our major data centers by 8% or more compared to FY 2013.
		(6)-3 Improve energy intensity by an average of 1% or more each year.
		(6)-4 Increase usage of renewable energy to at least 6%.*
		(7) Drive activities to reduce CO_2 emissions in the supply chain.
		(8) Reduce CO_2 emissions per sales from transport by an average of 2% or more each year.
	Reduce environmental impact	(9) Reduce water consumption by 1% in total (128,000 m³).
		(10) Reduce chemical pollutant (PRTR) release to less than the average level of FY 2012-2014 (20.7t).
		(11) Reduce the amount of waste to less than the average level of FY 2012–2014 (25,568t).

* The original goal, "Increase usage of renewable energy," was changed to a numerical target.
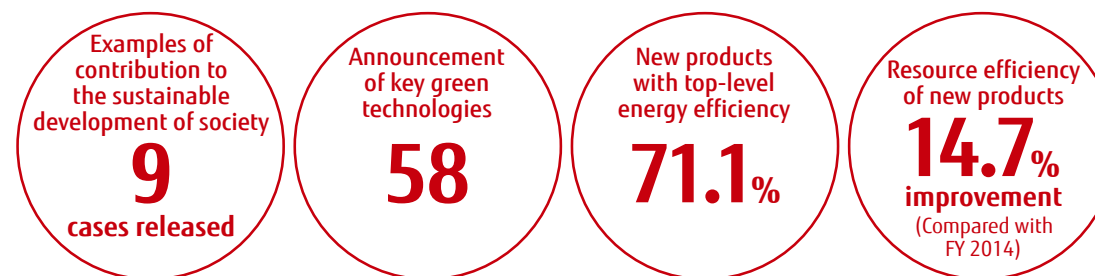
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Contribute to Sustainable Development of Society through Provision of ICT Services   Developing Innovative Technologies for Solving Environmental Issues   Development of Top-Level Energy Efficient Products   Improving the Resource Efficiency and Resource Circulation of Products   Product Recycling

Chapter I | Contribution to Society

Continuing from Environmental Action Plan (Stage VII), Environmental Action Plan (Stage VIII) turns on two points, namely, "contributing to society" and reducing the environmental burden of "our business activities."

In our efforts to contribute to society, we aim to contribute to the sustainable development of our customers and society by providing ICT services, improving the energy efficiency of our products, making more efficient use of resources, promoting recycling, and otherwise increasing environmental value in light of the United Nations' adoption of the SDGs in 2015.

Key Achievements in FY 2016

Examples of contribution to the sustainable development of society
9
cases released

Announcement of key green technologies
58

New products with top-level energy efficiency
71.1%

Resource efficiency of new products
14.7%
improvement
(Compared with FY 2014)

About Symbols Used   ✓ Examined by third-party organization   ○ FY 2016 target achieved

	Theme	Target items (targets through the end of FY 2018)	FY 2016 Target	FY 2016 Key Performance	Status	
Our Society	Contribute to sustainable development and preservation of biodiversity through provision of ICT services	Contribute to sustainable development of society through provision of ICT services.	Cases released	9	○	P. 21
		Develop innovative technologies that address environmental issues.	Announce 35[*2] key green technologies[*1]	Announced 58 key green technologies	○	P. 24
	Improve environmental performance of products throughout their lifecycle	Achieve top-level energy efficiency[*3] for 50% or more of the new products.	New products with top-level energy efficiency in 40% or more of our new products	71.1% ✓	○	P. 26
		Promote eco design for resource saving and circulation and increase resource efficiency[*4] of newly developed products by 15% or more. (Compared to FY2014)	5% or more improvement of the resource efficiency of new products	14.7% improvement ✓	○	P. 28
		Maintain over 90% resources reuse rate of business ICT equipment.	90% or more	92.0% ✓	○	P. 30

*1 **Key green technologies:** Technologies for reducing power/energy, improving man-hour efficiency, conserving resources, and resolving social issues.
*2 **Outside presentations:** Press announcements, academic society presentations, exhibitions, etc.
*3 **Top-level energy efficiency:** Establish a standard recognized as the top-level energy efficiency for each product category, as compared to the market and conventional products. See "Reference Information" on page 26 for details.
*4 **Resource efficiency:** Calculated by dividing "product value" by "environmental burden of use and disposal" of the individual elements (resources) of which the product consists. See "Reference Information" on page 28 for details.

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Contribute to Sustainable Development of Society through Provision of ICT Services

Our Approach

The effort to "Contribute to sustainable development of society through provision of ICT services" is one of the goals in the Fujitsu Group's Environmental Action Plan (Stage VIII). With the United Nations having adopted a set of Sustainable Development Goals (SDGs) in 2015, thereby laying out clear international targets, the Fujitsu Group is now aiming to contribute even more to the sustainability of customers and society.

Bringing that vision of a sustainable society to fruition will require initiatives to tackle a wide variety of social and environmental issues, ranging from combating global warming through reductions in GHG emissions to saving natural resources, preserving biodiversity, stabilizing food supplies, responding to urbanization, and protecting against disasters. Information and communication technology (ICT), which helps optimize, streamline, and automate processes in a diverse mix of fields, has the power to drive solutions to the problems that society and the natural environment are facing. By leveraging its ICT services and working with customers, the Fujitsu Group is determined to play an important role in achieving SDGs on a global scale.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Contribute to sustainable development of society through provision of ICT services.
FY 2016 Targets	Release case studies.
FY 2016 Key Performance	Released **9** case studies.

FY 2016 Performance and Results

Publishing Case Studies of ICT-Driven Approaches to SDGs

Fujitsu published nine case studies of efforts to contribute to SDGs, including educational solutions featuring content that underscores the importance of conserving natural resources, basic intelligence infrastructures for protecting biodiversity, disaster-prevention solutions for reducing damage from sewer flooding resulting from torrential rain, and next-generation bus location services.

Publicizing Efforts via outside Channels and Holding Seminars and Workshops for Employees

In working to create ICT services that help achieve SDGs, Fujitsu presented case studies of various ICT services at the UN-sponsored UNFCCC NAP Expo and other international conferences. The Company also used its intranet to distribute information and held internal seminars and workshops for employees. (See Page 48.)

Distributing information via the intrasite (ex.)

Case Studies of Contributions to SDGs

Next-Generation Bus Location Services

Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

FUJITSU Mobility Solution SPATIOWL uses real-time location information to tailor information and services to users' current locations. With that functionality, SPATIOWL helps optimize urban transportation, prevent and mitigate traffic congestion, and provide users with the ideal modes of transportation—all of which bring society closer to achieving SDGs.

The technology is already benefiting the DESUCA Company, which has issued over 100,000 DESUCA IC commuter cards for public transport in Kochi Prefecture. In the process of updating its DESUCA IC system, the company worked with Tosa Electric Railway (a core group company) to launch "buskocchi"—a service that lets users track bus locations. Fujitsu established a data link with the DESUCA IC system, which features an intuitive map display and search function. Fujitsu's contributions laid the foundation for high-accuracy, real-time visualizations of bus and user movement, thereby facilitating the optimization of bus schedules.

"With this system, we get a clear idea of differences in delays by route—and the locations where delays begin," a customer representative said. "When it comes to delay prevention and scheduling, we need the right environment to make the necessary changes. We hope Fujitsu continues to work with us in establishing that environment and developing the public transportation system in Kochi."

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Contribute to Sustainable Development of Society through Provision of ICT Services

Case Studies of Contributions to SDGs

Detecting Signs of Sewer Overflow to Limit Damage from Torrential Rain

Target 11.b (excerpt): Substantially increase the number of cities adopting and implementing integrated policies and plans towards resilience to disasters

Target 13.1 (excerpt): Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters

The Fujitsu Group's disaster-prevention solutions help prevent disasters before they occur and make it easier to collect, analyze, and publicize information during a crisis—benefits that make communities more resilient to disasters and enhance their adaptive capacities to climate-related hazards.

In a field trial of a sensing system for detecting signs of sewer overflow, the partners succeeded in real-time detection of early signs of inland flooding during localized downpours and gathered data for effective analyses. The trial also included validation of energy harvesting technology, which converts small amounts of energy from the natural environment into electricity. The partners confirmed that it could generate enough electricity for stable system operation and eliminate the need for battery replacement for five years or more.

"Monitoring the water levels in the sewer system helps us speed up the process of sending staff to sites, implementing emergency measures, and delivering evaluation information to residents," the customer said. "By quantifying changes in water levels, as well, the technology makes it possible to validate drainage plans, and thereby mitigate flood damage."

Laying the Groundwork for Science Museum Net (S-Net)

Goal 4 (overview): Provide quality education

Goal 17 (overview): Revitalize global partnership

Goals 14 and 15 (excerpt): Conserve and sustainably use water/land ecosystems

Musetheque is Fujitsu's educational solution to help museums, galleries, public records offices, and libraries manage their collections and materials. It contributes to education and research for biodiversity conservation.

The National Museum of Nature and Science aims to preserve collections of over 4.5 million specimens as the common heritage of mankind, and nurture scientific literacy through exhibits and learning support. Using Musetheque, the Museum built "Science Museum Net" to collect and share specimen data on collections at natural history museums throughout Japan. As Japan's Global Biodiversity Information Facility site, the Museum also uses Science Museum Net to publicize natural history specimen information.

"With our system, we've been able to gather data from over 80 institutions nationwide and amass a collection of information that exceeds what a single museum could offer," a Museum representative told us. "Science Museum Net is a popular resource for many researchers around the world, too. We want to keep offering users a valuable source of primary information on biodiversity."

Offering On-Site Environmental Classes

Goal 4 (excerpt): Ensure higher-quality, equitable learning and research throughout the primary and secondary education processes

Goals 6, 11, and 15 (excerpt): Protect and preserve endangered species in the natural world and preserve biodiversity

Fujitsu's "Manavication," an educational solution for collaborative learning in K-12 school environments, enables educators to help students engage in fundamental learning, acquire knowledge, hone their critical thinking, reasoning, and expressive abilities.

In a practical application of the technology, Fujitsu teamed up with WWF Japan to develop environmental study materials to help reconfirm the relationship between resources and lifestyles, think about what humans need to do to achieve a one planet lifestyle, and provide a catalyst for action. By posting and sharing students' opinions via an electronic whiteboard and other resources, Manavication encourages learners to think about the views of their peers and fosters a collaborative-learning environment. Fujitsu has been conducting visiting lectures on environmental education at domestic elementary and junior high schools. Approximately 130 groups and 7,200 students participated.

"Electronic study materials now provide a new means to make environmental education more attractive," a WWF Japan representative said. "The SDGs underscore the importance of education. WWF Japan will continue to pursue possibilities for new education."

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Contribute to Sustainable Development of Society through Provision of ICT Services

Main Activities in FY 2016

GHG Emission Reduction through the Provision of ICT

Through the provision of ICT, the Fujitsu Group is working to create innovations in wide-ranging areas of society, including improvement of efficiency in energy usage, greater efficiency in production activities, and reduction in the movements of people and goods. By doing so, we aim to contribute to the reduction of GHG emissions. We believe that the use of ICT by large numbers of customers will reduce GHGs in society overall, while leading to ongoing business growth for the Fujitsu Group as well.

The Fujitsu Group is working to quantitatively visualize— and also expand—the contribution to GHG reductions from the ICT used by our customers. The Fujitsu Group recognized 38 new cases of environmentally conscious solutions in FY 2016, bringing the cumulative total to 489 and helping reduce total CO_2 emissions by 7.37 million tons. Estimates indicate that middleware products that support ICT platform operations and management are effective in minimizing environmental impact by limiting the amounts of electricity that ICT devices consume. With FUJITSU Software Systemwalker Operation Manager, for example, users can schedule their servers to turn on and off according to usage status—and that functionality reduces server electricity consumption.
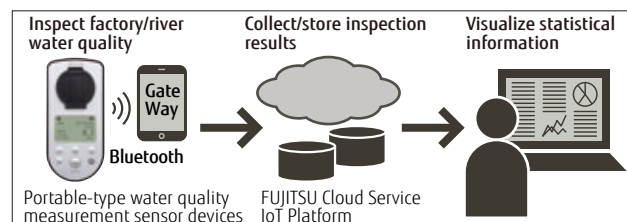
In FY 2016, we also expanded our "environmentally conscious solutions" into our cloud services. Using PaaS (Platform as a Service) technology allows users to accelerate application development and operations, thereby creating a lighter environmental impact.

Utilizing the IoT Platform to Lighten the Environmental Load of the Development Phase

OPTEX Co., Ltd. began offering "WATER it," a quick water-quality analysis service for users, to users in Asia in April 2016. WATER it forwards data from OPTEX's portable water quality measurement sensors to the cloud via smartphones, enabling users to analyze and visualize data on their devices. Using Fujitsu's IoT Platform, OPTEX successfully developed the service in a quick, cost-efficient manner. For the demonstration tests, which began in the fall of 2015, the team in charge of developing the equipment completed the water quality control application in just three months. According to Fujitsu estimates, the technology reduces the environmental burden of the development phase by approximately 50%.

WATER it will also help address environmental issues by improving water quality in Asia, where industrialization continues to charge forward. WATER it gives users the ability to make frequent measurements of water quality, which they can use to gather accurate analysis results and draw on their findings to develop plans for water-quality improvements. "By driving this kind of virtuous cycle, we put ourselves in position to sustain our business-development efforts and make contributions to society," an OPTEX representative explained. "That's the kind of business model we need."

WATER it, OPTEX's quick water-quality analysis system

Inspect factory/river water quality
Collect/store inspection results
Visualize statistical information

Gate Way
Bluetooth
Portable-type water quality measurement sensor devices
FUJITSU Cloud Service IoT Platform

Reference Information: Calculation Method for Amount of GHG Reduction Effect

Fujitsu uses assessment methods from Fujitsu Laboratories to evaluate environmental burden-reduction of its ICT offerings (in CO_2 emissions) and measures annual GHG reductions from solution user count, client count, or annual sales.

Overview of Environmental Impact Assessment Methodology
Conversion of 7 factors to CO_2 emissions

Factor	Description
Resource consumption	Consumption of paper, CDs, documents
Movement of people	Movements by airplanes, trains, buses and automobiles
Transport of goods	Transport by trucks and rail freight
Office space	Associated work-hours, documents/equipment space
Warehouse space	Storage in regular/refrigerated warehouses
Power Consumption of ICT/Network equipment	Power consumed by ICT equipment (servers, PCs, etc.)
Data communication traffic volume	Data communication traffic volume by Internet/FAX

Environmental-load basic unit database

Before/After comparison
CO_2 reduction effect
Sum of CO_2 emissions
Before   After

ICT solutions with expected reduction effect of 15% or more are certified as **environmentally conscious solutions**
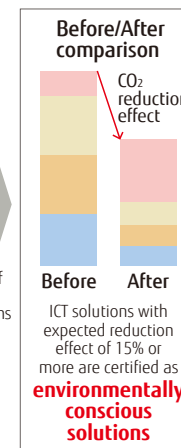
Comment from Third-Party Verification Body

Continuing from last year, we reviewed the data on the amount of contribution to GHG emission reduction through provision of ICT. For FY 2016, we changed the methods for determining reduction units and took other steps to improve the accuracy and reliability of calculation results.

Masatoshi Sakaguchi
System Certification Division, Bureau Veritas Japan

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Developing Innovative Technologies for Solving Environmental Issues

■ Our Approach

Fujitsu Laboratories, the core research and development (R&D) organization in the Fujitsu Group, works on a diverse mix of emerging ICT-related technologies—ranging from advanced materials, next-generation devices, networks, and cloud systems to the creation of next-generation solutions and services—with the environment always in mind.

Drawing on these efforts to develop innovative technologies and embracing its mission to create technologies that can help solve social and environmental problems, Fujitsu Laboratories promotes environmental activities ranging from CO_2 emission reductions through energy-conserving practices and work task-efficiency improvements to resource-saving initiatives, countermeasures for natural disasters, the preservation of biodiversity, and efforts to combat global warming.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VII) (toward FY 2018)	Develop innovative technologies that address environmental issues.
FY 2016 Targets	Announce **35** key green technologies* (event)
FY 2016 Key Performance	Announced **58** key green technologies (Press announcements: 25; Academic society presentations + exhibitions: 33)

* **Key green technologies:** Technologies for reducing power/energy consumption, improving work-hour efficiency, conserving resources, and tackling social issues

Showcasing Developed Technologies to the World

Fujitsu's Environmental Action Plan (Stage VIII) includes the objective of enhancing the company's ability to showcase the green-oriented technologies in its development portfolio to the public. In FY 2016, we expanded on our normal mass-media initiatives by giving presentations at a new selection of events (academic society meetings and exhibitions).

In terms of the SDGs, the technologies that Fujitsu announced in FY 2016 contribute primarily to two goals: "Make cities and human settlements inclusive, safe, resilient and sustainable" (Goal 11) and "Take urgent action to combat climate change and its impact" (Goal 13).

FY 2016 Development Performance (items appearing in the media)

(1) Technology for quickly tracking changes in open-source software

(2) High-accuracy fuel-efficiency estimates using ship operation data

(3) Mathematical AI technology for quickly solving urban security positioning problems

(4) High-speed forensic technology for grasping the entirety of a cyber-attack at a glance

(5) Technology for capturing human movements at high-speed, high-precision levels via 3D sensing and determining the corresponding techniques in real time

(6) Technology for building optimal networks for media-based services

(7) Semiconductor packaging substrate that enables thin film capacitor embedding

(8) Field engineering technology for providing IoT services rapidly

(9) Technology for automatically generating image recognition algorithms on an AI-enabled platform

(10) Energy-saving technology for cooling data centers

(11) Technology for automatically assessing personal data privacy risks

(12) System for detecting sewer flooding, aimed at reducing damage from torrential rain and flash floods

(13) Technology that allows 5G mobile wireless base stations and access points to achieve high-speed transmissions (over 10 Gbps) at low power-consumption levels on par with Wi-Fi

(14) LED-watermarking technology for automating and optimizing manual-labor tasks

(15) Technology for automatically extracting business specifications in programs

(16) Millimeter-wave CMOS circuitry for automotive radar, enabling the world's fastest frequency modulation

(17) Technology for using conversational speech to automatically identify customer satisfaction/dissatisfaction

(18) Analysis technology for improving the communications performance of virtual networks

(19) In-memory deduplication technology for accelerating the response times of large-scale storage

(20) Flexible, battery-less beacon that uses analog power circuit control to create a compact, slim configuration

(21) Technology for measuring magnetic properties under stress with a piezoelectric device

(22) Mobile-app control technology for revolutionizing home healthcare

(23) Technology for the centralized management of data distributed in the cloud and on edge servers

(24) Technology for enabling the secure use of cloud services via IoT devices using smartphone-based biometric authentication

(25) One of the world's smallest DC-DC power modules

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Developing Innovative Technologies for Solving Environmental Issues

Main Development Initiatives in FY 2016

High-Speed Forensic Technology for Grasping the Entirety of a Cyber-Attack at a Glance

Assessing the damaging effects of malware, which infect organizations to trigger problems, used to involve bringing experts in for time-consuming analyses of network and device logs.

By compressing, storing, and automatically analyzing massive volumes of network communications data, Fujitsu Laboratories has now developed technology that lets users analyze the status of a targeted cyber-attack in a short period of time and shows the whole picture at a glance. The technology collects communications data flowing through the network and then, using the data to infer the commands executed on the PC, connects command operations with specific user information to identify who executed what type of remote control and collect trace information about command operations. Upon detecting a targeted cyber-attack in its home system, the technology extracts affected PCs one after the other and automatically draws the attack status from a comprehensive perspective.

As a result, users can conduct analyses quickly without needing to be an expert, and can implement prompt, far-reaching countermeasures before the damage of an attack can spread.

Screenshot of the analysis system for the status of targeted attacks

The Industry's First Technology for Automatically Assessing Personal Data Privacy Risks

Japan's Amended Act on the Protection of Personal Information, which goes into effect in 2017, will make it possible to provide third parties with de-identified personal data—even without the individual's consent. Before providing de-identified data, providers must first ensure it complies with guidelines and evaluate the risk of specific individuals being recognized.

Based on data distribution, Fujitsu Laboratories developed the industry's first technology to automatically search for combinations of attributes that make it easiest to identify individuals—as well as quantifying that ease of identification—in a realistic timeframe. This makes it possible to quickly see which attributes to prioritize for de-identification. Fujitsu Laboratories also developed a technology for calculating potential damage from data leaks and determining compliance with various de-identification guidelines. Users can evaluate risks and implement appropriate de-identification processes quickly and easily.

Technology for quantifying the ease of personal data identification

Age	Occupation	Permanent address
50	Artist	Downtown
50	Public servant	Downtown
60	Artist	Downtown
60	Public servant	Downtown
60	Public servant	Suburbs

5 records can be identified

Age	Occupation	Permanent address	
50	Artist	Downtown	Possible to identify based on age and occupation Difficulty level: 1.8
50	Public servant	Downtown	
60	Artist	Downtown	
60	Public servant	Downtown	Difficulty level: 0.5
60	Public servant	Suburbs	Difficulty level: 0.6

5 records can be identified

Before the new technology: Difficult to establish countermeasures

With the developed technology: Easy to see items to de-identify

Energy-Saving Technology for Cooling Data Centers

Currently, reports indicate that data center energy consumption constitutes 1–2% of all electricity use, so better energy conservation is needed, particularly in air-conditioning.

To respond to the dynamic status changes unique to data centers, such as moving information equipment in and out and modifying rack arrangements, Fujitsu Laboratories has developed a highly accurate prediction technology. The innovation sequentially predicts air-conditioning effects, making it possible to reduce the amount of energy that air conditioning consumes. The technology creates a database that incorporates the status of air-conditioning equipment and operates under conditions requiring the system to gather information from two sources: not only choosing measurement data for addressing prediction targets but also automatically selecting at least one variable from the air-conditioning equipment status. By creating a predictive model using the selected variables, the technology successfully improves predictive accuracy.

High-precision temperature-prediction technology

Air supply (out) · A/C unit 1 · Racks · A/C unit 2 · Outside air · Air supply (in)

A/C sensor · Temperature sensors · Humidity sensors · ICT device power sensors

Combines sensor information + equipment information → Creates a regression model → Delivers high-accuracy predictions

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Contribute to Sustainable Development of Society through Provision of ICT Services　　Developing Innovative Technologies for Solving Environmental Issues　　Development of Top-Level Energy Efficient Products　　Improving the Resource Efficiency and Resource Circulation of Products　　Product Recycling

Development of Top-Level Energy Efficient Products

▌ Our Approach

As ICT spreads, an increase in energy demand is expected in proportion to the higher performance and higher-density integration of servers and other ICT products. Accompanying this, energy-related regulations for ICT products are increasing in various countries and regions, such that energy efficiency is taking on importance within society in the form of energy label conformance and green procurement requirements.

The Fujitsu Group believes that we also must aim to improve the energy performance of products during their use, in order to reduce GHG emissions. In that context, we will actively implement energy-saving technologies and continue working to improve the energy efficiency of products. Through these and other product-development efforts, we will strive to reduce the power consumption of our offerings in customer usage settings.

Summary of FY 2016 Achievements

| Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018) | Achieve top-level energy efficiency for **50**% or more of the new products. |

▼

| FY 2016 Targets | Make **40**% or more of new products top-level energy efficient. |

▼

| FY 2016 Key Performance | Made **71.1**% of new products top-level energy efficient. |

FY 2016 Performance and Results

Actively Applied Energy-Saving Technology

We have set targets for the achievement of top-level energy efficiency based on the number of product series that are expected to be developed during FY 2016–18.

Applications of energy-saving technologies include new, high-efficiency microprocessors and power supplies, energy-saving displays, optimized energy-saving controls, and the strengthening of power management features. In addition to these, we are actively undertaking the aggregation of LSIs and the reduction of components.

Achieved Top-Level Energy Efficiency for 71.1% of New Products

As a result of applying and expanding energy-saving technologies across our divisions in products including servers, PCs, network devices, and imaging devices, we were able to exceed by over 31.1% our 40% target (vs. FY 2016) for new product top-level energy efficiency.
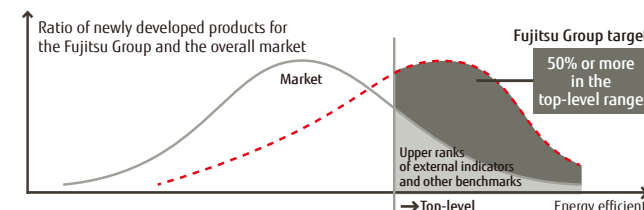
Working toward Our Targets

To help "achieve top-level energy efficiency for 50% or more of the new products," one of the objectives in our Environmental Action Plan, we will continue to make even stronger development efforts to give our products—from leading items in each division to the rest of the lineup—top-level energy efficiency.

In addition, we will deploy outstanding energy-saving technology and expand its application to products. Looking toward the future, we aim to push the development of advanced technology, which will contribute to revolutionary improvements in energy efficiency.

Reference Information — Top-Level Energy Efficient Products

Products, beginning with top-runner products (first in the world or industry, top of the world or industry), that meet criteria equivalent to the upper ranks of external indicators and other benchmarks of energy efficiency

Ratio of newly developed products for the Fujitsu Group and the overall market

Market

Fujitsu Group target
50% or more in the top-level range

Upper ranks of external indicators and other benchmarks

→Top-level　　Energy efficient

Reference Information — Top-Level Energy Efficient Product Target Standards

Fujitsu sets targets that recognize top-level energy efficiency standards in each product area compared with the market overall or with conventional products.

Example of Target Standards[1]

Reference Level	Product Categories
ENERGY STAR criteria compliant	PCs, displays, imaging equipment, etc.
Top-level Top Runner achievement rate under the Energy Conservation Law	Servers, storage systems, etc.
Industry-leading energy efficiency	LSI, products for specified fields, etc.
Industry's highest-level battery life	Smartphones
Power consumption reductions over prior products/prior performance	Network products[2], electronic components, etc.

[1] Depending on product specifications, standard values differ even for products within the same category.
[2] A larger number of stars designate the top-level, concerning the products which are assessed by Ecology Guideline For the ICT Industry.

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Development of Top-Level Energy Efficient Products

Main Development Initiatives in FY 2016

The Industry's First High-Efficiency Cooling Technology (VLLC) Unix Server

SPARC M12 Series

Fujitsu developed the industry's first Vapor and Liquid Loop Cooling (VLLC) technology using vaporization heat. Fujitsu has implemented the technology on the SPARC64 XII processors in the SPARC M12 Series, which debuted in April 2017. This enables the products to achieve cooling efficiency levels roughly double those of conventional cooling methods. Most existing servers use air-cooling systems, cooling the processor's surface heat sink with a fan. However, heat sinks—which release heat—continue to get bigger as higher-performance processors generate more heat. Fujitsu's new VLLC technology for vacuum-evaporative cooling delivers outstanding cooling performance by using water—which boasts excellent heat-transport capabilities—as its cooling medium and incorporating evaporation, a phenomenon that efficiently removes heat by decompressing the interior. This helps reduce fan power consumption.

The M12-2, part of the M12 Series, features a 80 PLUS® Platinum certified power-supply unit capable of converting power at an incredible 94% efficiency rate.

A Wireless Module with Higher Receiver Sensitivity and Less Power Consumption

FWM7BLZ20 Series

Fujitsu's FWM7BLZ20 Series of compact wireless modules compatible with Bluetooth version 4.2* features a wireless communication LSI with a built-in processor boasting excellent processing capabilities and low power consumption. By optimizing energy-management functions but maintaining the same size as existing products, the modules almost double the transmission distance of existing products at a receiving sensitivity of -94 dBm (measurement value), at half the power (around 5.4 mA; measurement value). Further, sensor data analysis traditionally done by servers is now possible within the module, so the module reduces network load, making systems less energy-intensive. A lighter internal layout reduces resource usage by 18%.

It is the ideal solution for customers considering remote maintenance, reduction of the power-consumption levels of Bluetooth devices, and boosting the speed of IoT devices.

* **Bluetooth version 4.2:** Bluetooth is the global wireless standard for exchanging data over short distances; version 4.2 introduces more features for IoT-related devices.

A Palm Vein Authentication Device that Cuts Power Consumption during Authentication by 80%

(L)
PalmSecure-F Pro Mouse
(C)
PalmSecure-F Pro Standard
(R)
PalmSecure-F Pro
(for embedding)

The PalmSecure-F Pro lineup uses a CMOS sensor with a higher frame rate* than the previous device, features a new current driving circuit, and shortens output of LED current (quickens shutter speed). By also capturing fewer frames during the imaging process, it cuts power consumption by 80% per authentication.

The device is also more compact. The product's smaller optical size, which enables smaller lenses, and the denser LED package configuration make it just one-third the total volume of the previous device. The device also expands the operating temperature range from the conventional 0–60℃ to a much wider -40–85℃. As a viable solution for embedded devices and applications in automobiles, which normally present considerable challenges, it broadens the scope of palm vein authentication systems. Finally, the device improves the authentication rate from a 1,000-person scale to a 10,000-person scale, enabling implementation in larger infrastructures.

* **Frame rate:** A value indicating the number of still images (frames) in one second of content; higher frame rates make the subjects in a video appear to move more smoothly.

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Improving the Resource Efficiency and Resource Circulation of Products

▌ Our Approach

There is a growing view worldwide of the importance of resource efficiency. An example can be seen in the EU's designation of resource efficiency as a growth strategy and its establishment of the Resource Efficiency Flagship Initiative.

Efficient use of resources in the ICT products that we provide to customers is important. We have engaged in 3R design that draws on the principles of reduce, reuse, and recycle, and have developed our products with technology that is effective in reducing the use of resources. We are making efforts to improve resource efficiency, which is made possible by designing products to be lighter and smaller, using recycled plastics, reducing the number of parts, enhancing ease of disassembly, and improving recyclability. Our goal is to offer products that provide customers with benefits including compactness, light weight, and space savings.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Promote eco design for resource saving and circulation and increase resource efficiency of newly developed products by **15**% or more (Compared to FY 2014)
FY 2016 Targets	Increase resource efficiency of new products by **5**% or more (Compared to FY 2014)
FY 2016 Key Performance	Increase resource efficiency of new products by **14.7**% improvement (Compared to FY 2014)

FY 2016 Performance and Results

Improving the Resource Efficiency of New Products

In FY 2012, the Fujitsu Group created its own definition of resource efficiency. In FY 2016, as well, we continued to use our indicators to evaluate products newly developed by Fujitsu*****, while also reducing product part quantities and reducing product size through smaller, thinner, and lighter parts and higher-density mountings.

* **Products newly developed by Fujitsu:** Excludes products for which resource efficiency is determined by customer specifications or standards.

Achieving 14.7% Improvement in Resource Efficiency

Fujitsu has achieved a 14.7% improvement in FY 2016, against a target of 5%, through reduced size and weight, in PCs, smartphones, palm authentication devices, and image scanners.

Fujitsu Receives the LCA Japan Forum Chairman's Award (See Page 48)

The Fujitsu Group received its first Chairman's Award at the 13th LCA Japan Forum Awards*****. The award recognized Fujitsu's efforts to improve product resource efficiency, implement Group-wide improvement activities, and continue applying its environment-related activities across its product lineups.

* **LCA Japan Forum Awards:** Given to companies that work to alleviate products' environmental burdens by applying, expanding, establishing, and energizing life-cycle assessments.

Award recipients

Working toward Our Targets

To improve new product resource efficiency by at least 15%, Fujitsu will continue current initiatives, while expanding development of new lightweight, rigid materials and the use of recycled materials. We will also widely publicize product environmental performance to grow sales.

Reference Information — Definition and Calculation of Resource Efficiency

Resource efficiency is evaluated by dividing the value of a product by the environmental burden from use and disposal of the elements (resources) comprising the product.

$$\text{Resource efficiency} = \frac{\text{Product value}}{\begin{array}{c}\text{Environmental burden from resource usage} \\ = \\ \Sigma \text{(Resource burden coefficient} \times \text{Resource usage volume)}\end{array} + \begin{array}{c}\text{Environmental burden from resource disposal} \\ = \\ \Sigma \text{(Resource burden coefficient} \times \text{Resource disposal volume)}\end{array}}$$

Definition of Each Item

Product value	To place emphasis on the valuation of reduction in environmental burden due to resource usage and disposal, product value is limited to those that are related to resource usage and is set on a per-product basis. (Example of factor not considered: CPU performance improvements)
Resource burden coefficient	Environmental burden weighting coefficient that is specific to a particular resource and considers factors like exhaustibility, scarcity, and environmental impact from mining and disposal. Activities will begin with this figure set to a value of "1" for all resources.
Resource usage volume	Mass of each resource used in the product (excluding the mass of recycled plastic used).
Resource disposal volume	Mass of each resource disposed of (not reused) in connection with a post-use product (design value). Activities will begin with this figure set to a value of "0."

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Improving the Resource Efficiency and Resource Circulation of Products

Main Activities in FY 2016

A Smartphone 12% Thinner and 5% Lighter Than Its Predecessor

arrows SV **F-03H**

34% resource efficiency improvement (over conventional models)

Fujitsu released the arrows SV F-03H smartphone in July 2016. Featuring a variety of unique design elements, the product achieves both a lightweight, resource-saving structure and a remarkable degree of toughness.

In addition to incorporating a high-density component layout that cuts the board area by 60% relative to the previous model, the device design uses an embedded touch panel with an integrated display to make the device 5% lighter and 12% thinner. The design team also focused on balancing toughness with aesthetic appeal, allowing the device to pass drop tests and other durability assessments as well. The number of repaired units dropped 70% from the last model.

The device's battery life* increased to more than three days. The plants manufacturing the smartphones switched to automated lines for the back panel-installing process, thereby contributing to CO_2 reductions in the production stage.

* **Battery life:** The average amount of time that a battery lasts under average smartphone usage conditions (calculated based on data from a June 2015 study by Intage Inc.)
(NTT DOCOMO research/manufacturer research)

The World's Lightest 13.3-Inch Mobile PC

LIFEBOOK UH75/B1

97% resource efficiency improvement (over conventional models)

The LIFEBOOK UH75/B1, which hit the market in February 2017, features new device casing parts and new printed-circuit boards, LCDs, batteries, and keyboards. By using the new components and working closely with plants and suppliers, Fujitsu created the world's lightest 13.3-inch mobile computer, weighing 761 grams.

Use of a magnesium-lithium alloy cover (LCD back cover) for the casing and thin-wall magnesium alloy casting for the top and bottom cover of the unit realized a thin and robust design in addition to lighter weight. Fujitsu also worked with its LCD manufacturer to develop thin glass and thin backlight features. Not only did the collaboration enable a lightweight design, but both collaborators also inspected each other's production lines to ensure maximum quality.

For the device components, too, Fujitsu focused on eliminating unnecessary elements, meticulously crafting a streamlined design and painstakingly minimizing the overall weight down to the last tenth of a gram.

Advancing 3R Design

Through our proprietary product environmental assessments and green product evaluations, the Fujitsu Group is working toward the application of reduced resource usage, improved recyclability, and other technologies that take into account the 3Rs. Examples of the effective resource-saving technologies that we are deploying in our products include reductions in the number of components and cables, performance enhancements, space savings through higher-density integration, and digital product manuals. Furthermore, we are using Fujitsu's own 3-D Virtual Product Simulator (VPS), which is popular with many of our customers during their product design processes, to test the steps involved and the convenience of product assembly and disassembly before creating prototypes.

From 2010, we have also conducted regular study tours for designers at the Fujitsu Group recycling centers. In addition to hands-on experience with dismantling used products, designers gain feedback from staff in charge of recycling through idea exchanges and explanations of the obstacles to ease of dismantling. From FY 2015, the Fujitsu Group has been summarizing examples of the obstacles to ease of dismantling that we have learned from some 90 case studies at 5 recycling centers. Results are distributed in a systematic collection complete with pictures.

Gaining experience in dismantling at recycling center study tour

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Product Recycling

■ Our Approach

The Fujitsu Group's product recycling programs are based on Extended Producer Responsibility (EPR) and Individual Producer Responsibility (IPR). EPR holds that producers bear responsibility for products from design and manufacturing to disposal and recycling. 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.

The Fujitsu Group carries out recycling programs that comply with the laws and regulations of the various countries in which it operates. Fujitsu accepts industrial waste for appropriate processing at Fujitsu recycling centers across Japan. 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 2016 Achievements

| Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018) | Maintain over **90**% resource reuse rate for business ICT equipment at Fujitsu recycling centers. |

▼

| FY 2016 Targets | Achieve a **90**% resource reuse rate. |

▼

| FY 2016 Key Performance | Achieved a **92.0**% resource reuse rate. |

FY 2016 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 4,185 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 61,435 end-of-life PCs from individual customers.

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

FY	2013	2014	2015	2016
Resource reuse rate* (%)	91.3	90.9	92.0	92.0
Amount processed (tons)	5,035	5,016	5,203	4,185

* 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	2013	2014	2015	2016
End-of-life PCs collected (units)	98,549	103,276	69,801	61,435

TOPICS Hong Kong Recycling Association visits Fujitsu Recycling Center

In February 2017, with support from the EMS Committee at Fujitsu Hong Kong, representatives from the Hong Kong WEEE Recycling Association toured the Fujitsu East Japan Fukushima Recycling Center's technologies. The tour showcased the operations at the facility, including systems for keeping waste to near-zero levels and methods for processing materials.

Hong Kong produces roughly 70,000 tons of waste electrical and electronic equipment (WEEE) a year. Most of the waste is exported abroad, while valuable materials are reused or collected. With international trade regulations on WEEE growing increasingly strict in recent years, and used product markets outside Hong Kong are shrinking. It is increasingly necessary to promote WEEE-recycling.

Under the Hong Kong government's policy, the Association gathers information on electronic waste-recycling practices around the world and encourages efforts to implement viable solutions in Hong Kong. Association Vice President Eddie Chan was enthusiastic about his experience. "It was helpful to see the technologies," he said. "We learned so much about how to generate more revenues from recycled products."

Representatives from the Hong Kong WEEE Recycling Association pose for a picture
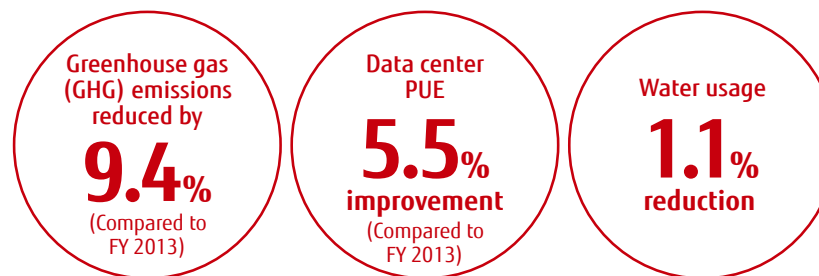

Participants gather information

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| Reducing Greenhouse Gas (GHG) Emissions and Boosting Energy Intensity at Our Business Sites | Improve Power Usage Effectiveness (PUE) at Our Data Centers | Expand the Use of Renewable Energy | Drive Activities to Reduce CO_2 Emissions in the Supply Chain | Reduce CO_2 Emissions from Transportation | Reducing the Amount of Water Used | Reducing Chemical Substances Emissions | Limiting Amounts of Waste Generated |

Chapter II | Our Business

Continuing from Environmental Action Plan (Stage VII), Environmental Action Plan (Stage VIII) turns on two points, namely, "contributing to society" and reducing the environmental burden of "our business activities."

In our business activities, we strive to reduce greenhouse gas emissions in the entire value chain in an aim to achieve the long-term zero emissions advocated in the Paris Agreement, and engage in efforts to reduce water usage, chemical emissions, generation of waste, and other environmental burdens.

Key Achievements in FY 2016

Greenhouse gas (GHG) emissions reduced by
9.4%
(Compared to FY 2013)

Data center PUE
5.5% improvement
(Compared to FY 2013)

Water usage
1.1% reduction

About Symbols Used ✓ Examined by third-party organization ○ FY 2016 target achieved ✕ Target not achieved

	Theme	Target items (targets through the end of FY 2018)	FY 2016 Target	FY 2016 Key Performance		Status	
Our Business	Reduce greenhouse gas emissions throughout the value chain	Reduce greenhouse gas emissions in our business facilities					
		Reduce greenhouse gas emissions by 5% or more compared to FY 2013.	Limit increase to 1.6%	Reduction of 9.4%	✓	○	P. 32
		Improve PUE*1 of our major data centers by 8% or more compared to FY 2013.	Improvement of at least 4.8%	5.5% improvement	✓	○	P. 33
		Improve energy intensity by an average of 1% or more each year.	Improvement of at least 1%	0.9% worse	✓	✕	P. 32
		Increase usage of renewable energy to at least 6%.*2	Usage rate: 5.5% or higher	Usage rate: 5.2%		✕	P. 35
		Drive activities to reduce CO_2 emissions*3 in the supply chain.	Ask secondary business partners to conduct reduction activities via business partners.	Asked secondary business partners (more than 37,000 companies) to conduct reduction activities via our major business partners (approximately 1,600 companies).		○	P. 36
		Reduce CO_2 emissions per sales from transport by an average of 2% or more each year.	Reduction of 2% or more	Reduction of 3.4%	✓	○	P. 37
	Reduce environmental impact	Reduce water consumption by 1% in total (128,000 m³).	0.1% (10,000 m³) reduction	1.1% (139,000 m³) reduction	✓	○	P. 38
		Reduce chemical pollutant (PRTR) release to less than the average level of FY 2012–2014 (20.7 t).	* No annual target	17.3 tons	✓	○	P. 39
		Reduce the amount of waste to less than the average level of FY 2012–2014 (25,568 t).	* No annual target	22,432 tons	✓	○	P. 40

*1 **PUE (Power Usage Effectiveness):** An indicator of the efficiency of electric power usage by the Data Center. It is a value calculated by dividing the Data Center's total electric power consumption by the electric power consumption of servers and other ICT devices. Values indicate higher efficiency the closer to 1.0 they become.
*2 The goal at the time the Environmental Action Plan (Stage VIII) was formulated was to "expand the usage of renewable energy," but it was subsequently changed to a quantitative target.
*3 **CO_2 emissions:** Conversion of the amount of energy used to the amount of CO_2 released.

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

Our Approach

The Fujitsu Group believes that prevention of global warming is a priority issue. Accordingly, we have formulated the "FUJITSU Climate and Energy Vision," Fujitsu's medium/long-term environmental vision, and aim to eliminate all CO_2 emissions from our business activities by 2050.

The primary GHG emissions from our business sites (plants, offices, and datacenters) are CO_2 accompanying energy (electricity, fuel oil, and gas) usage, and perfluorocarbon (PFC), hydrofluorocarbon (HFC), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3) used in semiconductor manufacturing. In addition to complying with relevant laws, we have set reduction targets for these and are striving to decrease and control the amounts we use and emit.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Reduce greenhouse gas emissions by	**5**% or more (compared to FY 2013)
	Improve energy intensity by an average of	**1**% or more each year
FY 2016 Targets	Keep the increase of greenhouse gas emissions at	**1.6**% or less (compared to FY 2013)
	Improve energy intensity	**1**% or more (compared to previous fiscal year)
FY 2016 Performance and Results	Reduced greenhouse gas emissions by	**9.4**% (compared to FY 2013)
	Energy intensity worsened by	**0.9**% (compared to previous fiscal year)

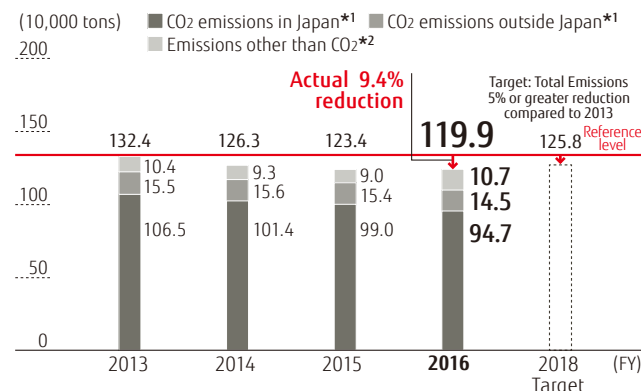## FY 2016 Performance and Results

Promoted Reductions of CO₂ Emissions Accompanying Energy Consumption

In fiscal 2016 as well, we are introducing and upgrading BAT* at each business site, streamlining manufacturing, making energy consumption "visible," and utilizing measurement data, etc.

GHG emissions in fiscal 2016 totaled approximately 1,199,000 tons (specific consumption/sale: 26.6 tons/100 million yen), down 9.4% since fiscal 2013. Despite increased production in Japan, we implemented measures to reduce approximately 20,000 tons. However, energy intensity worsened by 1.0% year on year. We will optimize specific consumption indicators in addition to conducting energy-saving activities.

* BAT (Best Available Technologies): Usable state-of-the-art technologies to reduce GHG.

Trends in Total Greenhouse Gas Emissions

(10,000 tons)   ■ CO₂ emissions in Japan[*1]   ■ CO₂ emissions outside Japan[*1]   ■ Emissions other than CO₂[*2]

Actual 9.4% reduction

Target: Total Emissions 5% or greater reduction compared to 2013

FY	Total	CO₂ outside Japan	CO₂ in Japan	Other than CO₂
2013	132.4	10.4	106.5	15.5
2014	126.3	9.3	101.4	15.6
2015	123.4	9.0	99.0	15.4
2016	**119.9**	**10.7**	**94.7**	**14.5**
2018 Target	125.8 Reference level			

*1 **CO₂ emissions in/outside Japan:** CO₂ conversion factor for purchased electric power has been calculated with a fixed value of 0.570 tons of CO₂ per MWh from FY 2013 to FY 2015, and a fixed value of 0.534 tons of CO₂ per MWh for FY 2016 for performance reports in our Environmental Action Plan.

*2 **Emissions other than CO₂:** These are converted to equivalent amounts of CO₂ using the global warming potential (GWP) of each gas.

Reports on Main Activities in FY 2016

Participation in Demand Response Verification Testing

Fujitsu's Numazu Plant participated in "Demand Response (Negawatt Trading) Verification Testing" conducted by the Ministry of Economy, Trade and Industry. In the verification testing, the company cooperates in suppressing the demand for power during a set period of time when requested (advance notification) by a power company. Incentives (monetary subsidies in the case of verification testing) are given according to amount of decrease and other results.

At the Numazu Plant, the methods of suppressing the demand for power (peak cut) included adjusting the operational output of gas engine generators in light of the plant's forecasted demand and utilizing smart switch (Comverge, U.S.) remote operation/control to stop air-conditioning devices, adjust temperatures, etc. In fiscal 2016, we were able to accommodate requests twelve times for a total of 124 MW.

Gas-engine power generator

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Improve Power Usage Effectiveness (PUE) at Our 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. Data centers comprised 24% of FY 2015 CO_2 emissions in the Fujitsu Group, with emission rates increasing 6.5% over the three years from FY 2012–15 at our 18 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[1] approximately 80% of our data centers (based on server room floor space) and we are working to boost environmental performance.

[1] **Activity targets:** Global data centers 1,000 m² or larger, in principle, or specific data centers requested by data center business units.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Improve PUE of our major data centers by **8**% or more. (Compared to FY 2013)
FY 2016 Targets	PUE 1.62 Improvement rate **4.8**% (Compared to FY 2013)
FY 2016 Key Performance	PUE 1.61 Improvement rate **5.5**% (Compared to FY 2013)

FY 2016 Performance and Results

Promoting Activities to Achieve the Targets

Continuing from Environmental Action Plan (Stage VII), Fujitsu is moving forward with the improvement of PUE[2] at its data centers inside and outside Japan. 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. This has led to an average yearly improvement of 2% or more.

Environmental Action Plan (Stage VIII), which started in fiscal 2016, will require further effort in the future to achieve improvements. In addition to continuing and expanding operational improvements that have been made up to this point, we will also reduce the power used for facilities and ICT by making energy more efficient through introduction of innovative technologies. Further, we will strive to increase the use of renewable energy, aiming for a carbon-free society as stipulated in the Paris Agreement[3].

[2] **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.

[3] **Paris Agreement:** A new framework for measures against global warming to reduce greenhouse gases through international cooperation, with more than 190 countries from the developed and developing world participating. It came into force in November 2016.

PUE Values and PUE Calculation Method

PUE values	PUE calculation method, etc.
Range: 1.32–2.21 Applicable DCs: 34 centers	- The Green Grid's method used - Implementation of improvement initiatives using the organization's DCMM

Air-conditioning Equipment Control through AI

Continuing from fiscal 2015, we improved air-conditioning energy efficiency inside and outside Japan, reaching the yearly target. We are improving efficiency through new technologies to achieve Environmental Action Plan (Stage VIII) targets.

For example, we are verifying Fujitsu's innovative just-in-time modeling air-conditioning controls, predicting temperatures and humidity an hour ahead from temperature, humidity, and power data for outside air environment and inside servers, then controlling outside air cooling and air-conditioning equipment air temperature.

Verification of AI-driven learning control technology is also currently underway. We are improving power efficiency with an AI learning wind volume, processing heat, outside air temperature, ICT device load, etc., and automatically model air conditioning properties. We will confirm effectiveness and implement measures at data centers in fiscal 2017.

JIT modeling air-conditioning control

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Improve Power Usage Effectiveness (PUE) at Our Data Centers

Main Activities of FY 2016

Data Center Goal of "Extreme Energy Conservation: Working Toward PUE 1.0"

Expansion of high-performance computing (high-performance, high-heat-generating servers used for big data and AI) increases energy used to cool data centers. Accordingly, Fujitsu participated in the Ministry of the Environment's FY 2016 Low Carbon Technology Research, Development and Demonstration Program, and is working on fundamental reduction of CO_2 at data centers.

We are focusing on cooling methods suited to ICT device heating levels, working particularly on high-heat-generating servers. Using a liquid-immersion cooling method in which ICT devices are submerged in fluorinated inert liquid (Fluorinert) with high thermal transport efficiency and insulating properties, we are challenging the "PUE 1.00 wall" with Fujitsu's new proprietary natural convection technology for Fluorinert circulation. AI-driven improvement of cooling efficiency is also being verified.

Liquid-immersion cooling technology to cool servers by submerging them in Fluorinert

Establishment of a Laboratory for Low-carbon Next-generation Cloud Infrastructure

In April 2017, Osaka University, Fujitsu Limited, and Fujitsu Laboratories Ltd. established the "Next Generation Cloud Research Alliance Laboratories" in Osaka University's Cybermedia Center.

The Laboratory will be used for research on energy-saving technology and security technology toward development of a next-generation cloud infrastructure that will be compatible with the future low-carbon society. In addition, it will be used to train the next generation of technicians, mainly for Osaka University students. In the future, the three organizations will conduct proof-of-concept testing based on research findings, at the Laboratory and on test beds (verification platform) built internally and externally by consortiums in which the Laboratory participates. Further, the developed energy-saving technologies will be utilized in an effort to make the next-generation cloud infrastructure and next-generation AI infrastructure more energy-conserving and low-carbon. Fujitsu will strive to apply the results of development in its AI technology "Zinrai."

Cold Storage Geo Replication Technology

Currently, coordination between data centers is conducted via two methods: low-delay short-range synchronous communication and long-range asynchronous communication backup. With the former, it is highly possible that multiple data centers would suffer damage in a large-scale disaster, and with the latter, there is increased data delay, so it was only possible to use a standby redundant connection.

On the other hand, "cold data," mainly images and video, which is rarely updated, constitutes the majority of data. This means that there is an increasing need to accumulate new data and share data between multiple sites. However, issues hindering data center coordination between multiple sites include synchronization between data centers and increasing data reading response speed.

In that context, we have been working since November 2016 to conduct joint verification testing on intercontinental data center coordination, focusing on cold data storage, between a data center inside Osaka University and a data center of Paris-based AntemetA. We have built a long-range coordination storage infrastructure, which, in addition to improving throughput and disaster resilience, excels at lowering costs by eliminating redundancy within individual data centers, and are verifying the effects.

Cold Storage Geo Replication

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Expand the Use of Renewable Energy

Our Approach

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

The Fujitsu Group has established its environmental vision aimed at achieving a decarbonized society. Under this vision, we proactively promote renewable energy use as well as thorough energy saving. To achieve this vision, we have set new quantitative targets in the Environmental Action Plan, and are actively promoting the installation of solar power generation equipment at our business sites, as well as expansion of purchasing and use of green power (electric power generated with 100% renewable energy) at overseas business sites at which costs are particularly reasonable.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Expand the renewable energy usage rate to **6**% or higher.
FY 2016 Targets	Expand the renewable energy usage rate to **5.5**% or higher.
FY 2016 Performance and Results	Expand the renewable energy usage rate to **5.2**%.

FY 2016 Performance and Results

New Usage Rate Target of 6% or Higher

Although numerical targets for the use of renewable energy were not originally set in the Environmental Action Plan (Stage VIII), we have set a new target: increasing the usage rate by 6% or higher in an effort to increase purchasing and use of renewable energy, mainly in overseas regions in which it is possible to procure with economic rationality. In an effort to expand purchasing and use more, we are utilizing the Guidelines for Adopting Renewable Energy and the Optimum Installation Maps & Power Generation Estimation Tools, both created in fiscal 2013, and promoting implementation at our business sites.

In fiscal 2016, approximately 133 GWh of renewable energy was used, constituting 5.2% of the total amount of power usage.

Fujitsu Technology Solutions (FTS) Green Power Certificate

Trend of FTS group Green Power Yearly Contract Amount
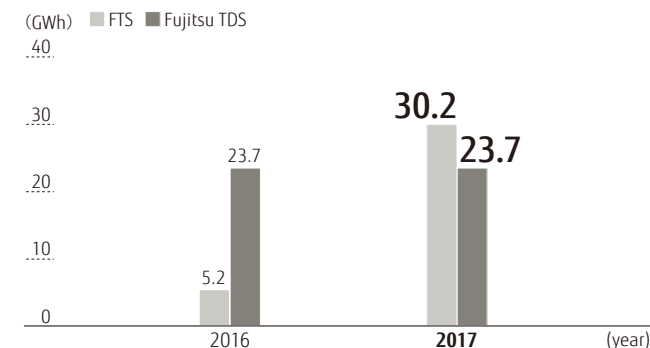
TOPICS Efforts to Expand Usage of Renewable Energy in the Future

The technical innovation in the electric power industry has been remarkable in recent years, with decreased costs for solar panels, wind power turbines, and storage cells giving a significant push to the use of renewable energy. Overseas in particular, there are regions in which 60% or more of the power supply consists of renewable energy.

In the future, Fujitsu will strive proactively to increase its use of renewable energy starting with overseas business sites at which it is easy to procure such energy. In addition, we are engaged in the development of a simulator to check the results of regional energy collaboration and research into high-efficiency charge/discharge control for storage cells, in order to increase the efficiency of using renewable energy.

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Drive Activities to Reduce CO_2 Emissions in the Supply Chain

Our Approach

The Fujitsu Group takes many steps to combat global warming. In addition to working to cut its own emissions, the Group also requests its business partners to implement CO_2-reduction activities as part of its green procurement efforts. As a result, all of the Group's major business partners have launched CO_2-reduction activities.

The Group began extending the scope of the activities further up the supply chain in FY 2016. In addition to asking business partners to take reduction-oriented steps, the Group is now also requesting its business partners to encourage similar initiatives at their own suppliers (the secondary suppliers to the Fujitsu Group).

Engaging in activities across the entire supply chain could help us not only expand our reduction effects (through synergy) but also enlarge the scope of the activities internationally, given the border-crossing scale of the supply chain. By pursuing these initiatives, we will keep striving to establish a decarbonized society for future generations.

Summary of FY 2016 Achievements

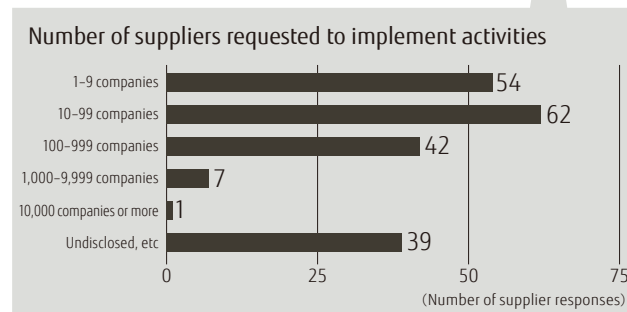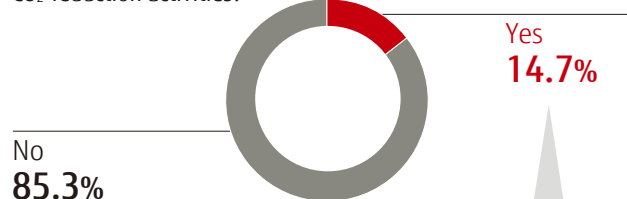|	
Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Drive activities to reduce CO_2 emissions in the supply chain.
FY 2016 Targets	Through business partners, request secondary suppliers to implement CO_2-reduction-oriented activities.
FY 2016 Key Performance	Through major business partners (approximately 1,600 companies), requested secondary suppliers (over 37,000 companies) to implement CO_2-reduction activities.

FY 2016 Performance and Results

Requests/Support for Activity Development at Secondary Suppliers

We asked our major business partners, which account for over 98% of the Group's total procurement value, to ask their own suppliers (secondary suppliers) to comply with the Group's requests for the implementation of CO_2-reduction activities. We also assessed the status of activities at our business partners using a unique Environmental Survey Sheet.

After analyzing the survey responses and creating a report outlining activity trends, we provided the results to the partners that submitted survey responses as a form of feedback that they could reference when developing and implementing future activities, urged the partners to continue engaging in activities, and asked them to extend the scope of activities to their own suppliers.

Although the number of the Group's business partners that had asked their own suppliers to implement activities came to less than 15% of the total as of the end of FY 2016, the number of secondary suppliers that received requests topped 37,000—a promising beginning for substantial awareness-raising initiatives.

The Fujitsu Group will continue to provide unique informational materials and take other steps to help its business partners appreciate the importance of CO_2-reduction activities in the supply chain. In addition, the Group will work to bring a growing number of business partners into the effort.

CO_2-reduction activities at secondary supplier sites

Have you requested your suppliers to implement CO_2-reduction activities?

Yes **14.7%**

No **85.3%**

Number of suppliers requested to implement activities

	Number of supplier responses
1–9 companies	54
10–99 companies	62
100–999 companies	42
1,000–9,999 companies	7
10,000 companies or more	1
Undisclosed, etc	39

Informational materials for business partners

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Reduce CO_2 Emissions from Transportation

Our Approach

With Group companies and business sites worldwide, and materials/parts sourced from a significant number of business partners, reducing CO_2 emissions accompanying logistics and transportation activities is a priority for the Fujitsu Group.

The Fujitsu Group has worked toward its targets for CO_2 emission reductions from domestic transport. Since Environmental Action Plan (Stage VII), we have expanded the scope of reductions to transport within regions overseas, as well as international transport. Stage VIII also drives streamlining and greater in global logistics.

The Group is working toward lowering environmental impact throughout the supply chain, such as displaying copies of the Fujitsu Group Green Logistics Procurement Directions, to strengthen our partnerships. Lastly, as an initiative in our overall distribution process, the Group is devoting effort to the 3Rs (Reduce, Reuse, Recycle) in packaging products and materials/parts.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Reduce by over **2%** on average every year CO_2 emissions per sales* from transport (compared to previous fiscal year)
FY 2016 Targets	Reduce by over **2%** CO_2 emissions per sales from transport (compared to FY 2015)
FY 2016 Key Performance	Reduced by **3.4%** CO_2 emissions per sales from transport (compared to FY 2015)

* **Net Sales:** Excludes the impact of exchange rates

FY 2016 Performance and Results

Reduced by 3.4% Compared to Previous FY; FY 2016 Results Broadly Surpassed Targets

FY 2016 CO_2 emissions from transport were 99,000 tons. Of that amount, 21,000 tons were from domestic transport, while 78,000 tons were from international and overseas local transport. CO_2 emissions per sales were reduced 3.4% compared to FY 2015, which broadly surpassed our targets for FY 2016.

Trends in CO_2 Emissions from Transport

(thousand tons) · (tons/100 mill. yen)

- CO₂ from Transport
- CO₂ emissions per sales (tons/100 mill. yen)

	2015	2016 (FY)
CO₂ from Transport	103	99
CO₂ emissions per sales	2.17	2.1
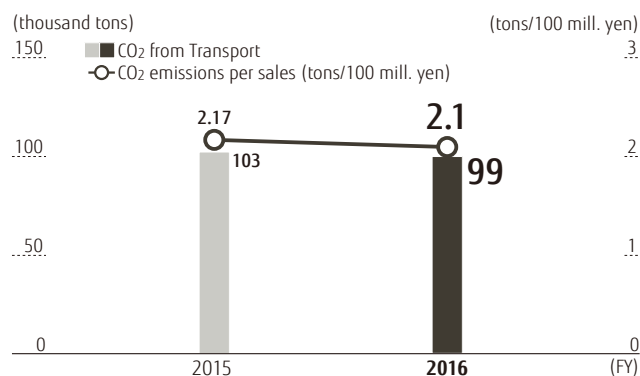
Example Initiatives in FY 2016

- **Promoting modal shifts (switching from air to ferry shipments)**
  For shipping of computers and PC servers, Fujitsu Ten Limited is actively switching to ferry shipments which have lower environmental burdens and lower costs than shipments by air.

- **Sharing the "Case Studies of Transportation CO₂ Reductions" with domestic and overseas group companies**
  We created and distributed the "Case Studies of Transportation CO₂ Reductions," which is a collection of activities that have been held by domestic and overseas group companies. This publication serves as guidance for group companies.
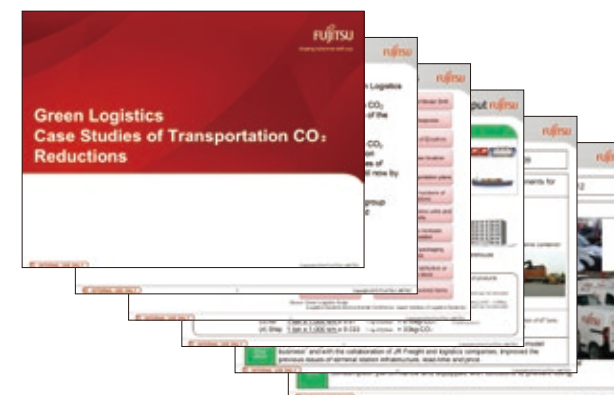
Case Studies of Transportation CO_2 Reductions (Image)

- **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.

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Reducing the Amount of Water Used

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. Under our Environmental Action Plan (Stage VIII), we have strengthened our efforts to use water resources effectively even more than in the past.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Reduce water consumption by **1**% in total. (**128,000** m³)
FY 2016 Targets	Water usage: **10,000** m³ reduction **0.1**% reduction (compared to FY 2013)
FY 2016 Key Performance	Water usage: **139,000** m³ reduction **1.1**% reduction (compared to FY 2013)

FY 2016 Performance and Results

139,000 m³ Reduction in Water Usage from FY 2013

In regard to the target for reduction of water usage stipulated in the Environmental Action Plan (Stage VIII), we achieved 139,000 m³, far exceeding the FY 2016 target of a 10,000 m³ reduction.

Water usage for FY 2016 was 16,870,000 m³ (specific consumption per sale: 374.1 m³/100 million yen), which was a 2.1% increase compared to FY 2015, with increased production in addition to other factors. However, the proportion of water usage consisting of recycled water overall was 44.6%, a 6.9% increase compared to FY 2015, as a result of various efforts at each office and plant to use water resources effectively.

Trends in Water Usage and Amounts of Recycled Water

(10,000 m³) ■ Water usage ■ Amount of recycled water

FY	2013	2014	2015	2016
Amount of recycled water	717	696	623	752
Water usage	1,925	1,743	1,652	1,687
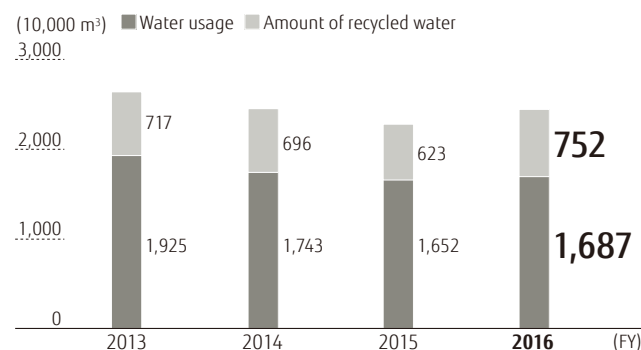
Main Activities in FY 2016

Repurposing Plant Wastewater as Recovered Water

Fujitsu Component Limited worked to reuse washing wastewater from the scribing process on the touch panel manufacturing line. In the past, all pure water used for washing became wastewater, but in cooperation with Fujitsu Facilities Limited, regular cleaning of the washing wastewater tank, installation of recovery piping, improvement of the quality of the pure water, and a variety of other efforts were implemented. This resulted in reuse of approximately 18% as recovered water, and a 12,000 m³ reduction of water usage for the year.

Water usage reduction activities through reuse of washing wastewater in the touch panel scribing process (Fujitsu Component Engineering and Development Center)

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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 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Reduce chemical pollutant (PRTR) release to less than the average level of FY 2012–2014 (**20.7** tons).

FY 2016 Key Performance	PRTR: **17.3** tons

FY 2016 Performance and Results

Achieved On-Going PRTR Substance Emission Target

Group-wide chemical substance emissions for FY 2016 came to 17.3 tons for PRTR, within the target value in the Environmental Action Plan (Stage VIII).

Trends in PRTR Substance Emissions in Japan

(tons)

- 2012–2014 average: 20.7 (Target level)
- 2015: 18.6
- 2016: 17.3 (Actual 16.4% reduction)

(FY)
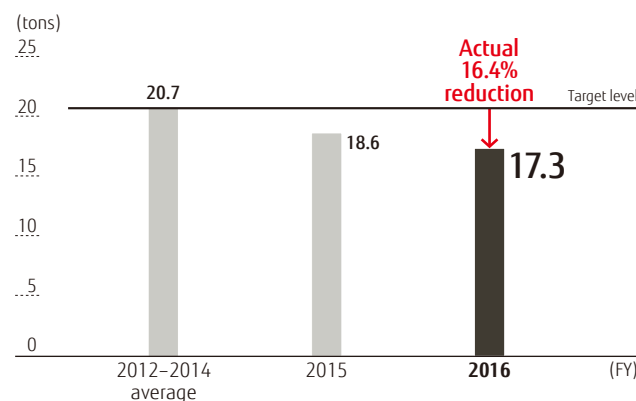
Main Activities in FY 2016

Reducing Prtr Emissions through Improvements in Production Yield and Changes to Raw Materials

In FY 2016, Fujitsu Kasei Limited worked to improve the quality of the base materials for computer casing components and the working environments for various processes. The changes not only boosted production yield in the company's painting process but also helped reduce the amount of PRTR-targeted substances in its paints by bringing overall paint consumption down.

Switching to paint materials containing fewer PRTR substances and implementing technological measures to improve paint coating film thickness, among other efforts, reduced the amount of PRTR emissions under chemical substance management by a total of 1.4 tons (7.0 tons to 5.6 tons): Toluene levels fell by 0.9 tons, xylene by 0.2 tons, and ethylbenzene by 0.2 tons.

At the beginning of the fiscal year, the company identified the issues that it would need to address in its efforts to make yield improvements and also reduce paint consumption. The various improvement measures resulted in the above achievements. In FY 2017, the company will continue to reduce PRTR emissions to address more issues.
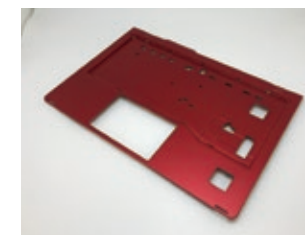
Computer casing painting: Improvements in quality

Painting process: Improvements in the work environment

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.

Furthermore, in order to properly dispose of waste, we have established the Standards for Consignment of Waste Disposal as company-wide standards. These standards are based on the Waste Management and Public Cleansing Act.

Summary of FY 2016 Achievements

Targets under the Fujitsu Group Environmental Action Plan (Stage VIII) (toward FY 2018)	Reduce the amount of waste to less than the average level of FY 2012–2014 (**25,568** tons)
FY 2016 Key Performance	**22,432** tons

FY 2016 Performance and Results

Internal Processing for Reducing Waste Amount and Converting Waste to Value-Added Material

The Fujitsu Nagano Plant reduced waste (427 tons) by internally manufacturing organically regenerated liquid waste. Mie Fujitsu Semiconductor Limited converted alkali liquid waste to a value-added material (95.6 tons).

This achieved our waste generation target of 22,432 tons (generation rate/unit of sales: 0.50 tons/100 mill. yen).

Waste Generated and Effective Utilization Ratio
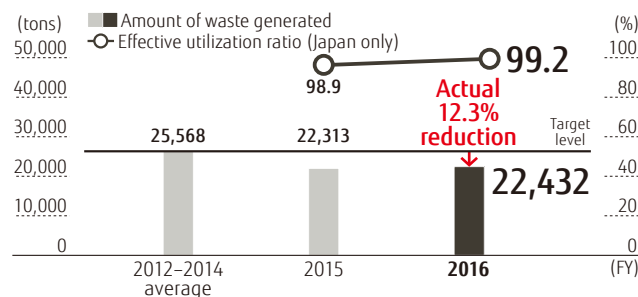
Waste Generated, Effective Use, and Final Disposal

(tons)

Waste Type	Waste Generated	Effective Utilization	Final Disposal
Sludge	4,449	4,333	117
Waste oil	1,186	1,157	29
Waste acid	3,204	3,198	6
Waste alkali	3,358	2,815	544
Waste plastic	3,557	3,416	141
Waste wood	997	997	0
Waste metal	735	734	1
Glass/ceramic waste	437	431	5
Other*	4,508	3,207	1,301
Total	22,432	20,288	2,144

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

Main Activities in FY 2016

Reducing Amount of Glass Waste by Using Large Mother Glass

The touch panel manufacturing process at Fujitsu Component Limited had problems including a tendency for film to warp. The company established a working group to solve these problems. The group implemented these improvements:
(1) A manufacturing line and manufacturing conditions with small bending even for large glass and no film warping.
(2) Printing technology and film bonding supporting multi-surface printing on products.
(3) Manufacturing/implementation new jigs for large glass.

These activities suppressed remnant material generated per sheet of mother glass. Since adopting large mother glass in the second half of FY 2014, glass waste dropped 150 tons in three years.

Changes in waste amount of ITO-coated glass

Environmental Management

Since our founding in 1935, the Fujitsu Group has made the initial concept of "operating in harmony with nature" our cornerstone.
We have now set "In all our action, we protect the environment and contribute to society" as our corporate value under the FUJITSU Way.
Contributing to the sustainability of the planet is a social responsibility of the Fujitsu Group and a reason for our existence.
We will build relationships of trust with a wide range of stakeholders and will work to preserve the environment throughout our value chain.

P. 42 Environmental Management
Endeavoring to make sustainable improvements to environmental management systems based on ISO14001, the Group is promoting unified environmental management.

P. 44 Green Procurement
To provide customers with products and services that have a light environmental footprint, we are implementing green procurement in concert with our business partners.

P. 45 Initiatives to Minimize Environmental Risk
To minimize the risk of polluting the environment and disrupting ecosystems, the Group is continuing such initiatives as setting voluntary control values that are tougher than those designated by laws and regulations.

P. 46 In-House Environmental Educational and Enlightenment Activities
We carry out various forms of environmental education and enlightenment training based on the belief that, "to promote environmental management, it is essential to raise the environmental awareness of each and every employee and to take proactive measures."

P. 47 Communication with Society
The Fujitsu Group works to communicate with our customers, employees, business partners, shareholders, investors, local and international communities, and all of our diverse stakeholders.

Evaluation by Outside Institutions

The Fujitsu Group has earned praise from external institutions for its active promotion of environmental and social initiatives, and has been included among Socially Responsible Investment (SRI) brands.

Recognition: Dow Jones Sustainability Indexes (World, Asia Pacific)
Evaluating institution: Dow Jones & Co., RobecoSAM AG

Recognition: FTSE4Good Index Series
Evaluating institution: FTSE Russell

Recognition: oekom Corporate Rating
Evaluating institution: oekom research AG

Recognition: Morningstar Socially Responsible Investment Index
Evaluating institution: Morningstar, Inc.

Recognition: UN Global Compact 100
Evaluating institution: U.N. Global Compact

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Environmental Management

Endeavoring to make sustainable improvements to environmental management systems based on ISO14001, the Group is promoting unified environmental management.

Environmental Management Framework

To conduct a comprehensive discussion of the Fujitsu Group's environmental management, we have established an Environmental Management Committee chaired by the president. This committee is considering medium-term issues, implementing policy decisions, and discussing methods for handling and sharing operating risks and opportunities from climate change, all with the aim of raising the level of the group's environmental management and strengthening its governance. Based on that, final decisions on environmental management at the Fujitsu Group are made at meetings of the Management Council and reported to the Board of Directors.

Subordinate to the Environmental Management Committee, we have organized environmental issue-specific committees composed of concerned parties that go beyond the framework of business groups and business units. Through this promotion structure, we are making it possible to quickly diffuse initiatives on these issues throughout the group.

We have also established an Environmental Management Working Group (WG) subordinate to the Green Management Committee, an issue-specific committee. The Environmental Management WG is working to unify global information transmission and strengthen environmental management systems (EMS) activities.

Environmental Management Framework (as of March 2017)

Board of Directors

Management Council (Chaired by president)

Person in Charge of In-Group Environmental Inspections (Corporate Internal Audit Division Vice President)

Environmental Management Committee (Chairperson: President)

Group Environmental Management Representative (VP, Head of the Corporate Environmental Strategy Unit)

Issue-specific committees
- Green Factory
- Environmental Solution
- Green Products
- Product Chemical Material
- Cutting-edge Green R&D
- Green Procurement
- Green Logistics
- Green Management
- Green Datacenter

Business Group

Fujitsu — Business unit (line), Business unit (line) — Business sites

Group (Japan) — Group Companies

Group (Overseas) — Group Companies

Configuration and Operation of Environmental Management Systems

The Fujitsu Group has constructed EMS based on the ISO 14001 international standard and is promoting environmental improvement activities across the Group. By EMS construction worldwide, the Fujitsu Group further strengthened its Group governance. This also allows the Group to promote even more efficient and highly effective environmental activities, including understanding the state of activities, legal compliance and emergency response.

As of April 2017, the Fujitsu Group has acquired global integrated ISO 14001 certification for a total of 82 companies of Fujitsu and its Japanese group companies, as well as for 8 overseas Group companies. Our 14 overseas consolidated subsidiaries that are not production base sites have constructed and are operating an EMS in line with Fujitsu Group environmental policies. In this way, we have established an environmental management structure across the whole Group.

Environmental management systems operational status

		FY 2014	FY 2015	FY 2016
Internal audit	Findings	148	130	145
External audit	Findings	5	2	4
	Opportunities for improvement	89	82	103
Environmental compliance	Violations of environmental laws	7	8	9

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Environmental Management

Internal Audit Implementation and Results

The Fujitsu Group is carrying out internal audits, a requirement of ISO 14001. To ensure the objectivity and independence of internal audits, the Corporate Internal Audit Division, takes the lead, allocating internal auditors who belong to Fujitsu or Fujitsu Group companies and carries them out.

In FY 2016, we carried out internal audits for factories, offices, and other facilities at 377 sites in Japan and 19 overseas. For these audits, we scrutinized the results of the FY 2015 internal audit and external audit, took the opinions and instructions of the Environmental Management Committee into consideration, and found three major focal points: (1) compliance, (2) operational control, and (3) organizations operating original EMS.

There were 145 total findings. Operational control accounted for roughly 20% of all the findings (both Japan and overseas), with many of the Japanese findings relating to methods for managing chemical substances and a large number of the overseas findings relating to the disposal of industrial waste.

Overseas, receiving cooperation from external experts thoroughly knowledgeable in local laws and regulations and operation, we carried out internal audits with the objective of strengthening compliance.

An internal audit being conducted overseas

External Audit and Results

To maintain our ISO 14001 certification, we are carrying out external audits by a certifying body. In FY 2016, we were audited in Japan by the Japan Audit and Certification Organization for Environment and Quality (JACO). Outside Japan, we were audited by DNV GL Business Assurance Japan K.K.

As a result, 58 areas, for our organizations in Japan, and 45 areas, for our overseas Group companies, were pointed out as opportunities for improvement. Four minor nonconformities were identified at our overseas entities. We have completed corrective actions against these matters as of the end of FY 2016. Moreover, external audit findings on these were shared throughout the Group in order to help efforts to prevent recurrences.

These audits were carried out, and as a result of the judgment of the two certifying bodies, we were again granted renewal of our ISO 14001 certification.

Status of Environmental Compliance

While the Fujitsu Group committed no major violations of environmental laws and caused no accidents that had any major impact on the environment in FY 2016, there were nine events in which laws were violated. They consisted of three violations related to water quality and two related to industrial waste and fluorocarbons.

Legal violations continued to be few in number through our efforts toward the horizontal sharing of information on findings, but we will aim to make our self-checks even more thorough and eventually bring the number of violations to zero. Also, with regard to industrial waste, we will select outstanding waste processors while configuring a structure to eliminate administrative violations related to waste from offices.

Use of the ISO 14001 Green Management System

The ISO 14001 Green Management System (GMS) is used to exercise unified control over the operational status of the EMS with regard to: improvements in and conformance issues relating to findings from internal audits, communications activities, direct and indirect effects identified in environmental impact assessments, and the setting of environmental management objectives and targets.

GMS enables corrective measures and objectives to be soundly managed, and effectively ensures continual improvement of the activities with reduced risks.

ISO 14001 Green Management System

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Green Procurement

To provide customers with products and services that have a light environmental footprint, we are implementing green procurement in concert with our business partners.

Procurement Activities Based on Green Procurement Direction

The Fujitsu Group summarized what it asks of its business partners regarding purchasing green parts, materials, and products in the "Fujitsu Group Green Procurement Direction." Together with partners in Japan and overseas, the Group implements green procurement activities and promotes procurement from business partners that fulfill the green procurement requirements (see below).

Using a Fujitsu Group Environmental Survey Sheet, we conduct annual monitoring of partners' status with regard to environment management system, CO_2 emission reduction, biodiversity preservation and water resource preservation activity, and ask them to take appropriate measures.

Green procurement requirements for business partners

	Requirements	Materials/parts business partners*	Non-materials/parts business partners
①	Establishment of environmental management systems (EMS)	○	○
②	Compliance with regulations for Fujitsu Group specified chemical substances	○	—
③	Establishment of chemical substance management systems (CMS)	○	—
④	CO_2 emission control/reduction initiatives	○	○
⑤	Biodiversity preservation initiatives	○	○
⑥	Aquatic resource preservation initiatives	○	○

* Materials/parts business partners: Business partners who supply components of Fujitsu Group products or OEM/ODM products

Establishment of Environmental Management Systems

We request our business partners to establish environmental management systems (EMS) to provide a backbone for ensuring that they independently and continuously implement environmental-preservation activities. In principle, we would like them to have third party-certified EMS. Where this is not possible, we ask them to build EMS incorporating the PDCA cycle suited to their circumstances.

CO_2 Emission Reduction Initiatives

The Fujitsu Group asks our business partners, as well, to engage in CO_2 emission reduction in hopes of addressing climate change. Specifically, we ask them to clearly express the intentions of their initiatives and request that they make efforts to achieve the objectives they set. Furthermore, we also ask them to collaborate with external organizations, where possible, and likewise encourage their own suppliers in an effort to expand the initiatives outside their respective businesses. Our annual Supply Chain Business Continuity Surveys give us a clear picture of how business partners are responding to a variety of climate-change risks, including tsunamis, floods, and torrential rains.

Acquiring Information on Chemical Substances Contained in Products

Countries around the world are establishing legal regulations governing chemical substances contained in products, including the RoHS[1] Directive and the REACH regulation.[2] The scope of the regulations continues to expand, as well, adding more and more substances, products, and applications on an almost daily basis.

The Fujitsu Group is investigating information on chemical substances contained in suppliers' products by using AIS[3] (offered by JAMP[4]). After gathering the information, we share our findings with other Group companies via our internal system and allow relevant parties to access the information whenever necessary. Support for AIS will conclude in June 2018. The Group is currently preparing to migrate to chemSHERPA,[5] the successor to AIS.

[1] RoHS: Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
[2] REACH regulation: Regulation for Registration, Evaluation, Authorization, and Restriction of CHemicals
[3] AIS (Article Information Sheet): Information sheet for information on chemical substances in articles
[4] JAMP: Joint Article Management Promotion-consortium
[5] chemSHERPA: Chemical information SHaring and Exchange under Reporting PArtnership in supply chain

Establishment of a Chemical Substance Management System (CMS) for Product Substances

The Fujitsu Group asks its business partners to establish a chemical substances management system (CMS) based on industry-standard JAMP guidelines on the management of chemical substances contained in products.

We carry out CMS audits where Fujitsu's auditors directly confirm the management of chemical substances in products at the business partners' manufacturing bases, and if the system established is inadequate in structure or operation, auditors make requests for corrections and provide support. Afterwards, we regularly confirm the system state and its operational status through periodic audits. With the understanding of our business partners, the Fujitsu Group will continue carrying out management of chemical substances included in products.

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Initiatives to Minimize Environmental Risk

To minimize the risk, the Fujitsu Group is continuing such initiatives as setting voluntary control values that are tougher than those designated by laws and regulations throughout the entire value chain.

Environmental Pollution Prevention and Preparations for Climate Change Risks

We are preparing rules that designate a response to accidents and emergency situations in case of the rare occurrence of environmental risks and educating employees on how to carry them out correctly. Additionally, there is the possibility of significant impacts on our business continuity from increases in the frequency and effects of natural disasters as a result of recent climate changes. We have formulated a business continuity plan and are devoting effort to continually revising and improving the plan.

Preventing Air Pollution

We have set voluntary control values that are more stringent than legally mandated emissions standards in order to prevent air pollution and limit acid rain. Regular measurement and monitoring is conducted based on these controls. Efforts are made to appropriately process dust and soot, sulfur oxide, nitrogen oxide, and other harmful substances, and reduce emissions. Furthermore, we are reducing the atmospheric discharge of organic solvent vapors containing substances like VOCs.

Moreover, with the enactment in April 2015 of the Act on Rational Use and Proper Management of Fluorocarbons, we have set in-house stipulations and striven for proper management of specified products (commercial refrigerators and air conditioners containing fluorocarbon refrigerants) while working to identify the volume of fluorocarbon leakage.

In addition, emission of dioxins has been prevented by suspending use of all in-house incineration facilities as of January 2000.

Preventing Water Pollution

In order to preserve the water quality of surrounding waterways, including rivers, groundwater and sewers, we have set voluntary controls that are even tougher than legal mandates, and conduct regular measurement and monitoring on this basis. We recover and recycle chemicals used in production processes, instead of discharging them into wastewater. And we are working to reduce discharges of harmful substances and other regulated substances (COD, BOD, etc.) by ensuring appropriate chemical use, preventing chemical leaks and permeation, and properly managing the operations of water treatment and purification facilities, among other measures.

Preventing Pollution of Soil and Groundwater

We have established rules for soil and groundwater surveys, measures and disclosure. We review these in accordance with changes in the law and social circumstances, and respond based on these rules. We systematically examine soil and groundwater, based on the rules, and if pollution is confirmed, we carry out cleanup and countermeasures at each plant according to the situation, while disclosing information in concert with administrative agencies.

As of FY 2016, there are six business sites where soil and groundwater pollution from prior business activities have been confirmed. At those business sites, we have installed observation wells to observe effects outside the site due to groundwater pollution, while also working on purification measures through water-lifting aeration, etc. (See Page 54.)

Chemical Substance Control

To prevent pollution of the natural environment or damage to health due to the use of harmful chemical substances, we are controlling the use of some 1,300 substances using the original Chemical Information System called "FACE" and working to appropriately control and reduce emissions at our business sites. (See Page 39.)

Furthermore, with regard to chemical substances included in products, we have determined banned substances and are working to thoroughly control them, including both inside the company and with business partners. (See Page 44.)

Appropriately Processing Waste

In order to confirm that subcontractors are appropriately handling the waste processing tasks we entrust to them, we regularly carry out on-site audits.

In addition, with regard to high concentration polychlorinated biphenyl (PCB) waste (transformers and condensers) processing, we have registered with the Japan Environmental Storage & Safety Corporation (JESCO), which carries out PCB waste interim storage and disposal under government supervision, and are carefully carrying out processing based on JESCO plans.

Conserving Biodiversity

In FY 2009, we settled on the Fujitsu Group Biodiversity Action Principles, and promote them based on the two pillars of reducing the impact of our activities on biodiversity and contributing to the creation of a society that conserves biodiversity.

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In-House Environmental Education and Enlightenment Activities

We carry out environmental education and enlightenment training based on our belief that "to promote environmental management, it is essential to raise the environmental awareness of each and every employee and to take proactive measures."

Comprehensive Environmental Education

Every three years we have all of our employees undertake e-Learning to acquire a basic understanding of environmental management. In addition, education is provided to meet the needs of each level of employee from new entrants to managers, as well as those of departments including design development, sales and systems engineering. We are also implementing internal auditor, waste management and other training as professional education for employees in charge of work related to the environment.

Environmental e-Learning

The Fujitsu Group offers environmental e-Learning to all of its employees to facilitate the spread, recognition, and

implementation of our Environmental Action Plan.

In FY 2016, the first year of Environmental Action Plan (Stage VIII), we implemented practical programs aimed at increasing understanding for the background and contents of the Plan.

In-House Award Scheme

To raise the environmental awareness of employees at all Fujitsu Group companies, we have operated an Environmental Contribution Awards scheme and conducted an Environmental Photo Contest, open to all employees, every year since 1995.

Winners of the FY 2016 Environmental Grand Prize (environmental contribution award)

1. **Developed the world's lightest mobile PC (refer to Page 29)**
   We developed a 13.3-inch mobile PC that saves resources and is the world's lightest design (761 grams), while still maintaining high performance including a long battery life, durability, and security.

2. **Achieved TCO reduction for entire system through water-cooled server**
   We developed a water-cooled server that saves energy and reduces TCO (Total Cost of Ownership) for the entire system. This server is used in the supercomputer that is jointly operated by the University of Tokyo and the University of Tsukuba. The supercomputer ranked 6th in the world in the Green500 list of top power-saving performance (as of November 2016).

Environmental Photo Contest Top Prize Winner "Ice Floe"
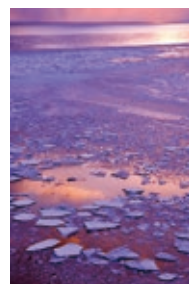
Judge's comment:
Ice floes provide rich oxygen and nutrition. In recent years, global warming has caused changes in the amount and season of ice floes. This has impacted the ecosystem of wildlife. This photograph was selected for the Top Prize in recognition of how it shows the need to continually protect nature and raises a strong alarm against the dangers of global warming.

Raising Awareness Through Environmental Seminars

The Fujitsu Group believes that proactive environmental action by each and every employee starts from an understanding of social issues, environmental issues, and international affairs. Therefore, we hold periodic environmental seminars and workshops. In FY 2016, we produced an animated film which is enjoyable for employees to watch and demonstrates the relationship between the environment and our business.

Seminars Held in FY 2016
- "Environmental Seminar: Understanding SDGs" (October 2016)
- "Adoption of the Paris Agreement—Business Strategy in Changing Times" (December 2016)
- Workshop "2030 Future Forecasting Seminar + Ideathon" (March 2017)

Animated Films
- "SDGs Implemented by the ICT" https://www.youtube.com/watch?v=Cv9tGB7qJ_I
- "Decarbonized society and its potential for business" https://www.youtube.com/watch?v=lD9OUuw7muM

Fujitsu's Environmental Education System

	New entrants	Ordinary employees	Middle managers	Senior executives
General education	Environmental e-Learning (every three years)			
	Level-specific training		Level-specific training (initial)	
Professional education Note: Only relevant persons attend lectures	Function-specific training (ad-hoc)			
	Internal auditor education			
	Waste management worker education			
Enlightenment	Lectures, seminars and training sessions			
	Environmental Contribution Awards and Photo Contest			
	Information provided through the Web and social networking services			

Hiroko Kuniya speaks at the "Environmental Seminar: Understanding SDGs"

Animated film: "Decarbonized society and its potential for business"

Scenes from workshop at the "2030 Future Forecasting Seminar + Ideathon" (left) and idea sheet (right)

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Communication with Society

The Fujitsu Group works to communicate with our customers, employees, business partners, shareholders, investors, local and international communities, and all of our diverse stakeholders.

Environmental Dialogues with Experts

In order to boost environmental management that reflects the changes and needs of society, the Fujitsu Group believes that it is important to have occasions for dialogue with a wide range of stakeholders and to build relationships of assured trust.

Group environmental dialogue has been one part of this effort since FY 2011. Experts have been invited in far-ranging fields, including representatives of NPOs, universities, and media organizations, to engage in dialogue on various themes centered on the environment. Such dialogue sessions have been held 28 times so far (as of March 2017), and discussions held with a total of 84 experts.

■ Discussing Scenarios for the Medium/Long-term Environmental Vision

In the FY 2016 dialogue sessions, we exchanged opinions with experts regarding information gathering and the scenarios that had been formulated, in preparation for formulation of the medium/long-term vision that was announced in May 2017. The Paris Agreement was taken into consideration during creation of the vision, and we positioned determination of how we would achieve zero emissions at our business sites by 2050 as the most important theme.

In regard to the possibility of achieving zero emissions, we discussed trends in energy conservation, renewable energy, and the Japanese government's long-term technological strategy with experts and received advice on things such as the element

FY 2016 Themes

1st dialogue The Possibility of Achieving Zero Emissions: From a Technical Perspective

2nd dialogue Renewable Energy Introduction Scenarios

3rd dialogue Trends in Worldwide Environmental Finance

The 28th environmental dialogue held in March 2017

technology that would be the key in the future, and methods of effective use of energy in partnership with the local community. Further, considering the importance of utilization of renewable energy and credit in addition to energy conservation for the transition from low-carbon to zero emissions, we asked for information on matters such as the status of implementation of renewable energy around the world, systems to encourage implementation, and trends in JCM and other credit systems, and exchanged opinions regarding them.

With these opinions from outside experts and discussions as a reference, we formulated the vision scenario for achieving zero emissions ourselves looking toward 2050, as a target to be achieved by the entire Fujitsu Group in the medium and long term. In the future, in addition to striving to achieve the medium/long-term vision, we will contribute to society through the utilization of ICT to its fullest.

Comments from One of the Facilitators

This fiscal year, the Fujitsu Dialogue was held three times on the themes of energy technology and environmental finance, with an eye toward "achieving a zero-emissions society." The sessions were not only opportunities to hear about the latest trends and the future outlook from the leading experts in each area, but thorough and repeated discussions also led to concrete implementation. Including related departments in the conversations has created a foundation for efforts such as implementation of the SDGs that must be spread throughout the company and ESG investment.

This is the fifth year of hosting these dialogue sessions to respond to the needs of the era and society, for a total of 28 sessions. Continuing to provide a forum to face social issues sincerely and engage with society in dialogue and co-creation of solutions has garnered Fujitsu the trust of society. At the same time, I am certain that conversing directly with outside stakeholders has provided Fujitsu employees with an opportunity to think deeply about their connection to society.

I respect the setting of the lofty goal of achieving zero emissions by 2050. In order to increase corporate value and competitiveness while conducting carbon-free operations through the combined strength of our engineering, manufacturing, sales, purchasing, and financial departments, etc., and to move forward with efforts to contribute truly to society without smugness, I have great expectations for significant utilization of environmental dialogue in the future as well.

Junko Edahiro
Professor, Department of Environmental Management, Tokyo City University
President, Institute for Studies in Happiness, Economy and Society

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Communication with Society

Outside Commendations

The various efforts of the Fujitsu Group to achieve the sustainable development of society have received high praise from multiple directions, and the Group has received many commendations from outside groups and organizations, etc.

■ Reception of the Seventh "Career Education Award" Grand Award

Since 2006, Fujitsu has visited elementary and junior high schools around Japan to teach classes on the environment.

The program is linked to career education, including what can be done now, but also "Future Jobs and Ecology" in which students think about the environmental activities they will be responsible for in their future jobs. These efforts have garnered high praise, with Fujitsu winning the "Career Education Award" Grand Award.

List of Outside Commendations FY 2016

Presenting organization/group	Commendation name	Submitted program/Submission title
Fujisankei Group/Ministry of Economy, Trade and Industry, Ministry of the Environment, Ministry of Education, Culture, Sports, Science and Technology, Ministry of Land, Infrastructure, Transport and Tourism, Ministry of Agriculture, Forestry and Fisheries, Japan Business Federation	26th Global Environment Awards Grand Prize	• Environmental management (Results of the Environmental Action Plan (Stage VII) and Formulation of the Environmental Action Plan (Stage VIII)) • World's smallest and most efficient AC adapter (GaN-HEMT)
Life Cycle Assessment Society of Japan/Ministry of Economy, Trade and Industry/Nikkan Kogyo Shimbun	13th LCA Japan Forum Awards LCA Japan Forum Chairman's Award	The Fujitsu Group's efforts to improve resource efficiency
Ministry of the Environment/Global Environmental Forum	20th Environmental Communication Awards Grand Prize, Environmental Reporting Category	Fujitsu Group Environmental Report 2016
Nature Conservation Society of Japan/Ministry of the Environment, Japan Committee for IUCN, Japan Committee for UNDB	Japan Nature Conservation Awards for 2016 Special Award	Support for protection of the endangered Blakiston's fish owl, utilizing ICT
Ministry of Economy, Trade and Industry/Career Education Coordinator Network Council	Seventh "Career Education Award" Grand Award	Visiting environment classes "Future Jobs and Ecology" —Career Education X Environmental Education—

■ Reception of the 26th "Global Environment Awards" Grand Prize

The past results of the Fujitsu Group's Environmental Action Plan and the energy conservation effect of "development of the world's smallest and most efficient AC adapter, utilizing gallium nitride" garnered high praise, and received the 26th Global Environment Awards Grand Prize.

Fujisankei Group Chairman Hisashi Hieda presents a trophy to Fujitsu President Tatsuya Tanaka

Gallium nitride (GaN-HEMT) AC adapter

Communication through Exhibitions and Events

The Fujitsu Group provides information on our initiatives toward solving global environmental issues by using exhibitions and events inside and outside Japan as a means for communicating with customers and stakeholders.

Main Exhibitions and Events Attended in FY 2016

- Eco-Products International Fair Thailand/June 2016
- UNFCCC NAP Expo Germany/July 2016
- ITU Green Standard Week Uruguay/September 2016
- Sustainable Brand International Conference Tokyo/March 2017

■ Lecture on Contributing to Sustainability Through Digital Innovation

The Sustainable Brand International Conference, which began in the United States, was held in Japan for the first time in March 2017. Senior Executive Vice President Norihiko Taniguchi and Hideyuki Kanemitsu, Head of the Corporate Environmental Strategy Unit, took the podium for keynote lectures and represented Fujitsu in discussions. They introduced the latest examples to explain Fujitsu's commitment to utilizing digital technology and co-creating new business models with the customer and aim for achievement of a sustainable society.

Senior Executive Vice President Norihiko Taniguchi gives a keynote lecture

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Communication with Society

Social Contribution Activities

■ Tropical Rainforest Restoration Activities

Beginning in 2002, the Fujitsu Group has worked on a project to restore tropical rain forests at the Fujitsu-Malaysia Eco-Forest Park (hereinafter "Eco-Forest Park") in the state of Sabah, on the island of Borneo with the support of the Sabah Forestry Development Authority (SAFODA). In December 2016, the long-term forest preservation activity bore fruit and the park was certified as a "Forest Reserve" by the Sabah State Legislature.

Up to this point, 37,500 dipterocarps, a native species, have been planted across an area of about 150 hectares. A total of more than 2,000 people have been involved in the project, including employees and their families, local universities and professional schools, and Japanese schools. It entered the cultivation phase in 2007, and since then maintenance activities have been conducted to cultivate saplings.

Participants in the Fujitsu Group's tropical rainforest restoration activities

■ Winemaking with Volunteer Employee Participants

Fujitsu Group employees and their families assist in the farm work at the "Fujitsu GP2020 Wine Farm" at the Okunota Winery in Yamanashi Prefecture. They partner with the owner, whose goal is to create the world's best wine, to cultivate Cabernet Sauvignon, said to be difficult in Japan, and are making Fujitsu GP2020 Wine.

The purpose of the activities is to enable participants to learn about the preservation of biodiversity and deepen their understanding of problems faced by farming and mountain villages (village forests) while enjoying farm work at a farm that promotes biodiversity-friendly agricultural method.

In FY 2016, Fujitsu Group employees and their families (a total of 178 people) participated in the entire series of fieldwork, from the pruning of branches, which starts in early spring, to harvesting grapes in autumn.

Participants in "grape harvesting" at a wine farm

Tie-ups with External Organizations

By actively participating in external organizations inside and outside Japan, the Fujitsu Group is endeavoring to promote and spread green ICT solutions for realizing a sustainable society.

Major Participating Organizations

World Business Council for Sustainable Development (WBCSD):
reviewing assessment indices in traffic and transportation fields, and promoting concrete solutions in various categories

Global e-Sustainability Initiative (GeSI) :
contributing to SMARTer2030, a report comprehensively analyzing the potential of ICT to bring about sustainability

The ITU-T's ICT and Climate Change Group (SG5 WP3):
spreading and expanding green ICT

ITU-T "IoT and Its Application, Including Smart Cities and Communities (SG20)":
Consider standardization of IoT-related matters and smart cities and communities

ISO TC286 SC1 (Smart Urban Infrastructure Metrics):
building infrastructure assessment methods and promoting efforts to clarify the role of ICT in smart communities

The Steering Committee for the ICT Sector Guidance to the GHG Protocol Product Life Cycle Accounting and Reporting Standard:
assessing ICT life cycle environmental effects

Global Taskforce on Harmonizing Global Metrics for Data Center Energy Efficiency:
promoting environmental consciousness of datacenters

JEITA Environment Board:
contributing to the establishment of a method for evaluating the contributions of products and services

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Environmental Accounting

Fiscal 2016 Breakdown of Results (Capital investment, costs, economic benefits)

Item		Main areas covered	Cost (billion yen)		Economic benefits (billion yen)
			Capital investment	Expense	
Business area costs/ benefits	Pollution prevention costs/ benefits	Air/water pollution prevention, etc.	0.46 (-0.28)	4.69 (+0.35)	6.23 (-0.03)
	Global environmental conservation costs/benefits	Global warming prevention, saving energy, etc.	0.60 (-0.05)	2.45 (-0.50)	1.49 (-0.32)
	Resource circulation costs/ benefits	Waste disposal, efficient utilization of resources, etc.	0.11 (+0.11)	2.30 (-0.06)	9.98 (-0.26)
Upstream/downstream costs/benefits		Collection, recycling, reuse, and proper disposal of products, etc.	0.01 (+0.00)	0.83 (-0.02)	0.53 (+0.08)
Administration costs/benefits		Provision and operation of environmental management systems, environmental education of employees, etc.	0.03 (+0.01)	2.64 (-0.06)	0.49 (+0.19)
R&D costs/benefits		R&D on products and solutions that contribute to environmental protection, etc.	0.10 (-0.11)	46.69 (+5.46)	79.10 (+7.84)
Social activity costs		Donations to, and support for, environmental groups, etc.	0.00 (+0.00)	0.03 (-0.00)	—
Environmental remediation costs/benefits		Restoration and other measures related to soil and groundwater contamination, etc.	0.04 (+0.03)	0.08 (-0.01)	0.00 (+0.00)
Total			1.35 (-0.28)	59.70 (+5.17)	97.81 (+7.50)

* Numbers in parentheses indicate increases or decreases in comparison with the previous year. Due to rounding, figures in columns may not add up to the totals shown. Amounts shown as "0.00" include amounts for which the value was smaller than the display units used.

Costs and Economic Benefits in FY 2016

The results of this accounting for FY 2016 showed expense of 59.7 billion yen (a 9% increase from the previous year) and the economic benefits were 97.8 billion yen (an 8% increase from the previous year). Thus both costs and benefits increased. Also, our capital investment was 1.3 billion yen (a 17% decrease from the previous year).

Driving forward our R&D on products and solutions to contribute to environmental conservation for customers and society led to broad increases in R&D costs and economic benefits (calculated by our own method for estimating economic benefits).

Trends in Expenses and Economic Benefits

(billion yen) ■ Expenses ■ Actual benefits ■ Estimated benefits

	2013	2014	2015	2016
Expenses	45.5	51.5	54.5	59.7
Estimated benefits	63.3	72.7	77.8	85.8
Actual benefits	15.0	13.5	12.5	12.0
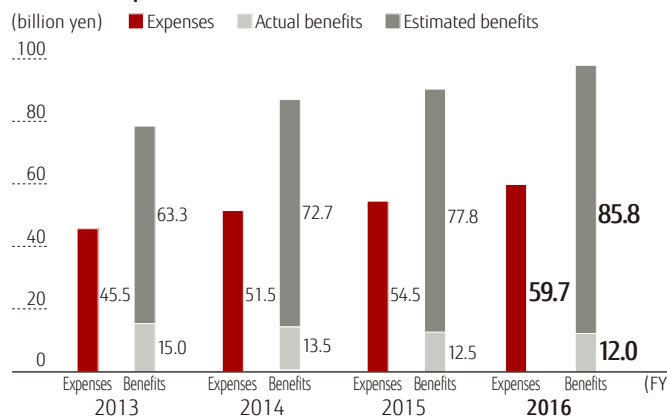
Environmental Liabilities

Our Liabilities toward the Environment

The Fujitsu Group, in properly forecasting expected future environmental liabilities and communicating our soundness and stance of not deferring environmental liabilities, has recorded a liability of 6.45 billion yen in soil-pollution cleanup costs, high-level polychlorinated biphenyl (PCB) waste disposal costs, and asbestos processing costs during facilities demolition. This total is the amount we calculate, as of the end of FY 2016, to be necessary for the Fujitsu Group in Japan to carry out these tasks in the next FY and beyond.

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Environmental Accounting/ Environmental Liabilities | Material Balance | GHG Emissions Report Based on GHG Protocol Standards | Supplementary Data | Environmental Performance Data Calculation Standards |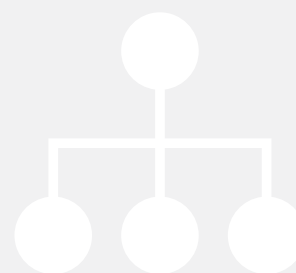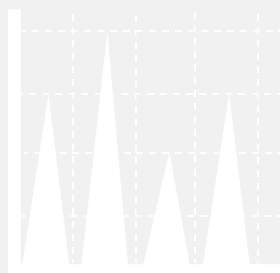 List of Organizations Covered by the Report on Environmental Activities | Third Party Verification | GRI Guidelines Reference Table

Material Balance

Fujitsu depicts the overall image of our environmental impacts using numbers, in order to engage in business activities with the environment in mind.

● Manageable scope of the Fujitsu Group   ● Within the scope of the Fujitsu Group's impact
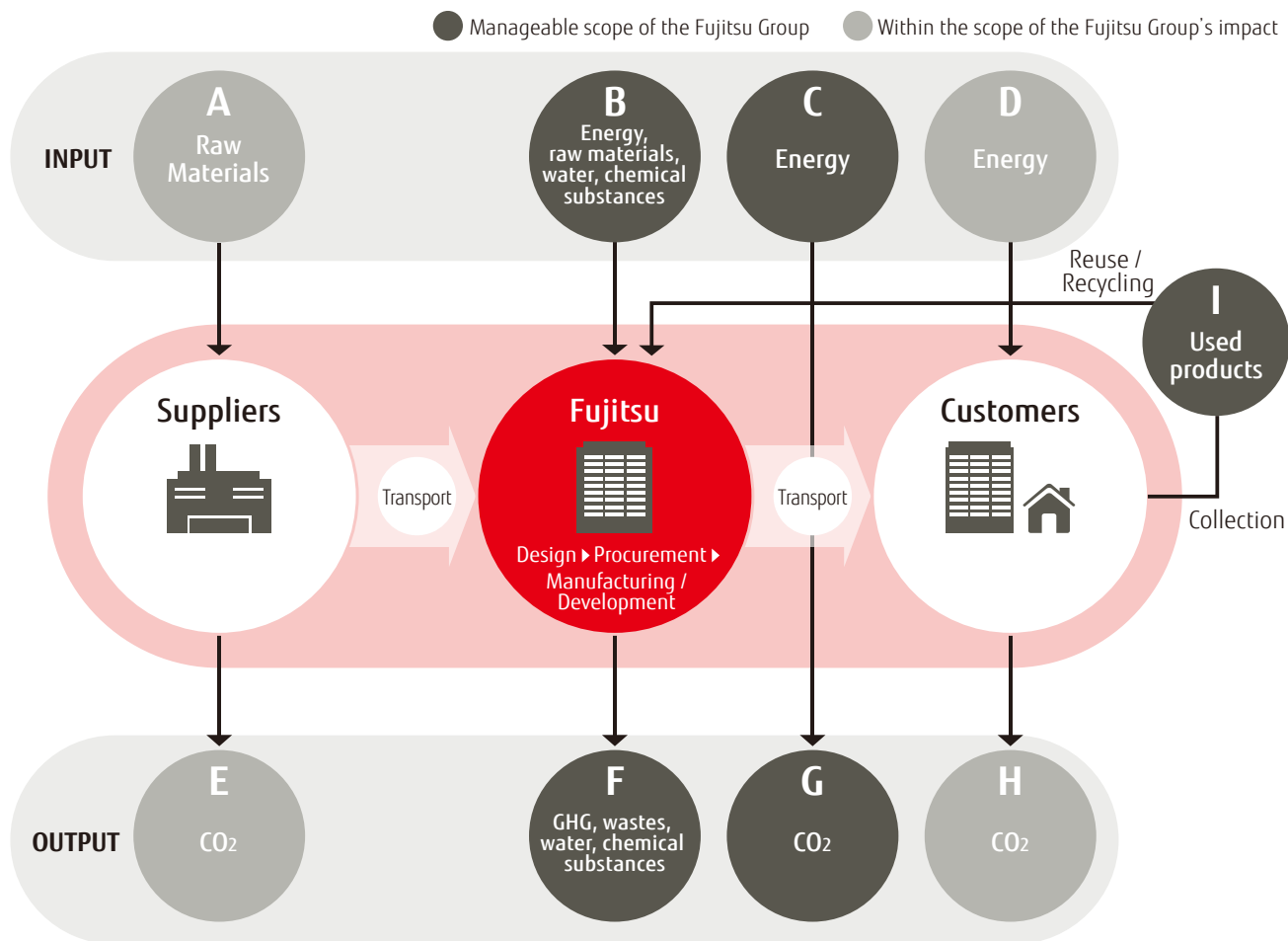
FY 2016 Key Performance

INPUT

A·B | Design/Procurement/ Manufacturing/Development

Raw Materials

Metal	25 ktons
Plastic	11 ktons
Others	15 ktons

Chemical Substances*

VOCs	1.4 ktons
PRTR	9.8 ktons

Water

Water usage	16.87 Mm³

Energy

Total	20.38 PJ
Purchased electricity	1,899 GWh
Heavy oil, kerosene, etc.	10,118 kL
LPG, LNG	3,059 tons
Natural gas, city gas	29.99 Mm³
District heating and cooling	43 TJ

C | Distribution/Sales

Energy

Fuel (light oil, gasoline, etc.)	1.46 PJ

D | Usage

Energy

Electricity	8,111 GWh (80.87 PJ)

I | Collection/Reuse/Recycling

Resources recycling rate	92%
Amount processed	4,185 tons

OUTPUT

E·F | Design/Procurement/ Manufacturing/Development

Raw Materials

CO_2 emissions	640 ktons-CO_2

Chemical Substances*

VOCs	245 tons
PRTR	11 tons

Atmospheric Release

Total GHG emissions	1,229 ktons
CO_2	1,122 ktons-CO_2
GHG other than CO_2 (PFC, HFC, SF_6, others)	107 ktons
NOx	104 tons
SOx	30 tons

Water Discharge

Wastewater discharges	15.28 Mm³
BOD	391 tons
COD	179 tons

Waste

Amount of waste generated	22.4 ktons
Thermal recycling volume	4.7 ktons
Material recycling volume	15.6 ktons
Disposal volume	2.1 ktons

G | Distribution/Sales

Atmospheric Release

CO_2	99 ktons-CO_2

H | Usage

Atmospheric Release

CO_2	4,570 ktons-CO_2

* Substances that qualify as both a PRTR targeted chemical and a VOC are included under "VOCs" only.

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GHG Emissions Report Based on GHG Protocol Standards

■ Covered
■ Not applicable

Materials purchase ▶ Transportation initiated by Fujitsu ▶ Production ▶ Value chain transportation ▶ Waste

Scope 3
Upstream

Purchased goods and services
Materials, components, etc.
2,432 ktons

Capital goods
Building construction
31 ktons

Fuel- and energy-related
Not included in Scopes 1 and 2
76 ktons

Transportation and distribution (Upstream)
Product distribution, etc.
99 ktons

Waste generated in operations
Industrial waste treatment, etc.
8 ktons

Business travel
Use of public transportation
107 ktons

Employee commuting
87 ktons

Leased assets (Upstream)
Building use
373 ktons

Scopes 1, 2
Reporting company

Scope 1
Direct emissions
Burning, etc. of fossil fuels
208 ktons

Scope 2
Indirect emissions from energy sources
Use of purchased electricity
Use, etc. of purchased steam
1,021 ktons

Scope 3
Downstream

Transportation and distribution (Downstream)
Not applicable (Calculated value: 6)

Processing of sold products
21 ktons

Use of sold products
Products' electricity consumption
4,566 ktons

End-of-life treatment of sold products PC recycling (and other)
Not applicable (Calculated value: 2)

Leased assets (Downstream)
The Company's business is not applicable.

Franchises
The Company's business is not applicable.

Investment
The Company's business is not applicable.

Emissions (kton-CO₂e)

Scope 3 Upstream
3,213

Scope 2 Indirect emissions
1,021

Scope 1 Direct emissions
208

Scope 3 Downstream
4,587

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Supplementary Data

Business Sites Where Soil or Groundwater Contamination Has Been Found

Site Name (Location)	Cleanup and Countermeasure status	Monitoring Well Maximum Value (mg/L) Substance	Measured Value	Regulated Level (mg/L)
Kawasaki Plant (Kawasaki City, Kanagawa Prefecture)	We are continuing to clean up VOCs by pumping and aeration.	Cis-1, 2-dichloroethylene	5.9	0.04
Oyama Plant (Oyama City, Tochigi Prefecture)	We are continuing to clean up VOCs by pumping and aeration.	Cis-1, 2-dichloroethylene	3.776	0.04
		Trichloroethylene	1.494	0.03
		1, 1-dichloroethylene	0.179	0.1
Nagano Plant (Nagano City, Nagano Prefecture)	We are continuing to clean up VOCs by pumping and aeration.	Cis-1, 2-dichloroethylene	0.059	0.04
Suzaka Plant (Suzaka City, Nagano Prefecture)	We have constructed an underground impervious wall and are continuing processing pumped water	Polychlorinated biphenyl	0.0024	Must not be detected
FDK Sanyo plant (Sanyo-Onoda City, Yamaguchi Prefecture)	We are continuing to clean up VOCs by pumping and aeration.	Trichloroethylene	0.048	0.03
FDK Energy (Formerly the FDK Washizu Plant) (Kosai City, Shizuoka Prefecture)	We are continuing to clean up VOCs by pumping and aeration.	Cis-1, 2-dichloroethylene	0.68	0.04
		Trichloroethylene	0.23	0.03
		Tetrachloroethylene	0.26	0.01

Energy Use（Scope 1 and Scope 2 ）

Category	Energy use
Total	20.38 million GJ (452.0 GJ/100 million yen)
Scope 1	1.87 million GJ
Scope 2	18.52 million GJ

Response to Environmental Complaints (FY 2016)

Complaint	Cases	Response
NA	0	–

Fujitsu Group Profile

Company Name: Fujitsu Limited

Addresses:
- Kawasaki Main Office
  4-1-1 Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588, Japan
- Headquarters
  Shiodome City Center 1-5-2 Higashi-Shimbashi, Minato-ku, Tokyo 105-7123, Japan

President: Tatsuya Tanaka

Established: June 20, 1935

Main Business Activities:
Manufacture and sale of communications systems, information processing systems, and electronic devices, and the provision of services related to those products

Capital: ¥324.6 billion

Net sales: ¥2,034.5 billion (Fujitsu only), ¥4,509.6 billion (consolidated)

Employees: 155,000 (as of March 31, 2017)

Directors: 10

FY 2016 Consolidated Net Sales by Business Segment

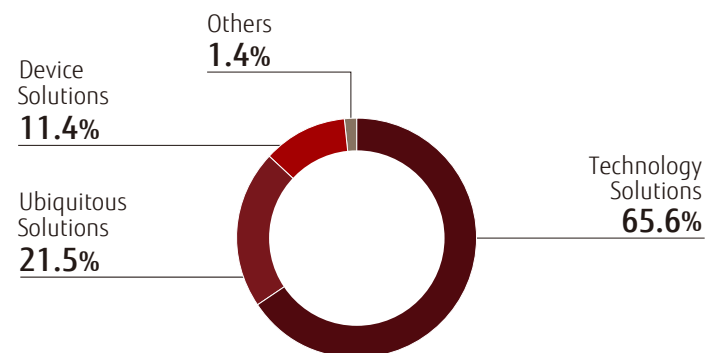
Others 1.4%
Device Solutions 11.4%
Ubiquitous Solutions 21.5%
Technology Solutions 65.6%

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Environmental Performance Data Calculation Standards

Subject Period: April 1, 2016 – March 31, 2017
Scope: Fujitsu and the Fujitsu Group (For details, refer to the List of Companies Covered by the Report on Environmental Activities.)

Chapter I Contribution to Society (Fujitsu Group Environmental Action Plan (Stage VIII) "Contribution to Society")

Target Item	Indicator	Unit	Calculation Method
Achieve top-level energy efficiency for 50% or more of the new products.	The percentage of new products that are top-level energy efficient	%	The percentage of top-level[1] energy efficient products with respect to the number of product series that are expected to be developed. [1] Top-level energy efficiency: Achieve an upper-level benchmark based on outside indicators, etc., in energy efficiency, on a par with "top-runner" products (first in the world or industry, top of the world or industry).
Promote eco design for resource saving and circulation and increase resource efficiency of newly developed products by 15% or more.	Rate of improvement of resource efficiency of new products	%	The average rate of improvement of resource efficiency[1] (versus FY 2014) of products. [1] Hardware products, under the Fujitsu brand, newly developed in FY 2016–18. Excludes products not designed by Fujitsu (OEM products) and products designed under customer specifications. *Refer to "Improving resource efficiency of new products" for the resource efficiency calculation method.
Maintain over 90% resource reuse rate of business ICT equipment at Fujitsu recycling centers.	Resource reuse rate of business ICT equipment	%	Based on the calculation method provided by JEITA, recycled components and resources as a percentage of the weight of used products processed in Japan. Excludes collected waste other than used electronic products.

Chapter II Pursuing Internal Reforms
(Fujitsu Group Environmental Action Plan (Stage VIII) "Our Business")

Target Item	Indicator	Unit	Calculation Method
Reduce greenhouse gas emissions by 5% or more compared to FY 2013.	GHG emissions	Tons CO_2	CO_2 emissions: $\sum$〔(Electricity, fuel oil, gas, and district heating and cooling annual usage) $\times CO_2$ conversion factor for each type of energy[1]〕 [1] CO_2 conversion factor: The factor is based on the Act on Promotion of Global Warming Countermeasures. In FY 2013, the conversion factor for electricity was 0.570 tons CO_2/MWh and in FY 2016 it was 0.534 tons CO_2/MWh. GHG emissions other than CO_2: Annual emissions of HFCs, PFCs, SF_6, and NF_3 at three semiconductor plants (Mie Fujitsu Semiconductor Limited, Aizu Fujitsu Semiconductor Wafer Solution Limited, and Aizu Fujitsu Semiconductor Manufacturing Limited). $\sum$〔Annual emissions for each type of gas[1] $\times$ Global warming potential for each gas[2]〕 [1] Based on the calculation method used by the industries of electrical and electronics: Amount of each gas used (or purchased) $\times$ Reactant consumption rate $\times$ Removal efficiency, etc. [2] Global Warming Potential (GWP): IPCC (Intergovernmental Panel on Climate Change) Fourth Assessment Report "Climate Change 2007."
	Percentage reduction in total greenhouse gas emissions	% reduction	(Total GHG emissions in FY 2013 – Total GHG emissions in the fiscal year) / Total GHG emissions in FY 2013 $\times$ 100

Target Item	Indicator	Unit	Calculation Method
Improve PUE of our major data centers by 8% or more compared to FY2013.	Rate of improvement of PUE	%	PUE = Σ (Total DC energy consumption) ÷ Σ (Total IT device enegy consumption) Σ: Combined total energy of the 34 main sites Rate of improvement (%) = (Base year PUE – PUE for the current fiscal year) ÷Base year PUE x 100 Base year: FY 2013
Improve energy intensity by an average 1% or more each year.	Rate of improvement of energy intensity	%	The improvement rate, year on year, for each business site's energy rate index is a weighted average of the proportion to the site's overall energy usage. These values are added to calculate our total improvement rate. Σ〔% improvement year-on-year in each business site's rate index x wt% proportion of overall energy usage〕 Target business sites: Japan (energy management plants specified under the Act on the Rational Use, etc. of Energy), UK and Australia offices
Increase the renewable energy usage rate to 6% or higher.	Renewable energy usage rate	%	Power generated by the company through renewable energy (solar, wind, hydraulic, biomass, geothermal, etc.) or purchased from an outside source ÷ total amount of electric power used
Reduce CO_2 emissions per sales from transport an average of 2% or more.	CO_2 emissions per sales from transport	Tons/100 million yen	Transport CO_2 emissions/sales (100 million yen) * Sales: Excluding the effects of the exchange rate
	Reduction rate of CO_2 emissions compared to the previous fiscal year	% reduction	(Previous fiscal year's transport CO_2 emissions per sales – Current fiscal year's transport CO_2 emissions per sales) / Previous fiscal year's transport CO_2 emissions per sales x 100
Reduce water consumption by 1% in total. (128,000 m³)	Amount of reduction of water use	m³	Build up the water use reduction impact of measures implemented at each business site (actual or estimated), and calculate the amount of reduction for the current fiscal year.
Reduce chemical pollutant (PRTR) release to less than the average level of FY 2012–2014. (20.7 t)	Volume of PRTR-targeted substances	Tons	For the substances covered by the PRTR law (Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof), released totals are provided for those substances handled in quantities exceeding 100 kg annually per business site.
Reduce the amount of waste to less than the average level of FY 2012–2014. (25,568 t)	Amount of Waste Generated	Tons	Total amount for industrial waste and general waste generated by factories and offices (Thermal recycling volume + Material recycling volume + Disposal volume)
	Effective utilization ratio (Japan only)	%	(Amount of effective use (thermal recycling & material recycling) / amount of waste generated) $\times$ 100

[1] **Four electrical and electronic industry associations:** The Japan Electrical Manufacturers' Association (JEMA), Japan Electronics and Information Technology Industries Association (JEITA), Communications and Information Network Association of Japan (CIAJ), and Japan Business Machine and Information System Industries Association (JBMIA)

Environmental Liabilities

Indicator	Unit	Calculation Method
Cost for environmental liabilities	Yen	1. Asset retirement obligation (Only asbestos removal cost related to facility disposal) 2. Cost for soil contamination measures 3. Disposal processing cost for waste with high concentrations of PCB (polychlorinated biphenyl)

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GHG Emissions Report Based on GHG Protocol Standards

Indicator		Unit	Calculation Method
Upstream (Scope 3)	Purchased goods and services	Tons	Components purchased during the fiscal year × Emissions per unit of purchases (Source: Embodied Energy and Emission Intensity Data (3EID) published by the National Institute for Environmental Studies Center for Global Environmental Research)
	Capital goods	Tons	Monetary value of capital × Emissions value per unit of capital value (Source: Embodied Energy and Emission Intensity Data (3EID) published by the National Institute for Environmental Studies Center for Global Environmental Research)
	Fuel and energy – related items not included in Scopes 1 and 2	Tons	Annual amounts of fuel oil and gas, electricity and heat purchased (consumed) mainly at business sites owned by Fujitsu × Emissions per unit (Source: Basic Guidelines for Calculating Greenhouse Gas Emissions Via Supply Chains and the Carbon Footprint Communication Program Basic Database Ver. 1 published by the Ministry of the Environment and the Ministry of Economy, Trade and Industry)
	Transportation and distribution (upstream)	Tons	Transportation of goods within Japan: CO_2 emissions related to the transportation of goods within Japan by the Fujitsu Group. CO_2 emissions related to domestic transportation by the Fujitsu Group, based on the Act on the Rational Use, etc. of Energy. The fuel economy method (for some vehicles) or the improved ton-kilometer method (vehicle, rail, air, ship).
		Tons	International transport/overseas local transport: transportation ton-kilometers × emission per unit (source: GHG protocol emissions coefficient database)
	Waste generated in operations	Tons	Annual amounts of waste (discharged mainly by business sites owned by Fujitsu) processed or recycled, by type and processing method × Emissions per unit of annual amount of waste processed or recycled (Source: Basic Guidelines for Calculating Greenhouse Gas Emissions Via Supply Chains published by the Ministry of the Environment and the Ministry of Economy, Trade and Industry)
	Business travel	Tons	(By means of transport) Σ (Transportation expense payment × Emissions per unit) (Source: Basic Guidelines for Calculating Greenhouse Gas Emissions Via Supply Chains Ver. 2.1 and Emissions per Unit Database Ver. 2.1 published by the Ministry of the Environment and the Ministry of Economy, Trade and Industry)
	Employee commuting	Tons	For portions of commute by public transportation: (By means of transport) Σ (Transportation expense payment x Emissions per unit) (Source: As above) For portions of commute by private automobile: Σ (Transported persons-kilometer × Emissions per unit) (Source: As above) Transported persons-kilometer is calculated from transportation expense payment, price of gasoline, and fuel efficiency.
	Leased assets (Upstream)	Tons	Annual amounts of fuel oil, gas, electricity, and heat consumed mainly at leased business sites × Emissions per unit of fuel oil, gas, electricity, and heat consumed (Sources - Japan: Act on Promotion of Global Warming Countermeasures - GHG Emissions Accounting, Reporting, and Disclosure System; Overseas: IEA CO_2 Emissions from Fuel Combustion Highlights 2013)
Reporting company (Scopes 1, 2)	Direct emissions	Tons	Amount of CO_2 emissions from the consumption of fuel oil and gas (burning of fuel), and GHG emissions, other than CO_2 mainly at business sites owned by Fujitsu *For the calculation method, see "Greenhouse gas emissions (CO_2 emissions, greenhouse gas emissions other than CO_2) from business sites" in the Environmental Action Plan (Stage VIII).
	Indirect emissions from energy sources	Tons	CO_2 emissions from the consumption (purchase) of electricity and heat mainly at business sites owned by Fujitsu *For the calculation method, see "Greenhouse gas emissions (CO_2 emissions) at business sites" in the Environmental Action Plan (Stage VIII). Use IEA CO_2 Emissions from Fuel Combustion Highlights 2013 for some overseas business sites.
Downstream (Scope 3)	Processing of sold products	Tons	Intermediate product sales volume x Emissions per unit of processing volume Intermediate product sales volume is Fujitsu's device solution sales. Emissions per unit of processing volume is calculated from Fujitsu's FY2015 assembly plant data.
	Use of sold products	Tons	Electricity consumption during product use × Emissions per unit of electricity (Source: Actual emission factor for each electricity utility based on ministerial ordinances on calculation and adjusted emission factor for each electricity utility based on reporting orders, announced for each fiscal year from FY 2011 to FY 2015) Electricity consumption during product use is calculated as electricity usage for the anticipated usage time per product unit × Units shipped for the subject fiscal year. Electricity usage for the anticipated usage time per product unit is calculated as electricity consumed (kW) × Time used (h) / Days × Number of days used / Year × Number of years used. Time used (h), number of days used per year, and number of years used are set according to Fujitsu's internal scenarios.
	End–of–life treatment of sold products	Tons	(Weight of all sold products / Weight of products processed at Fujitsu's recycling centers during the year) × Electricity used at Fujitsu's recycling centers during the year × Emissions per unit of electricity (Source: Actual emission factor for each electricity utility based on ministerial ordinances on calculation and adjusted emission factor for each electricity utility based on reporting orders, announced for each fiscal year from FY 2011 to FY 2015)

Supplementary Data

Indicator	Unit	Calculation Method
Measured value of groundwater pollution	mg/L	The highest value in the fiscal year for substances detected at levels exceeding regulated levels set in the Soil Contamination Countermeasures Act etc. at monitoring wells at the boundaries of sites where past business activities have resulted in soil contamination.

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Operating Activities and Environmental Load (Material Balance)

Indicator			Unit	Calculation Method
INPUT				
	Raw Materials		ktons	Material inputs to our major products[1] shipped in the fiscal year (raw materials per unit for each product x the number of units shipped in the fiscal year)
Design/ Procurement/ Manufacturing/ Development	Chemical Substances	Volume of substances subject to VOC emissions restrictions	Tons	For the 20 VOCs (Volatile Organic Compounds) specified in the environmental voluntary action plans of the four electrical and electronic industry associations,[2] total amounts handled are provided for those substances handled in quantities exceeding 100 kg annually at individual business sites, including overseas sites. Substances subject to VOC emissions controls that are also covered by the PRTR law are included in the section on substances subject to VOC emissions controls
		Volume of PRTR-targeted substances	Tons	For the substances covered by the PRTR law (Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof), totals are provided for those substances handled in quantities exceeding 100 kg annually per business site, including overseas sites.
	Water usage		m^3	Annual use of clean water, industrial water, and groundwater (Not including groundwater extracted for purification or used for melting snow)
	Amount of recycled water		m^3	Annual amount of water used for manufacturing and other purposes, then recovered, processed, and used again for manufacturing and other processes
	Energy consumption (calorie basis)		GJ	$\sum($(Electricity, fuel oil, gas, and district heating and cooling annual usage) $\times$ Thermal conversion factor for each type of energy[1]) *1 Thermal conversion factor (Heating value unit): According to the "Act on the Rational Use, etc. of Energy" For town gas, conversion factors from each supplier or 44.8 GJ/1,000m³ were used.
		Purchased electricity	MWh	Annual electricity usage
		Bunker A, fuel oil, light oil, benzine, gasoline	kL	Annual fuel oil usage (or purchases)
		Natural gas	m^3	Annual natural gas usage (or purchases)
		Town gas	m^3	Annual town gas usage (or purchases)
		LPG	Tons	Annual LPG usage (or purchases)
		LNG	Tons	Annual LNG usage (or purchases)
		District heating and cooling	GJ	Annual district heating and cooling (cold and hot water for cooling and heating) usage (or purchases)
Distribution/ Sales	Energy consumed for transport		GJ	Total value of transport energy consumption for Fujitsu[1] and Fujitsu Group companies[2] *1 Fujitsu (domestic transport): Energy consumption related to domestic transport by the Fujitsu Group, based on the Act on the Rational Use of Energy "Logistics." *2 Fujitsu Group Companies: Calculated from the transport CO₂ emissions from OUTPUT (distribution and sales) using the ratio of Fujitsu (domestic transport) transport energy consumption to transport CO₂ emissions.
Usage	Energy	Electricity	GWh / GJ	Electricity consumed in connection with major products[1] shipped during the fiscal year (Amount of electricity used for time estimated per product unit × units shipped in the fiscal year)
Recycling of resources	Resource recycling rate		%	Based on the calculation method provided by JEITA, recycled components and resources as a percentage of the weight of used products processed in Japan. Excludes collected waste other than used electronic products.
	Processed volume		Tons	

Indicator			Unit	Calculation Method
OUTPUT				
Design/ Procurement/ Manufacturing/ Development	Raw Materials	CO₂ emissions	Tons CO₂	CO₂ emissions related to all stages from resource extraction through processing into raw materials (CO₂ emissions equivalent for raw materials used per product unit × Units shipped in the fiscal year) for the raw materials used in major products[1] shipped in the fiscal year.
	Chemical Substances	Volume of substances subject to VOC emissions restrictions	Tons	For the 20 VOCs (Volatile Organic Compounds) specified in the environmental voluntary action plans of the four electrical and electronic industry associations,[2] total amounts released are provided for those substances handled in quantities exceeding 100 kg annually at individual business sites, including overseas sites. Substances subject to VOC emissions controls that are also covered by the PRTR law are included in the section on substances subject to VOC emissions controls
		Volume of PRTR-targeted substances	Tons	For the substances covered by the PRTR law (Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof), released totals are provided for those substances handled in quantities exceeding 100 kg annually per business site, including overseas sites.
	Atmospheric Release	CO₂ emissions	Tons CO₂	* For the calculation method, see "Greenhouse gas emissions (CO₂ emissions) from business sites" in the Environmental Action Plan (Stage VIII).
		GHG emissions other than CO₂	Tons	* For the calculation method, see "Greenhouse gas emissions (GHG emissions other than CO₂) at business sites" in the Environmental Action Plan (Stage VIII).
		NOx emissions	Tons	NOx concentration (ppm) $\times 10^{-6} \times$ Dry gas emissions (m³N/hr) $\times$ Operating time (hr/yr) $\times 46/22.4 \times 10^{-3}$
		SOx emissions	Tons	SOx concentration (ppm) $\times 10^{-6} \times$ Dry gas emissions (m³N/hr) $\times$ Operating time (hr/yr) $\times 64/22.4 \times 10^{-3}$
	Water Discharge	Wastewater discharges	m^3	Annual water discharges into public waterways and sewers (Not including groundwater used for melting snow, but including groundwater extracted for purification when the amount of water is known)
		BOD emissions	Tons	BOD concentration (mg/l) $\times$ Water discharges (m³/yr) $\times 10^{-6}$
		COD emissions	Tons	COD concentration (mg/l) $\times$ Water discharges (m³/yr) $\times 10^{-6}$
	Waste	Amount of Waste Generated	Tons	* For the calculation method, see "Waste generated" in the Environmental Action Plan (Stage VIII).
		Thermal recycling volume	Tons	Among all types of waste put to effective use, the total volume used in thermal recycling * Thermal recycling: Recovery and use of the heat energy generated by incinerating waste.
		Material recycling volume	Tons	Among all types of waste put to effective use, the total volume used in material recycling * Material recycling: Processing of waste to facilitate its re-use, and re-use of processed waste as material or raw materials for new products.
		Disposal volume	Tons	Volume of industrial and general waste processed by, for example, landfilling or simple incineration
Distribution / Sales	Atmospheric Release		Tons CO₂	* For the calculation method, see "Transportation and distribution (upstream)" in the GHG Emissions Report based on GHG Protocol Standards.
Usage	Atmospheric Release		Tons CO₂	Emission intensity per electricity has changed since FY2014. For the calculation method, see "Use of sold products" in the GHG Emissions Report based on GHG Protocol Standards.

*1 **Major products:** Personal computers, mobile phones, servers, workstations, storage systems, printers, scanners, financial terminals, retail terminals, routers, LAN access equipment, access network products, mobile phone base stations, and electronic devices.
*2 **Four electrical and electronic industry associations:** The Japan Electrical Manufactures' Association (JEMA), Japan Electronics and Information Technology Industries Association (JEITA), Communications and Information Network Association of Japan (CIAJ), and Japan Business Machine and Information System Industries Association (JBMIA).

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Environmental Accounting/ Environmental Liabilities | Material Balance | GHG Emissions Report Based on GHG Protocol Standards | Supplementary Data | Environmental Performance Data Calculation Standards | **List of Organizations Covered by the Report on Environmental Activities** | Third Party Verification | GRI Guidelines Reference Table

List of Organizations Covered by the Report on Environmental Activities

▪ Organizations Covered
The coverage is of Fujitsu itself plus a total of 138 companies (including companies outside Japan) centering on consolidated subsidiaries that have built environmental management systems.
The table below shows the organizations for which individual performance data is gathered.

▪ Regarding the Indicators:
- Environmental burden: Organizations and Fujitsu's overseas non-manufacturing business sites for which business site environmental burden data is calculated
- Scope 1, 2, 3: Organizations that are the subject of calculations used in the GHG Emissions Report based on GHG Protocol Standards (p. 53)
- Logistics: Organizations for which logistics and transport data is calculated
- Environmental Accounting: Organizations for which environmental accounting data is calculated
- EMS: Organizations with Environmental Management Systems (EMS)

No.	Company name	Environmental burden	Scope 1, 2, 3	Logistics	Environmental Accounting	EMS
1	Fujitsu Limited	✓	✓	✓	✓	✓

Fujitsu Group companies in Japan (87 companies)

No.	Company name	Environmental burden	Scope 1, 2, 3	Logistics	Environmental Accounting	EMS
1	Fujitsu Advanced Printing & Publishing Co., Ltd.		✓	✓		✓
2	FUJITSU HOME & OFFICE SERVICES LIMITED		✓			✓
3	Fujitsu University		✓			✓
4	Kawasaki Frontale Limited		✓			✓
5	Fujitsu Refre Limited		✓			✓
6	Fujitsu Travelance Ltd.		✓			✓
7	Fujitsu Human Resource Professionals Limited		✓			✓
8	Fujitsu Techno Research Limited		✓			✓
9	Fujitsu CIT Limited		✓			✓
10	Toyama Fujitsu Limited	✓	✓			✓
11	Fujitsu Facilities Limited		✓			✓
12	OKINAWA FUJITSU SYSTEMS ENGINEERING LIMITED.		✓			✓
13	DIGITAL PROCESS LTD.		✓			✓
14	PFU LIMITED	✓	✓	✓		✓
15	FUJITSU BANKING SOLUTIONS LIMITED		✓			✓
16	SHIGA FUJITSU SOFTWARE LIMITED		✓			✓
17	FUJITSU BROAD SOLUTION & CONSULTING Inc.		✓			✓
18	FUJITSU SOCIAL SCIENCE LABORATORY LIMITED		✓			✓
19	FUJITSU MISSION CRITICAL SYSTEMS LIMITED		✓			✓
20	FUJITSU YFC LIMITED		✓			✓
21	FUJITSU NIIGATA SYSTEMS LIMITED		✓			✓
22	FUJITSU HOKURIKU SYSTEMS LIMITED		✓			✓
23	FUJITSU KYUSHU SYSTEMS LIMITED		✓			✓
24	FUJITSU KAGOSHIMA INFORNET LIMITED		✓			✓
25	FUJITSU FIP CORPORATION		✓			✓
26	FUJITSU CLOUD TECHNOLOGIES LIMITED		✓			✓
27	G-Search Limited		✓			✓
28	FUJITSU FSAS INC.		✓	✓		✓
29	FUJITSU COMMUNICATION SERVICES LIMITED		✓			✓
30	FUJITSU NETWORK SOLUTIONS LIMITED		✓			✓
31	Fujitsu Frontech Limited	✓	✓	✓	✓	✓
32	FUJITSU SYSTEM INTEGRATION LABORATORIES LIMITED		✓			✓
33	FUJITSU TOKKI SYSTEMS LIMITED		✓			✓
34	FUJITSU DEFENSE SYSTEMS ENGINEERING LIMITED		✓			✓
35	Fujitsu Applications, Ltd.		✓			✓
36	FUJITSU LEARNING MEDIA LIMITED		✓			✓
37	FUJITSU RESEARCH INSTITUTE		✓			✓
38	FUJITSU Marketing LIMITED		✓	✓		✓
39	FUJITSU FOM LIMITED		✓	✓		✓
40	FUJITSU CoWorCo LIMITED		✓	✓		✓
41	TWO-ONE LIMITED		✓			✓
42	FUJITSU I-NETWORK SYSTEMS LIMITED	✓	✓	✓	✓	✓
43	ECOLITY SERVICE LIMITED		✓		✓	✓
44	FUJITSU ADVANCED ENGINEERING LIMITED		✓			✓
45	Fujitsu Software Technologies Limited		✓			✓
46	FUJITSU MIDDLEWARE LIMITED		✓			✓
47	Fujitsu Kyushu Network Technologies Limited		✓			✓
48	FUJITSU TELECOM NETWORKS LIMITED	✓	✓	✓	✓	✓
49	FUJITSU COMPUTER TECHNOLOGIES LIMITED		✓			✓
50	FUJITSU IT PRODUCTS LIMITED	✓	✓	✓	✓	✓
51	Fujitsu Isotec Limited	✓	✓	✓	✓	✓
52	FUJITSU PERIPHERALS LIMITED	✓	✓	✓	✓	✓
53	FUJITSU PERSONAL SYSTEM LIMITED		✓			✓
54	Shimane Fujitsu Limited	✓	✓	✓	✓	✓
55	FUJITSU KASEI LIMIED		✓			✓
56	Fujitsu Integrated Microtechnologies Limited	✓	✓	✓	✓	✓
57	FUJITSU QUALITY LABORATORY LIMITED		✓			✓
58	Fujitsu Optical Components Limited	✓	✓	✓	✓	✓
59	FUJITSU KANSAI-CHUBU NET-TECH LIMITED		✓			✓
60	Fujitsu Mission Critical Software LTD.		✓			✓
61	FDK CORPORATION	✓	✓	✓	✓	✓
62	FUJITSU COMPONENT LIMITED	✓	✓	✓	✓	✓
63	Transtron Inc.		✓	✓		✓
64	FUJITSU ELECTRONICS INC.		✓			✓

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No.	Company name	Environmental burden	Scope 1, 2, 3	Logistics	Environmental Accounting	EMS
65	Fujitsu Semiconductor IT Systems Ltd.		✓			✓
66	FUJITSU FACILITIES ENGINEERING LIMITED		✓			✓
67	SHINKO ELECTRIC INDUSTRIES CO. LTD.	✓	✓	✓	✓	✓
68	FUJITSU TEN LIMITED	✓	✓	✓	✓	✓
69	FUJITSU TEN MANUFACTURING LIMITED	✓	✓			✓
70	FUJITSU LABORATORIES LTD.	✓	✓		✓	✓
71	FUJITSU SEMICONDUCTOR LIMITED	✓	✓	✓		✓
72	Fujitsu Design Limited		✓			✓
73	Fujitsu Advanced Technologies Limited		✓			✓
74	FUJITSU MOBILE COMMUNICATIONS LIMITED		✓			✓
75	Fujitsu Systems West Limited		✓			✓
76	Fujitsu Systems East Limited		✓			✓
77	FUJITSU CAPITAL LIMITED		✓			✓
78	MIE FUJITSU SEMICONDUCTOR LIMITED	✓	✓		✓	✓
79	AIZU FUJITSU SEMICONDUCTOR LIMITED	✓	✓			✓
80	AIZU FUJITSU SEMICONDUCTOR WAFER SOLUTION LIMITED	✓	✓		✓	✓
81	AIZU FUJITSU SEMICONDUCTOR MANUFACTURING LIMITED	✓	✓		✓	✓
82	AIZU FUJITSU SEMICONDUCTOR PROBE LIMITED	✓	✓			✓
83	Fujitsu IT Management Partner Co., Ltd.		✓			✓
84	Fujitsu IS Service Limite		✓			✓
85	Fujitsu Quality & Wisdom Limited		✓			✓
86	FUJITSU CLIENT COMPUTING LIMITED		✓	✓		✓
87	FUJITSU CONNECTED TECHNOLOGIES LIMITED		✓		✓	✓

Fujitsu Group companies worldwide (50 companies)

No.	Company name	Environmental burden	Scope 1, 2, 3	Logistics	Environmental Accounting	EMS
1	FUJITSU COMPUTER PRODUCTS OF VIETNAM	✓	✓		✓	✓
2	Jiangsu Fujitsu Telecommunications Technology Co., Ltd.		✓			✓
3	Fuitsu Electronics Pacific Asia Limited		✓			✓
4	Fuitsu Electronics (Shanghai) Co., Ltd.		✓			✓
5	FUJITSU HONG KONG LIMITED		✓			✓
6	FUJITSU DO BRASIL LIMITADA	✓	✓			✓
7	FUJITSU ASIA PTE. LTD.		✓			✓
8	FUJITSU NETWORK COMMUNICATIONS INC.	✓	✓	✓	✓	✓
9	Fujitsu America, Inc.	✓	✓	✓		✓
10	Fujitsu (Thailand) Co., Ltd.		✓			✓
11	Fujitsu PC Asia Pacific Pte Ltd.		✓	✓		✓
12	FUJITSU AUSTRALIA LTD.	✓	✓	✓		✓
13	Fujitsu Technology Solutions GmbH	✓	✓	✓	✓	✓
14	Fuitsu Electronics Europe GmbH		✓			✓
15	Nanjing Fujitsu Nanda Software Technology Co., Ltd.		✓			✓
16	FUJITSU SERVICES HOLDINGS PLC		✓	✓		✓
17	FUJITSU KOREA LTD.		✓			✓
18	FUJITSU TAIWAN LIMITED		✓			✓
19	Fujitsu Telecomunication Asia Sdn. Bhd.		✓			✓
20	FUJITSU (CHINA) HOLDINGS CO., LTD.		✓			✓
21	Fuitsu Technology and Business of America, Inc.		✓			✓
22	FUJITSU (XI'AN) SYSTEM ENGINEERING CO., LTD.		✓			✓
23	Beijing Fujitsu System Engineering Co., LTD.		✓			✓
24	Fujitsu Glovia, Inc.		✓			✓
25	FUJITSU AUSTRALIA SOFTWARE TECHNOLOGY PTY. LTD.		✓			✓
26	FUJITSU Enabling Software Technology GmbH		✓			✓
27	Fuitsu Electronics America, Inc		✓			✓
28	Fuitsu Electronics Korea Ltd.		✓			✓
29	Fujitsu Research and Development Center Co., Ltd.		✓			✓
30	Fujitsu Computer Products of America		✓	✓		✓
31	Fujitsu Frontec North America	✓	✓	✓		✓
32	FUJITSU COMPONENTS (CHANGZHOU) CO., LTD.	✓	✓			
33	QINGDAO KOWA SEIKO CO., LTD.	✓	✓			
34	FUJITSU COMPONENT (MALAYSIA) SDN. BHD.	✓	✓			
35	PT FDK INDONESIA	✓	✓			
36	XIAMEN FDK CORPORATION	✓	✓			
37	SUZHOU FDK CO., LTD.	✓	✓			
38	FUCHI ELECTRONICS CO., LTD.	✓	✓			
39	FUJITSU TEN CORP. OF THE PHILIPPINES	✓	✓			
40	FUJITSU TEN de MEXICO, S.A.de.C.V.	✓	✓			
41	FUJITSU TEN (THAILAND) COMPANY LIMITED	✓	✓			
42	TIANJIN FUJITSU TEN ELECTRONICS CO., LTD.	✓	✓			
43	FUJITSU TEN ELECTRONICS (WUXI) LTD.	✓	✓			
44	FUJITSU TEN ESPANA, S.A.	✓	✓			
45	FUJITSU DIE-TECH CORP OF THE PHILS.	✓	✓			✓
46	SHINKO ELECTRIC INDUSTRIES (WUXI) CO., LTD.	✓	✓			
47	KOREA SHINKO MICROELECTRONICS CO., LTD.	✓	✓			
48	SHINKO ELECTRONICS (MALAYSIA) SDN. BHD.	✓	✓			
49	TRANSTRON (THAILAND) CO., LTD.	✓	✓			✓
50	Fujitsu Consulting India	✓	✓			

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Third Party Verification

In order to ensure the reliability of the content of the Fujitsu Group Environmental Report 2017 and the Fujitsu Group CSR Report 2017, we ask a third party, Bureau Veritas Japan, to examine and post a review of the reports.

GREENHOUSE GAS EMISSIONS VERIFICATION STATEMENT

To: Fujitsu Limited

June 27, 2017

Bureau Veritas Japan Co., Ltd.
System Certification Services Headquarters

Bureau Veritas Japan Co., Ltd. (Bureau Veritas) was engaged by Fujitsu Limited (Fujitsu) to conduct independent verification of the greenhouse gas (GHG) emissions reported in the Fujitsu Group Environmental Report 2017 for FY2016.

1. Scope of Verification
Fujitsu requested Bureau Veritas to verify, to a limited level of assurance, the accuracy of the following GHG information:

1) Scope 1 and Scope 2 emissions:
- CO_2 emissions from energy use through business operations of Fujitsu, Fujitsu Group's 25 companies within Japan and 25 companies outside Japan for the period of April 1, 2016 through March 31, 2017
- HFCs, PFCs, SF_6 and NF_3 emissions through business operations of Fujitsu Group's three semiconductor manufacturing sites within Japan for the period of April 1, 2016 through March 31, 2017

2) Categories 1, 4 and 11 of Scope 3 GHG emissions accounted and reported in line with the GHG Protocol's 'Corporate Value Chain (Scope 3) Accounting and Reporting Standard' within the boundaries defined by Fujitsu for each category

2. Methodology
Bureau Veritas conducted the verification in accordance with the requirements of the international standard 'ISO 14064-3(2006): Greenhouse gases - Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions'.

As part of Bureau Veritas' assurance, the following activities were undertaken:
- Interviews with relevant personnel of Fujitsu responsible for the identification and calculation of GHG emissions;
- Review of Fujitsu's information systems and methodology for collection, aggregation, analysis and review of information used to determine GHG emissions; and
- Audit of a sample of source data to check accuracy of quantified GHG emissions.

3. Conclusion
Based on the verification work and processes followed, there is no evidence to suggest that the GHG emissions assertions shown below:
- are not materially correct and are not a fair representation of the GHG emissions, as per the scope of work;
- are not prepared in accordance with the methodology for calculating GHG emissions established and implemented by Fujitsu.

Verified greenhouse gas emissions		
Scope 1 208 kt-CO_2e	Scope 2 1,021 kt-CO_2e	Scope 3 7,039 kt-CO_2e

The breakdown of Scope 3 emissions are as follows.
Category 1: 2,432 kt-CO_2e | Category 4: 41 kt-CO_2e | Category 11: 4,566 kt-CO_2e

【Statement of independence, impartiality and competence】
Bureau Veritas is an independent professional services company that specializes in Quality, Health, Safety, Social and Environmental management with over 180 years history in providing independent assurance services. No member of the verification team has a business relationship with Fujitsu, its Directors or Managers beyond that required of this assignment. We conducted this verification independently and to our knowledge there has been no conflict of interest. Bureau Veritas has implemented a Code of Ethics across the business to maintain high ethical standards among staff in their day-to-day business activities. The verification team has extensive experience in conducting assurance over environmental, social, ethical and health and safety information, systems and processes.

Fujitsu Group CSR Report 2017 / Fujitsu Group Environmental Report 2017 Independent Verification Report

To: Fujitsu Limited

July 25, 2017

Bureau Veritas Japan Co., Ltd.
System Certification Services Headquarters

Bureau Veritas Japan Co., Ltd. (Bureau Veritas) has been engaged by Fujitsu Limited (Fujitsu) to conduct an independent verification and review of its sustainability performance indicators selected by Fujitsu for inclusion in the Fujitsu Group CSR Report 2017 and the Fujitsu Group Environmental Report 2017 (the Reports) issued under the responsibility of Fujitsu.
The aim of the verification is to evaluate and to provide an opinion, in the form of an independent statement, on the reliability and accuracy of selected sustainability performance indicators within the Reports based on objective evidence and to a limited level of assurance. The aim of the review work is to evaluate the quality of certain other sustainability performance indicators within the Reports in the interests of reporting improvement.

1. Outline of verification and review
Bureau Veritas conducted the following verification and review based on agreement with Fujitsu.
Verification and review of social and environmental performance indicators related to business operations in FY2016

Data verified or reviewed	Site Visited	Verification or Review Methodology
All indicators listed in Annex 1: 'The list of social performance indicators verified'	- Fujitsu Headquarters - Fujitsu Kawasaki Main Office	- Review of documentary evidence produced by Fujitsu Headquarters - Interviews with relevant personnel of Fujitsu Headquarters and Fujitsu Kawasaki Main Office - Comparison between the reported data and the supporting documentary evidence
All indicators listed on Annex 2: 'The list of environmental performance indicators verified and reviewed'	- Fujitsu Kawasaki Main Office - Fujitsu Akashi Plant - Fujitsu Tatebayashi System Center - FDK CORPORATION Kosai Plant - MIE FUJITSU SEMICONDUCTOR LIMITED	- Review of documentary evidence produced by Fujitsu Headquarters and the sites visited - Interviews with relevant personnel of Fujitsu Kawasaki Main Office and the sites visited - Site inspection and assessment of data monitoring process - Comparison between the reported data and the supporting documentary evidence

The verification was conducted using Bureau Veritas' standard procedures and guidelines for external verification of non-financial reporting, based on current best practice. Bureau Veritas refers to the International Standard on Assurance Engagements (ISAE) 3000 in providing a limited assurance for the scope of work stated herein.
The review was conducted using Bureau Veritas' standard procedures for external review of sustainability reporting.

2. Findings
On the bases of our methodology and the activities described above:
- Nothing has come to our attention to indicate that the reviewed information within the scope of our verification and review is inaccurate and does not provide a fair representation of the performance for the defined period.
- It is our opinion that Fujitsu has established appropriate systems for the collection, aggregation and analysis of quantitative data within the scope of our verification and review.

Bureau Veritas has implemented a code of ethics across its business which is intended to ensure that all our staff maintain high standards in their day to day business activities. We are particularly vigilant in the prevention of conflicts of interest. Bureau Veritas activities for Fujitsu are for sustainability reporting verification only and we believe our verification assignment did not raise any conflicts of interest.

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Annex 1

The list of social performance indicators verified

Performance indicators verified	Page
Number of attendees to Female Leadership Development Program	15
Rate of female managers	15, 60, 82
Employment rate of people with disabilities	15, 62, 82
Number of employees using the care leave support system	15, 68, 83
Foster global business leaders Number of attendees to Next-generation business leaders development programs	16
The number of periodic engagement with residents in regions with major business sites	16
The number of internal database records of social contribution activities	17
CSR activities with use of ISO26000 Number of group companies which performed survey based on ISO26000	20
Number of Directors	35, 82, 121
Frequency of industrial accidents	72, 83
Numbers and average ages of employees	82, 121, 123
Number of employees by age group	82
Hiring of recent college graduates	83
Employees by region	82, 122
Average years of service	83
Promoting socially responsible procurement (the number of written surveys to suppliers)	101

Annex 2

The list of environmental performance indicators verified and reviewed

Performance indicators verified		Page
Rate of newly developed products that are top-level energy efficient		26
Improvement rate of resource efficiency in newly developed products		28
Resource reuse rate of business ICT equipment		30
Amount of greenhouse gas emissions in our business facilities		32
Improving rate of energy intensity in our business facilities		
CO_2 emission from transport (Fujitsu and group companies in Japan)		37
Water usage		38
PRTR Substance and VOC Emissions		39, 52
Amount of waste generated		40
Effective utilization ratio		
INPUT (design, procurement, manufacturing, development)	Water	52
	Energy	
INPUT (recycling)	Resource recycling rate	
OUTPUT (design, procurement, manufacturing, development)	Chemical substances	
	Atmospheric release Greenhouse gases total	
	Atmospheric release CO_2	
	Atmospheric release Greenhouse gases other than CO_2	
	Volume of waste generated	
	Volume of thermal and material recycling	
	Volume of waste disposal	
OUTPUT (distribution) Atmospheric release CO_2 (Fujitsu and group companies in Japan)		
Scope3 (upstream) Transportation and distribution (Fujitsu and group companies in Japan)		53
Scope1 (reporting company) Direct emissions		
Scope2 (reporting company) Indirect emissions from energy sources		
Scope3 (upstream) Purchased goods and services		
Scope3 (downstream) Use of sold products		
Energy usage in Scope1 and Scope2		54

Performance indicators reviewed		Page
Amount of contribution to reducing emissions of greenhouse gases (GHG) through the provision of ICT		23
Improvement rate of PUE		33
Percentage of reduced CO_2 emission per sales from transport		37
CO_2 emission from transport (group companies in worldwide)		
Reduction in water usage		38
Environmental accounting		51
INPUT (design, procurement, manufacturing, development)	Chemical substances	52
INPUT (distribution) Energy		
OUTPUT (distribution) Atmospheric release CO_2 (group companies in worldwide)		
Scope3 (upstream) Transportation and distribution (group companies in worldwide)		53

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GRI Guidelines Reference Table (G4)

General Standard Disclosures

Indicator		Relevant page / topic
Strategy and Analysis		
G4-1	Statement from the most senior decision-maker	4　Top Message
G4-2	Key impacts, risks, and opportunities	5　Message from the Head of the Corporate Environmental and CSR Strategy Unit 45　Initiatives to Minimize Environmental Risk
Organizational Profile		
G4-3	Name of the organization	54　Fujitsu Group Profile
G4-4	Primary brands, products, and services	54　Fujitsu Group Profile
G4-5	Location of the organization's headquarters	54　Fujitsu Group Profile
G4-6	Number, and names, of countries where the organization operates	58　List of Organizations Covered by the Report on Environmental Activities
G4-7	Nature of ownership and legal form	—
G4-8	Markets served	—
G4-9	Scale of the organization: employees, operations, net sales	54　Fujitsu Group Profile
G4-10	Number of employees by employment contract and gender	—
G4-11	Percentage of employees covered by collective bargaining agreements	—
G4-12	Organization's supply chain	—
G4-13	Significant organizational changes during the reporting period	2　Significant Changes in Coverage
Commitments to External Initiatives		
G4-14	The precautionary approach or principle addressed by the organization	45　Initiatives to Minimize Environmental Risk
G4-15	Initiatives which the organization endorses	49　Tie-ups with External Organizations
G4-16	Membership in external associations	44　Acquiring Information on Chemical Substances Contained in Products 49　Tie-ups with External Organizations
Identified Material Aspects and Boundaries		
G4-17	List of entities included in the organization	—
G4-18	Process for defining the report content and the aspect boundaries	2　Editorial Policy

Indicator		Relevant page / topic
G4-19	List of specified material aspects	5　Message from the Head of the Corporate Environmental and CSR Strategy Unit 9　Special Feature 1: Fujitsu Group Medium/Long-term Environmental Vision 19　Fujitsu Group Environmental Action Plan Stage VIII 20　Contribution to Society 31　Our Business
G4-20	Aspect boundary for each material aspect (within the organization)	52　Material Balance 55　Environmental Performance Data Calculation Standards 58　List of Organizations Covered by the Report on Environmental Activities
G4-21	Aspect boundary for each material aspect (outside the organization)	—
G4-22	Reasons for any restatements of information provided in previous reports	20　Contribution to Society 31　Reducing Our Environmental Burden
G4-23	Changes to scope and aspect boundaries	2　Significant Changes in Coverage
Stakeholder Engagement		
G4-24	List of stakeholder groups engaged by the organization	49　Tie-ups with External Organizations
G4-25	Basis for identification and selection of stakeholders	47　Environmental Dialogues with Experts
G4-26	Engagement frequency and numerical totals	46　In-House Environmental Educational and Enlightenment Activities 47　Environmental Dialogues with Experts 49　Social Contribution Activities
G4-27	Key topics and concerns raised through stakeholder engagement	47　Environmental Dialogues with Experts
Report Profile		
G4-28	Reporting period	2　Reporting Period
G4-29	Date of most recent previous report	2　Published
G4-30	Reporting cycle	2　Published
G4-31	Contact point for questions regarding the report	2　Editorial Policy
GRI Content Index		
G4-32	The 'in accordance' option the organization has chosen	—
Assurance		
G4-33	Policy and practice regarding external assurance for the report	60　Third Party Inspection
Governance		
*G4-51 to G4-55 do not apply.		

| Top Message | Message from the Head of Corporate Environmental and CSR Strategy Unit | Special Feature 1: The Fujitsu Group Medium/Long-term Environmental Vision | Special Feature 2: Digital Co-creation | Fujitsu Group Environmental Action Plan Stage VIII | Chapter I Contribution to Society | Chapter II Our Business | Environmental Management | Data Overview |

| Environmental Accounting/ Environmental Liabilities | Material Balance | GHG Emissions Report Based on GHG Protocol Standards | Supplementary Data | Environmental Performance Data Calculation Standards | List of Organizations Covered by the Report on Environmental Activities | Third Party Verification | GRI Guidelines Reference Table |

Indicator		Relevant page / topic	
G4-34	Governance structure	42	Environmental Management
G4-35	Process for delegating authority for economic, environmental and social topics	42	Environmental Management
G4-36	Appointees with responsibility for reporting economic, environmental and social topics	42	Environmental Management
G4-37	Processes for consultation between stakeholders and the highest governance body	42	Environmental Management
G4-38	Composition of the highest governance body	42	Environmental Management
G4-39	Whether the Chair of the highest governance body is also an executive officer	42	Environmental Management
G4-40	Nomination and selection processes	—	
G4-41	Processes for avoiding conflicts of interest	—	
G4-42	Roles in the development of purpose, policies, and strategies	42	Environmental Management
G4-43	Enhancing knowledge of economic, environmental and social topics	—	
G4-44	Evaluation with respect to governance of economic, environmental and social topics	42	Environmental Management
G4-45	Identification of economic, environmental and social impacts, risks, and opportunities	42	Environmental Management
G4-46	Roles in risk management processes for economic, environmental and social topics	42	Environmental Management
G4-47	Review of economic, environmental and social impacts, risks, and opportunities	42	Environmental Management
G4-48	Highest committee or position that approves the report	—	
G4-49	Process for communicating critical concerns	42	Environmental Management
G4-50	Nature and number of critical concerns that were communicated	—	

Ethics and Integrity

*G4-56 to G4-58 do not apply.

Specific Standard Disclosures: Economic
*G4-EC1, G4-EC3 to G4-EC7, G4-EC9 do not apply.

Indicator		Relevant page / topic	
Aspect: Economic Performance			
G4-EC2	Financial implications and other risks and opportunities for the organization's activities due to climate change	45 51	Initiatives to Minimize Environmental Risk Environmental Accounting

Indicator		Relevant page / topic	
Aspect: Indirect Economic Impacts			
G4-EC8	Significant indirect economic impacts, including the extent of impacts	5 45 51	Message from the Head of the Corporate Environmental and CSR Strategy Unit Initiatives to Minimize Environmental Risk Environmental Accounting

Specific Standard Disclosures: Environmental

Indicator		Relevant page / topic	
Aspect: Materials			
EN1	Materials used by weight or volume	52	Material Balance
EN2	Percentage of materials used that are recycled input materials	—	
Aspect: Energy			
EN3	Energy consumption within the organization	52	Material Balance
EN4	Energy consumption outside of the organization	52	Material Balance
EN5	Energy intensity	54	Energy Usage (Scope 1 and Scope 2)
EN6	Reduction of energy consumption	32 33 36 37	Reducing Greenhouse Gases (GHG) Emissions and Boosting Energy Intensity at Our Business Sites Improve Power Usage Effectiveness (PUE) at Our Data Centers Drive Activities to Reduce CO_2 Emissions in the Supply Chain Reduce CO_2 Emissions from Transportation
EN7	Reductions in energy requirements of products and services	26	Development of Top-Level Energy Efficient Products
Aspect: Water			
EN8	Total water withdrawal by source	—	
EN9	Water sources significantly affected by withdrawal of water	—	
EN10	Percentage and total volume of water recycled and reused	38	Reducing the Amount of Water Used
Aspect: Biodiversity			
EN11	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	—	
EN12	Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas	49	Social Contribution Activities

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Environmental Accounting/ Environmental Liabilities | Material Balance | GHG Emissions Report Based on GHG Protocol Standards | Supplementary Data | Environmental Performance Data Calculation Standards | List of Organizations Covered by the Report on Environmental Activities | Third Party Verification | GRI Guidelines Reference Table

Indicator		Relevant page / topic	
EN13	Habitats protected or restored	49	Social Contribution Activities
EN14	Total number of iucn red list species and national conservation list species with habitats in areas affected by operations, by level of extinction risk	—	
Aspect: Emissions			
EN15	Direct greenhouse gas (GHG) emissions (scope 1)	53	GHG Emissions Report Based on GHG Protocol Standards
EN16	Energy indirect greenhouse gas (GHG) emissions (scope 2)	53	GHG Emissions Report Based on GHG Protocol Standards
EN17	Other indirect greenhouse gas (GHG) emissions (scope 3)	53	GHG Emissions Report Based on GHG Protocol Standards
EN18	Greenhouse gas (GHG) emissions intensity	32	Reducing Greenhouse Gases (GHG) Emissions and Boosting Energy Intensity at Our Business Sites
EN19	Reduction of greenhouse gas (GHG) emissions	32	Reducing Greenhouse Gases (GHG) Emissions and Boosting Energy Intensity at Our Business Sites
EN20	Emissions of ozone-depleting substances (ODS)	—	
EN21	NOx, SOx, and other significant air emissions	52	Material Balance
Aspect: Effluents and Waste			
EN22	Total water discharge by quality and destination	52	Material Balance
EN23	Total weight of waste by type and disposal method	40 52	Limiting Amounts of Waste Generated Material Balance
EN24	Total number and volume of significant spills	—	
EN25	Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, III, and VIII, and percentage of transported waste shipped internationally	—	
EN26	Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the organization's discharges of water and runoff	—	
Aspect: Products and Services			
EN27	Extent of impact mitigation of environmental impacts of products and services	26 28	Development of Top-Level Energy Efficient Products Improving the Resource Efficiency and Resource Circulation of Products

Indicator		Relevant page / topic	
EN28	Percentage of products sold and their packaging materials that are reclaimed by category	30 52	Product Recycling Material Balance
Aspect: Compliance			
EN29	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations	43	Status of Environmental Compliance
Aspect: Transport			
EN30	Significant environmental impacts of transporting products and other goods and materials for the organization's operations, and transporting members of the workforce	37 52	Reduce CO_2 Emissions from Transportation Material Balance
Aspect: Overall			
EN31	Total environmental protection expenditures and investments by type	51	Environmental Accounting / Environmental Liabilities
Aspect: Supplier Environmental Assessment			
EN32	Percentage of new suppliers that were screened using environmental criteria	—	
EN33	Significant actual and potential negative environmental impacts in the supply chain and actions taken	—	
Aspect: Environmental Grievance Mechanisms			
EN34	Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms	54	Response to Environmental Complaints (FY 2016)

Specific Standard Disclosures: Society
*Labor Practices and Decent Work, Human Rights ,Product Responsibility do not apply.

Indicator		Relevant page / topic	
Society			
*G4-SO1, G4-SO3 to G4-SO11 do not apply.			
G4-SO2	Operations with significant actual and potential negative impacts on local communities	45 54	Preventing Pollution of Soil and Groundwater Business Sites Where Soil or Groundwater Contamination Has Been Found