Leading-Edge Green ICT R&D

We are concerned with reducing environmental burdens from the initial policy formulation stages in our leading-edge R&D, and are continuously creating technologies that contribute to saving energy and the use of next-generation sources of energy.

Basic Approach

Promote the Development of Products and Services that Contribute to Lower Environmental Burdens

To achieve the goal of reducing CO2 emissions by about 30 million tons a year in Japan by 2020, as proposed in our medium-term environmental vision Green Policy 2020, we need to develop revolutionary leading-edge technologies that are even more effective at reducing environmental impact.

Fujitsu Laboratories Ltd., which handles the Fujitsu Group's leading-edge green ICT R&D, has introduced the slogan "Further strengthen leading-edge green ICT R&D and contribute even more to Fujitsu Group business," and is pushing forward with R&D on technologies that can help lower environmental burdens. Based on the concept of Green R&D, we are establishing and implementing policies from an environmental standpoint in all development work, from materials and devices through to facilities, systems and solutions.

Basic Approach to R&D

Promoting the development of revolutionary leading-edge technologies with green ICT as a priority area

- Rendering visible the low-carbon benefits across the entire value chain
- Low-carbon technologies for ubiquitous equipment
- Energy-saving technologies for datacenters and networks
- Environmental solution technologies

Synergies between overall technology development and open innovation

- Consolidation of elemental technologies from materials and devices to solutions
- Global technology collaborations

Initiatives in FY 2012

Quantitatively Evaluating CO2 Emission Reduction Benefits from the R&D Stage

To accelerate our environmentally-oriented R&D, for all of our leading-edge technologies being developed, since FY 2010 Fujitsu Laboratories has been promoting initiatives to quantitatively evaluate the benefits of reduced CO2 emissions (i.e. environmental contribution) at the usage stage of products and services leveraging those technologies. These initiatives are implemented across all units in our laboratories, enabling researchers to evaluate the environmental impact of their technologies, thus clarifying R&D factors that should be focused on from an environmental perspective. Furthermore, by including "environmental impact" as an additional aspect for the technology-evaluation axes of "performance/ functionality/quality" and "cost" that had been primarily used to evaluate technologies thus far, well-balanced R&D of leading-edge technologies developed across these 3 axes is enabled.

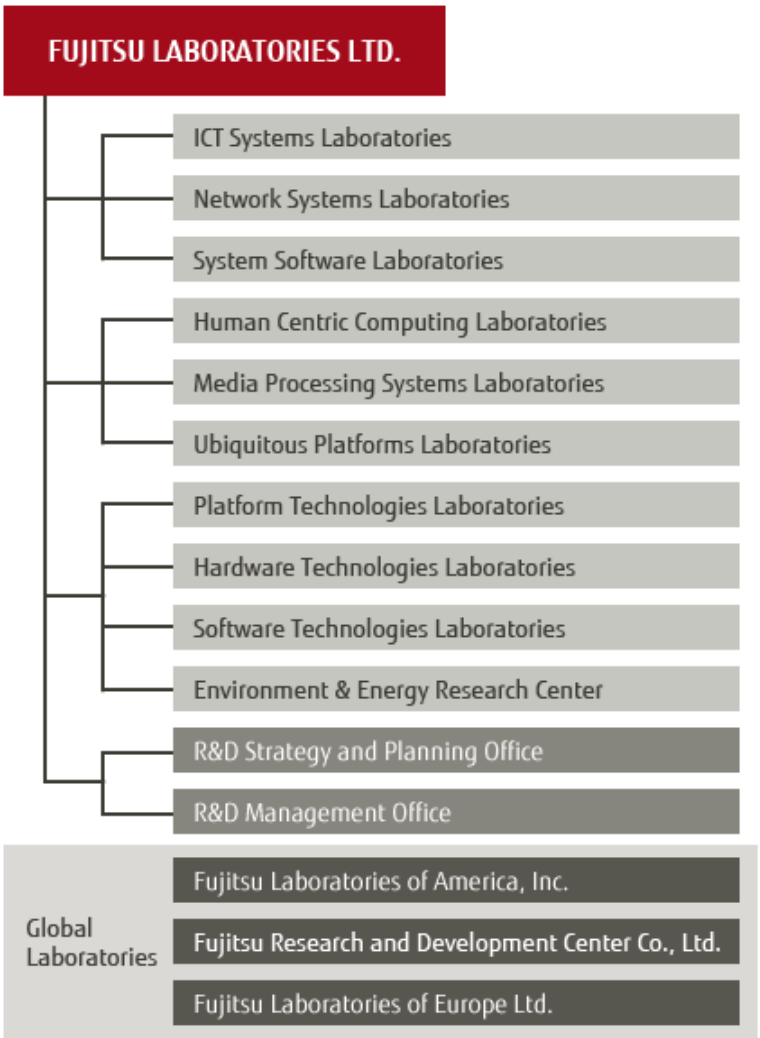
The Fujitsu Group Environmental Protection Program (Stage VI), which covers the period FY 2010 to FY 2012, sets forth "Strengthening leading-edge green ICT R&D" as a priority, and divides this into two areas with specific targets: next-generation datacenters and networks, and solutions.

The target for the next-generation datacenter and network area is developing technologies that can double the overall efficiency*1 of ICT equipment*2 by the end of FY 2012 (April 2012 - March 2013). The target for the solutions area, also by the end of FY 2012, is to increase by at least 70% the development ratio*3 for technologies that improves the effective reduction of environmental burdens.

In FY 2012, we achieved the FY 2012 target of developing technologies that can increase ICT equipment efficiency by at least 2.0 times. We did this by developing technologies in the area of next-generation datacenters and networks. These include a high-capacity power supply technology for servers that is capable of 94.8% conversion efficiency and technology that increases the efficiency of fiber optic network resource usage, enabling up to 40% greater communications capacity. We also met our FY 2012 target in the solutions area, where we were able to achieve a development ratio of 73% for technologies that improve the effective reduction of environmental burdens, and thus met our target of 70% for the fiscal year.

While further increasing the environmental contribution of our leading-edge technologies, Fujitsu Laboratories will aim to expand applications to areas such as complete systems, including those in which the individual technologies, operations and management work together.

Organization of Fujitsu Laboratories Ltd. (As of May 2013)



*1 Overall efficiency:
Efficiency of electricity consumption

*2 Efficiency of ICT equipment:
This refers to the total efficiency of various "efficient-ICT equipment" combined, with such equipment made efficient by individual technologies developed.

*3 Development ratio:
Development ratio of technologies that improve the effective reduction of environmental burden = (Technologies that improve the effective reduction of environmental burden / All technologies developed) x 100

Case Study

Energy-Saving A/C Fan Control Technology for Container Datacenters

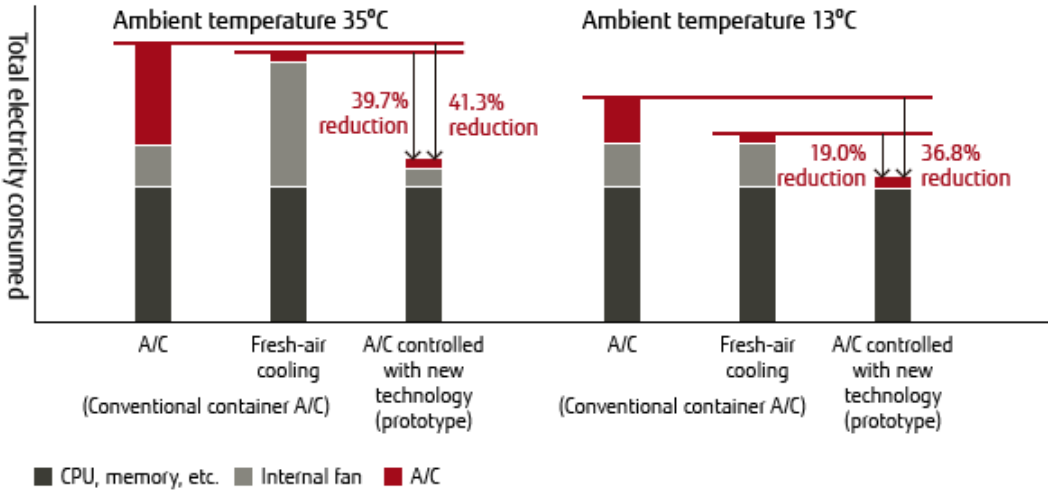
In April 2012, Fujitsu Laboratories Ltd. announced the development of energy-saving system control technology that uses server information to control air-conditioner fans for datacenters.

Prototype container datacenter

Using servers that lack internal fans and using only container air-conditioning fans for cooling is an effective way to cut the electricity consumption of container datacenters. Air-conditioning systems in conventional datacenters, however, operate without detecting the temperatures of individual servers and their CPUs. This wastes electricity on excessive cooling and can result in performance declines due to inadequately cooled CPUs.

The technology newly developed by Fujitsu controls container air-conditioning fans based on assessments of CPU temperatures relative to ambient temperature, and electricity consumption data for servers. This maintains appropriate server operations and minimizes the datacenter's overall electricity consumption. In prototype testing, energy consumption was reduced by up to approximately 40% compared to a conventional container datacenter consisting of servers with internal fans (See the figure below.) Fujitsu Laboratories is performing verification testing of this technology with plans for applying it in the operating and management systems of datacenters planned for introduction in FY 2013.

Energy-Saving Performance of Fujitsu's Energy-Saving System Control Technology



- Fujitsu Develops Power Saving System Control Technology for Container Data Centers [Press Release]

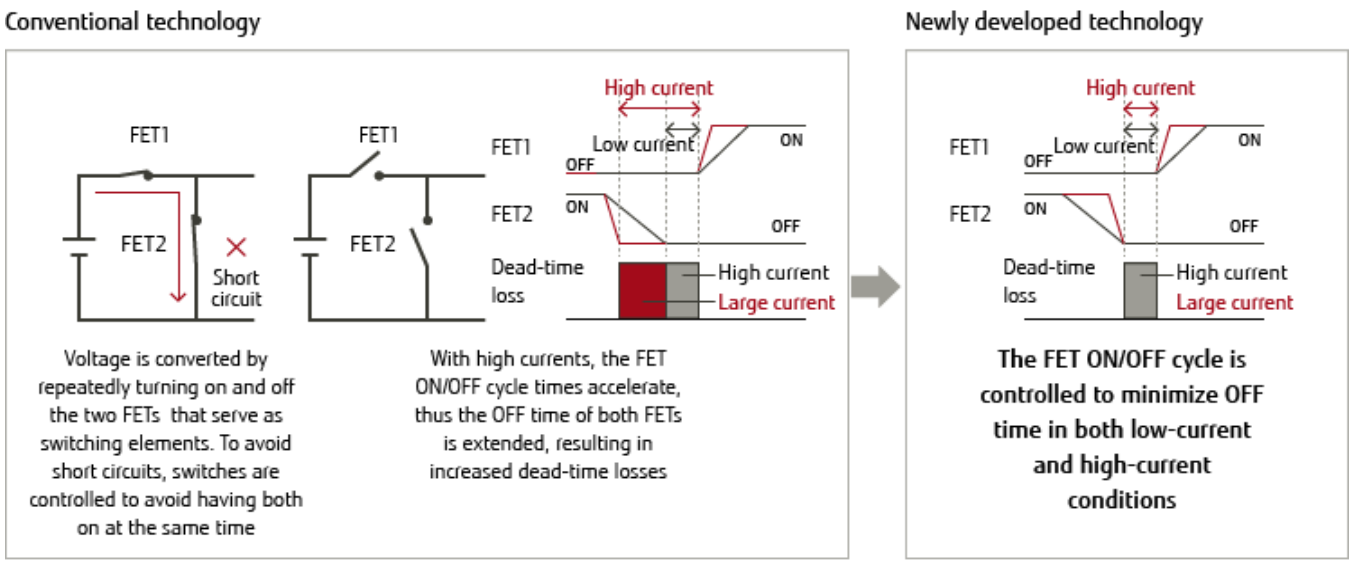
Case Study

High-Output Server Power Supply Unit with the World's Highest Conversion Efficiency

In April 2012, Fujitsu Laboratories Limited announced the development of a new high-output power supply unit that provides high-performance servers with 2.3 kW of power and, at 94.8%, the world's highest conversion efficiency rate. This technology reduces server electricity consumption and contributes greatly to energy efficiency for datacenters.

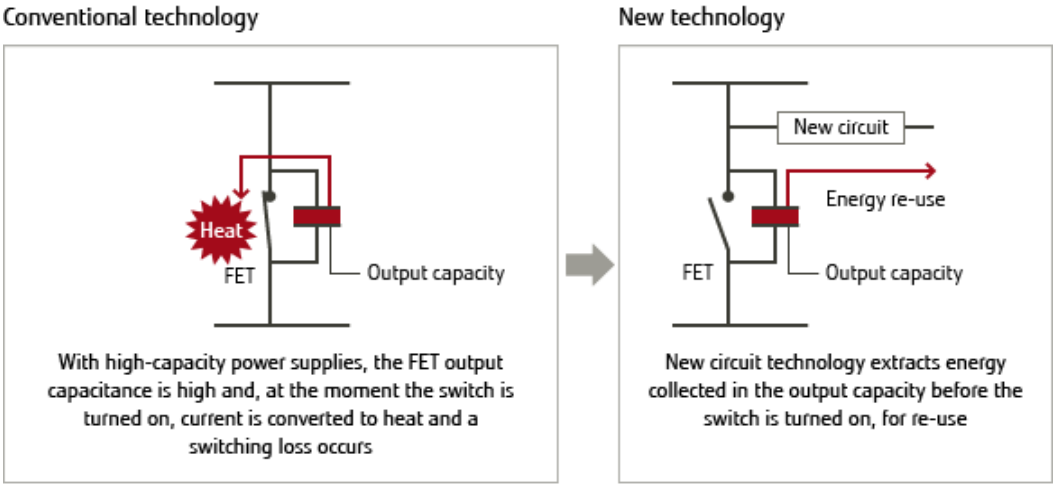
Power supply units that provide power to servers convert AC power to DC power, losing some power in the process. In reducing the overall power consumption of servers, therefore, it is important to increase the power conversion efficiency rate. Fujitsu has reduced power losses by using digital control technology and newly developed circuit technology. Efforts to achieve even greater efficiency, and evaluate reliability and stability, will move forward with plans to include this power supply unit in 2014 server products.

Digital Control Technology that Alleviates Dead-time Loss in Voltage Conversion



FET: Field Effect Transistor

New Circuit Technology for Reducing Switching Loss at the Moment the FET is Switched On



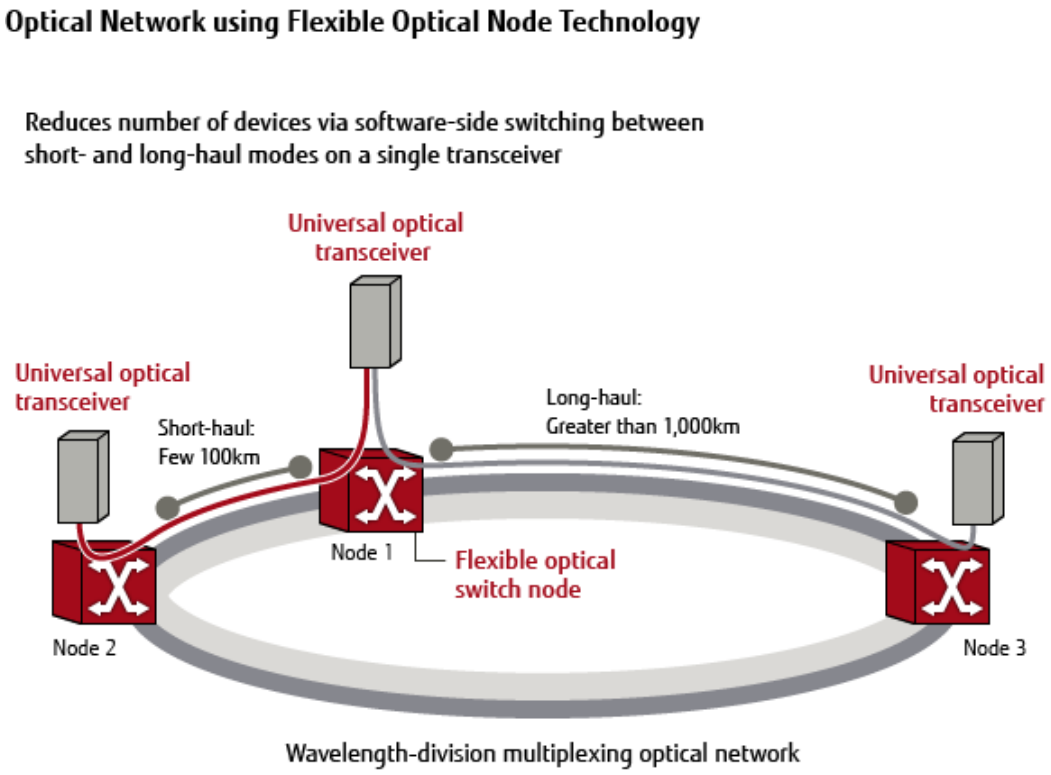
- Fujitsu Develops a 2.3kW High-capacity Power Supply Unit for Servers Offering a World-leading Conversion Efficiency Rate of 94.8% [Press Release]

Case Study

World's First Technology for Increasing Utilization Efficiency for Optical Network Resources without Disrupting Service

Fujitsu Laboratories Ltd, Fujitsu Laboratories of America, Inc., and Fujitsu Limited announced in September 2012 the development of the world's first technology for future long-haul and metropolitan optical networks that can dynamically alter the architecture of optical network resources and enhance utilization efficiency without disrupting service.

Development efforts have resulted in two new technologies. One is "flexible optical node" technology that is not subject to optical signal wavelength, modulation scheme, or route limitations. The other is "spectrum defragmentation" technology that uses portable optical nodes to increase the utilization efficiency of in-service optical network resources. These technologies enable the lowering of power consumption through the use of fewer network devices, and improve network communications capacity by up to 40%.



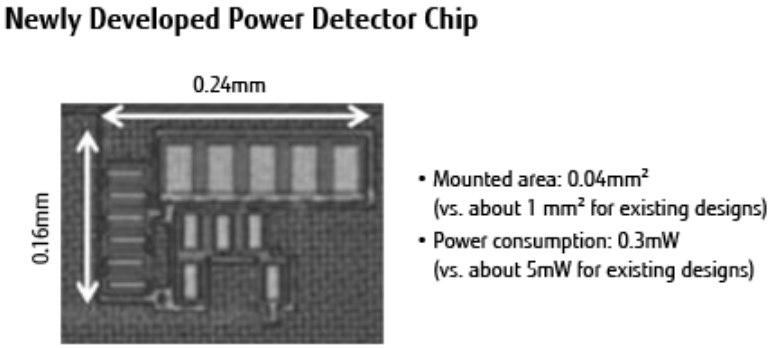
- Fujitsu Develops World's First Technology to Increase Efficiency of In-Service Optical Network Resources [Press Release]

Case Study

Compact, Low-Power Power Detector for Smartphones and Other Mobile Terminals

Fujitsu Laboratories Limited announced in September 2012 the development of a compact, low-power CMOS power detector for use in smartphones and other mobile terminals.

By using a diode-based power detector with a new technology for temperature compensation, the new CMOS power detector enables high-precision power detection without the use of a large amplifier. Requiring only 1/25th the mounted area of conventional detectors and less than 1/10th the power, the new product contributes to efforts to make mobile terminals smaller, less expensive, and more energy efficient. Going forward, this technology will be used to further improve detection precision.



- Fujitsu Develops World's First On-chip CMOS Power Detector with Temperature Compensation [Press Release]

- Leading-Edge Green ICT R&D : Case Study Archives

Fujitsu Group Environmental Action Plan Stage VII

Development of Innovative Technologies that Can Help to Lower the Environmental Burden of Solutions and Products

The amount of information flowing across the Internet is continually growing, and it is anticipated that there will be a rise in the amount of electricity consumed by ICT devices and related solutions and services, which support increasingly information-dependent social infrastructure. In addition, considering the growth of emerging economies and the re-examination of dependence on various energy resources, with a renewed awareness in the wake of the Great East Japan Earthquake, there is a pressing need to realize a sustainable, low-carbon society.

With R&D priorities in the domains of Ubiquitous Innovation, Social Innovation, IC Innovation, and Manufacturing Innovation, by developing environmentally valuable innovative technologies and through the provision and use of solutions, services, and products, Fujitsu Laboratories is contributing to the realization of an environmentally conscious, prosperous society.

FY 2013 Initiatives

In FY 2013, Fujitsu Laboratories Ltd. is continuing initiatives aimed at quantitatively evaluating the CO2 reduction impacts of technologies under development. It is also considering benchmarks that would enable novel measurements of resource efficiency in the case of technologies for which the calculation of CO2 equivalents is impractical.

This recurring cycle, in which objective evaluations of advanced technology are performed and results are then fed back to R&D units by the Leading-Edge Green R&D Committee, is the vehicle through which the environmental value of research results is continuously enhanced and innovative technologies offering high environmentally valuable are developed. We use press releases and other media to actively disseminate information on the innovative technologies we develop and help to lower the environmental burden of society by turning these technologies into products.

Eco-Friendly Products

We promote eco-friendly design in our products to lower their environmental impact throughout their whole life cycles.

Eco-Friendly Product Development

The Fujitsu Group has adopted a unified Group-wide approach to eco-design for newly designed products and works to improve environmental performance throughout the product life cycle. We have been implementing our own environmental assessments for all of our products since 1993, and strive to develop eco-friendly products that reflect environmental considerations in such areas as energy saving, 3R design*1, non-use of hazardous chemical substances, packaging materials, and information disclosure.

*1 3R design:
Design based on the principles of reduce, reuse and recycle

Development of Green and Super Green Products

The Fujitsu Group has established its Procedure for Product Environmental Green Assessment to further the development of environmentally conscious products. Products that meet these standards are designated as Green Products. We are constantly upgrading our Green Product Evaluation Standards in an effort to strengthen and improve the efficiency of our Green Product development.

To pursue the design of environmentally conscious products at a global level, we comply with the international IEC 62075 standard*2 and our own Eco Design Standard*3, which we established in 2011 to incorporate environmental and other market demands. Fujitsu PCs and servers are designed in Japan and Europe, based on these standards, and sold globally.

In developing new products, we work to create "Super Green Products." Super Green Products are those that meet the required conditions for Green Products and are also top-class in terms of low energy consumption and/or 3R design technology, non-use of hazardous substances, packaging materials and use of eco-friendly materials and technologies. Super Green Products are products or systems recognized as having environmental characteristics superior to those of others we supply or that are available on the market. In FY 2010, the definition of Super Green Products was revised to include the stricter requirement of "being in the top level in both energy saving and other parameters (such as resource saving)."

In FY 2012, another 12 products were recognized as being Super Green Products. Since we began this scheme in FY2010, the number of Super Green Products has steadily increased and for the updated 2012 total, 39% of our Green Products were also Super Green Products, meaning we had achieved the target set in Fujitsu Group Environmental Action Plan (StageVI).

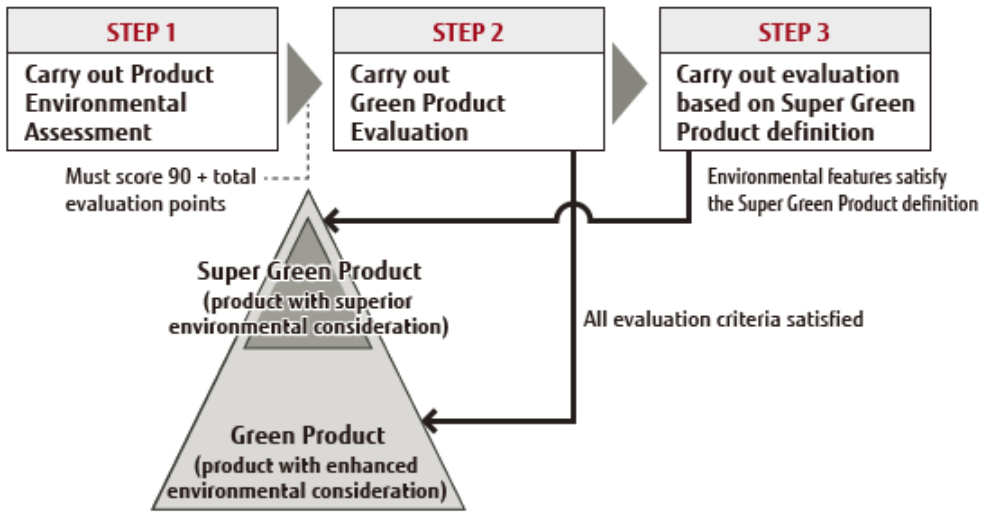
*2 IEC 62075:
Standard on "Audio/video, information and communication technology equipment-Environmentally conscious design." This standard was published in 2008 and established as JIS C 9914 in 2010 in Japan.

*3 Covered products:
Personal computers, servers, and storage systems.

Evolution of Environmentally Conscious Design

Period	Environmental Action Plan Targets and Measures	Regulation Formulation
Environmental Protection Program (Stage I) (FY 1993 - FY 1995)	• Improve product recyclability by 50% compared to FY 1992	Guideline for Product Environmental Assessment
Environmental Protection Program (Stage II) (FY 1996 - FY 2000)	• Product recycling measures • Advancement of Green Product development	Procedure for Green Product Evaluation Procedure for LCA
Environmental Protection Program (Stage III) (FY 2001 - FY 2003)	• Make all newly developed products Green Products	Procedure for OEM Product Environmental Evaluation
Environmental Protection Program (Stage IV) (FY 2004 - FY 2006)	• Offer Super Green products from the main product groups of all business units	Procedure for Product Environmental Green Assessment Procedure for Super Green Product Operation
Environmental Protection Program (Stage V) (FY 2007 - FY 2009)	• From all business units, provide newly developed products 50% or more of which are Super Green • Achieve environmentally efficiency factor of 2	Procedure for Environmental Efficiency Factor Evaluation
Environmental Protection Program (Stage VI) (FY 2010 - FY 2012)	• From all business units, provide newly developed products 30% or more of which are Super Green • Achieve environmentally efficiency factor of 4.0	Eco Design Standard
Environmental Action Plan (Stage VII) (FY 2013 - FY 2015)	• Make 50% of all new products top-level performers in terms of energy efficiency • Improve resource efficiency for new products by 20% compared to FY 2011	-

Mechanism for Green and Super Green Product Evaluation



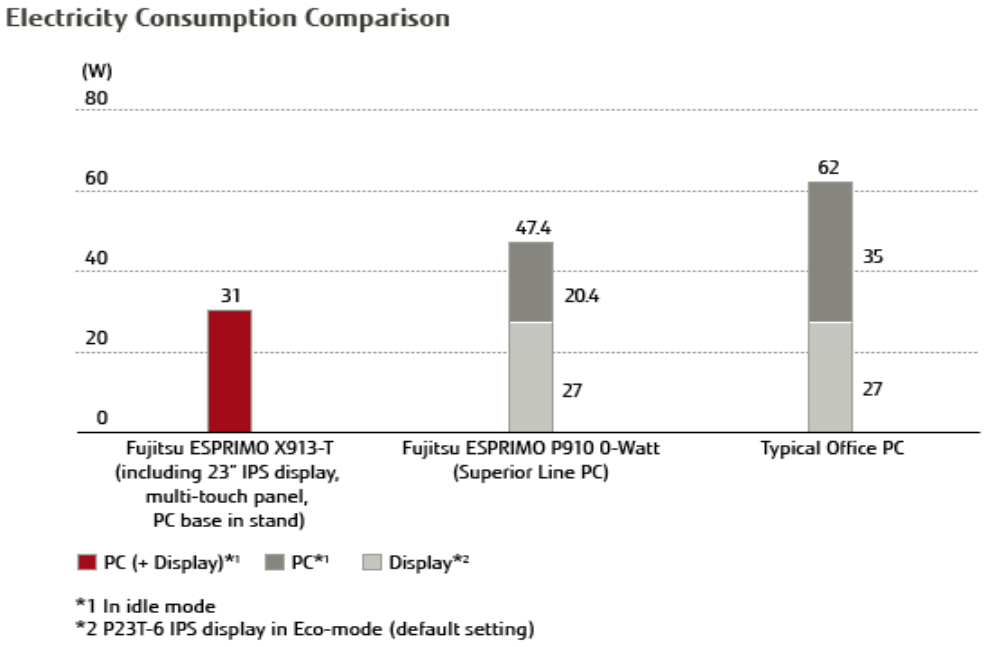
Case Study

Fujitsu ESPRIMO X913-T - stylish front-end device PC features space-saving design and the latest power-saving technology

From the earliest stage of development the Fujitsu ESPRIMO X913-T has incorporated energy conservation concepts in its design. The seamless frame, slim-panel and the adjustable stand with an integrated base unit reduce the number of parts and the overall material consumption. Best possible compliance with international standards is achieved with certifications like EPEAT and ENERGY STAR®.

ESPRIMO X913-T

A 90% efficient onboard power supply is integrated into the base unit of the Fujitsu ESPRIMO X913-T. It is designed according to the 80 PLUS Gold certification and performs even under low loads (10% load) with an energy efficiency of 87%. This leads to highest energy savings to cut customers' costs and reduces the cabling to a minimum.
Further energy savings can be addressed using the presence sensor in the optional multifunction module. The ultrasound presence sensor detects the movement and body outline of anyone sitting within the sensor's range. When the user leaves his PC different settings can be chosen to achieve maximum energy savings. This leads to energy savings of up to 50% versus a typical office PC:



VOICE

Fujitsu Technology Solutions ESPRIMO X913-T System Developer Wilhelm Neukam

Supplied with or without a touch panel, depending on the customer's desires, the newly developed Esprimo X series products manifest the Fujitsu brand promise of "Shaping tomorrow with you." This new series responds to customers' needs for environmentally conscious products and demonstrates once again Fujitsu's leadership at the forefront of ICT products.

Case Study

Fujitsu PRIMERGY TX120 S3p
The World's Most Energy-Efficient Tower Server

Fujitsu's PRIMERGY servers deliver the ultimate in productivity, cost performance, and flexibility, and simultaneously lower environmental burden while supporting increases in datacenter efficiency and energy cost reductions, for organizations of all sizes. The PRIMERGY TX120 S3p, introduced in May 2012, features a power supply with a high, 90%, conversion efficiency rating and patented 0-Watt technology that completely eliminates losses in off mode. Power consumption savings, in other words, are achieved not only when the server is being used but also when it's not. At over 6,100 overall ssj_ops/watt, the PRIMERGY TX120 S3p leads the world on the SPECpower_ssj®2008*4 benchmark for server energy efficiency.

PRIMERGY TX120 S3p

With its ultra-compact form factor, the PRIMERGY TX120 S3p requires very little space. It also weighs less than half a conventionally sized server and is made with far fewer resources. Its super-quiet system means this server can be used in office environments and even on desks. And its use of a halogen-free motherboard is just one more example of our commitment to doing ever we can to lower environmental burden.

*4 SPECpower_ssj®2008:
An industry-standard benchmark developed by Standard Performance Evaluation Corporation (SPEC®) to evaluate the energy efficiency of volume server class computers.

VOICE

Fujitsu Technology Solutions, Senior Director of Product Management for Servers
Uwe Romppel

For datacenters and offices, it is not enough for servers to be friendly to the environment. Whether in a small office, or large-scale datacenter, the ICT platform must be suited to the customer's needs. An appropriate level of performance and the highest levels of energy efficiency are absolute requirements; but there are also cases in which compact design and minimal noise are key concerns. PRIMERGY servers are solutions that deliver the computing power businesses demand and do so with the industry's highest levels of customizability.

Case Study

Smartphones Friendly to the Environment and People

ARROWS series smartphones, as the first smartphones in the Japanese market to offer a quad-core processor (F-10D and ISW13F), full-HD LCD (F-02E) and Softbank 4G compatibility (201F), and the world's first smartphone to offer Raku-Raku touch panel technology (F-12D), are constantly rising to the challenge of applying cutting-edge technologies. In the series' tablet computers (F-05E), we combined energy-saving technologies and a high-capacity battery to achieve battery life among the best in the industry. Also, with our proprietary "Human-Centric Engine" technologies for improving the user's visual, audio, and touch experience, tight security, and other features that realize ultimate ease-of-use, as well as water-resistance built into every model, we offer usability for a wide range of users in a range of different environments.

ARROWS Series

In developing these products, compliance with the RoHS Directive and other chemical substance restrictions is a given. We also, however, use Virtual Product Simulator (VPS) environments relying mainly on 3D-CAD systems to minimize resource usage in prototypes; display materials used in components, in order to facilitate recycling; take steps like reusing components in repairs; and work in other ways, as well, to use fewer resource in all product-related processes. As a result, all of our ARROWS series smartphones have been certified as Super Green products. Going forward, we aim to take these initiatives to an even higher level and further improve energy-efficiency performance to offer smartphones that are even friendlier to the environment and people.

VOICE

Mobile Phones Unit, Mobile Phones Division, Director of Engineering Dept.1
Masato Hori

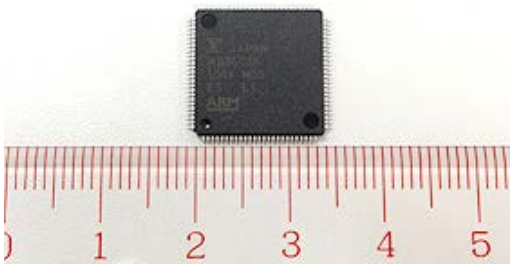
In striving to create the world's most convenient smartphones - products that customers will find a joy to use - we are constantly aware of the 3Rs and work to minimize resource usage, even as we reach for new heights in functionality and performance. Developing smartphones that are attractive and friendly to both the environment and people is our ongong mission.

Case Study

MB86C36 LSI Cuts Power Consumption in Standby by up to 97%

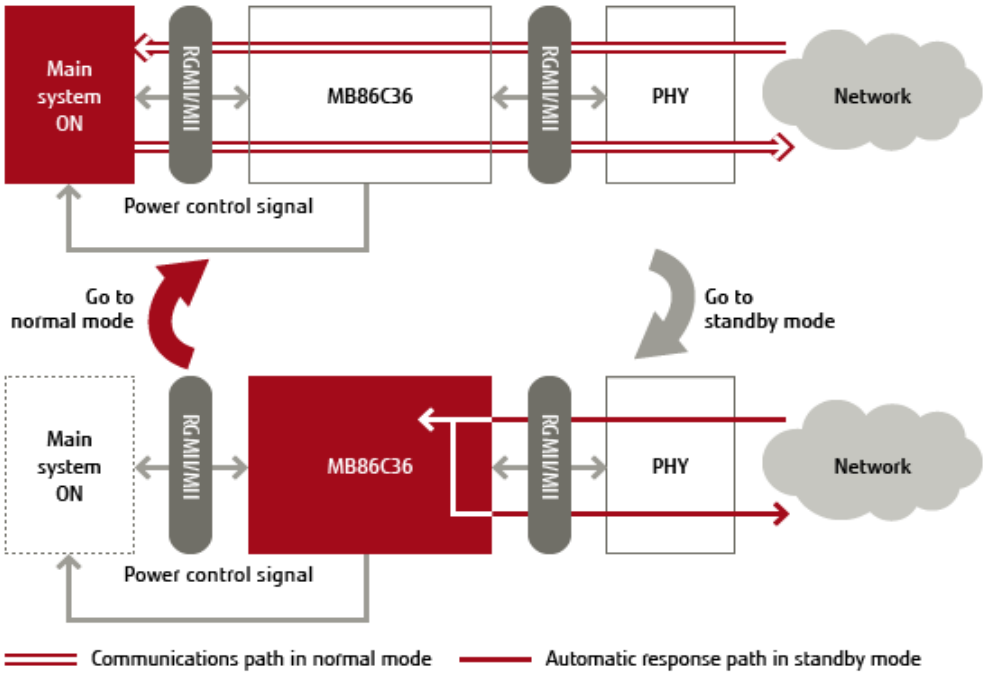
Amid ongoing worldwide efforts to lower environmental burden, reduction targets for power consumption by multifunction printers, conventional printers, routers, and other devices with network functionality are constantly being raised.

The MB86C36 is a network-answering proxy LSI that sits between a device's main system (CPU) and network interface. It maintains network connectivity by receiving network connections from external devices and automatically responding to them even when the CPU is in standby or powered off. This makes it possible to turn off power to the main system when the device is in standby and reduced power consumption by up to 97%.



MB86C36

What Happens in Standby



VOICE

Fujitsu Semiconductor Limited, MCU Business Division, MCU Development Department
Hiroyoshi Yamashita

Concentrating on minimizing power consumption not only at the LSI level but also at the system level, we have succeeded in greatly reducing overall power consumption. By providing the MB86C36 to as many customers as possible, we will help to reduce overall system power consumption and help to lower environmental burden.

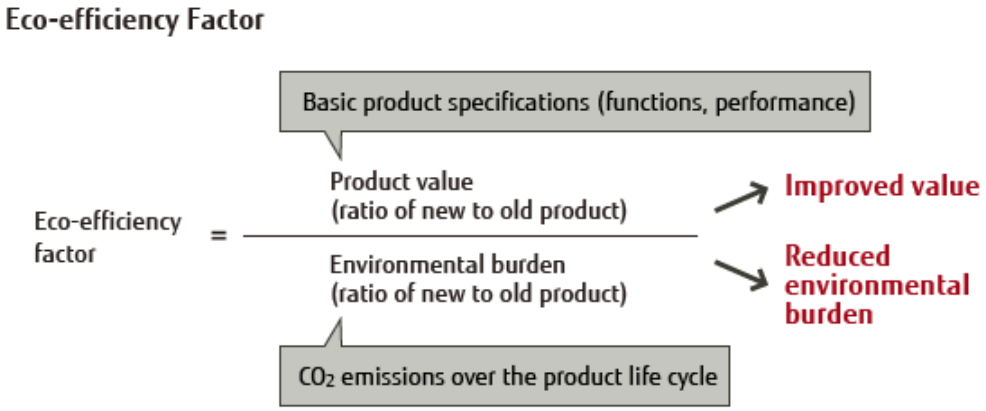
- Eco-Friendly Products : Case Study Archives

Using the Eco-Efficiency Factor to Reduce Product Environmental Burden

The Fujitsu Group introduced the eco-efficiency factor*5, which simultaneously evaluates both environmental burden reductions and product value increases for newly developed Green Products in FY 2007. In the Fujitsu Group Environmental Protection Program (Stage VI), which covers FY2010-2012, we changed the base fiscal year for products from FY 2005 to FY 2008 and continued these activities. In FY 2011, we also revised our targets upwards based on actual results as of the end of FY 2010.

In FY 2012, we exceeded our newly established Fujitsu Group Environmental Protection Program (Stage VI) target of 4.0, with an actual result of 4.6. Product lines primarily responsible for contributing to these results included our mobile phones, mission critical IA servers, and photonics solutions. These improvements were achieved in part through improvements in transmission speeds and data processing capabilities, and through reductions in product weight and energy consumption.

*5 Eco-efficiency factor:
A method for comparing old and new products that quantitatively incorporates improvements in both product environmental burden and value (functionality and performance). This is an environmental index that promotes the creation of products that can provide even higher values with even lower environmental burden.



Carrying Out Life Cycle Assessment (LCA)

The Fujitsu Group has made it obligatory to perform LCAs for all its Green Products. Calculation standards have been formulated for each product family, and the Group uses its own database*6 to evaluate the environmental burdens of its products.

We perform LCAs to determine which parts of a product's life cycle account for the greatest proportion of the environmental burden, so that we can effectively design environmentally friendly products. We also apply the expertise developed through our LCA activities to calculate the eco-efficiency factor, and are actively using this as a tool for communicating with our customers.

*6 Own database:
Our own unique database of unit values, created by Fujitsu Laboratories based on input-output tables.

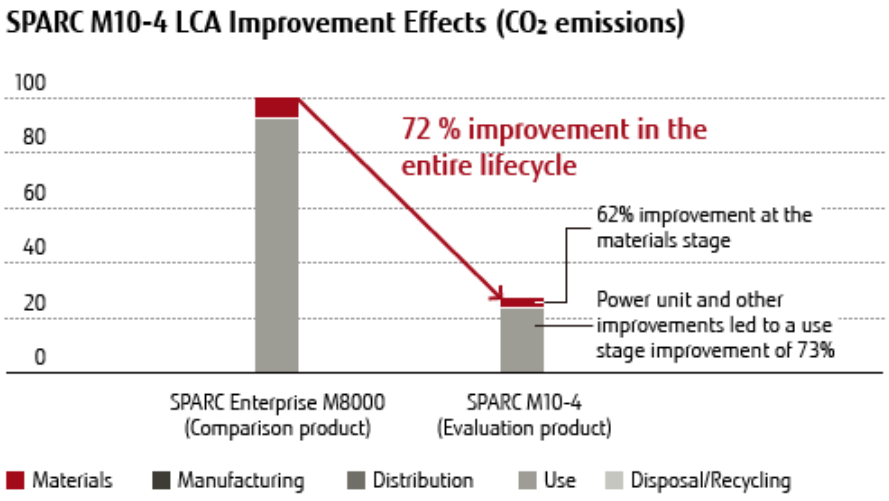
Case Study

SPARC M10-4 UNIX Server Cuts Life-Cycle CO2 Emissions 72%

SPARC M10-4

The SPARC M10-4 UNIX server, equipped with the SPARC64 X 16-core SoC (System on Chip) processor, greatly reduces the numbers of components on the printed board unit. It also represents success in greatly reducing power consumption during use - something achieved by incorporating Fujitsu's own high-efficiency power unit and other design improvements. In addition, the SPARC M10-4 uses a compact chassis made possible by Liquid Loop Cooling - the latest cooling technology - backplane-less straight cooling, as well as other packaging technologies. And, its entire-life-cycle CO2 emissions, compared with earlier products with the same maximum number of processor cores*7, have been reduced by up to 72%. Based on these and other initiatives, the SPARC M10-4 has been certified as a Super Green product.

*7 Comparison product:
SPARC Enterprise M8000 (Introduced in December 2010)



- SPARC M1 Environmental Considerations (Product site)(in Japanese)
- Liquid Loop Cooling (in Japanese)

Promoting 3R Design

Through its product environmental assessments and Green Product evaluations, the Fujitsu Group is working to apply a wide variety of 3R-friendly technologies that conserve resources and improve recyclability. Technologies being incorporated into our products that are effective in conserving resources include ways to reduce the number of parts and cables, to save space through improved performance and more highly integrated design, and digitization of manuals and other documentation.

Gaining experience in dismantling

We are also working to improve recycling rates by utilizing recyclable parts from the product design stage; and, by establishing recycle scheme, we promote the recovery and recycling of used ICT equipment. For example, usable parts are separated and extracted from products returned from leasing, and after checks to verify they are of the same quality as new parts, are either reused as parts in new products or as spare parts for maintenance.

Since 2010, we have held twice-yearly tours of Fujitsu recycling centers for designers throughout the Fujitsu Group, in an initiative to improve the recyclability of our products. During these tours, designers gain experience in dismantling post-consumer products, and recycling professionals provide feedback to designers through case studies showing factors that make dismantling difficult and by encouraging an exchange of views.

Going forward, we plan to draw up a design guideline containing case studies that Fujitsu recycling centers have accumulated showing factors that make dismantling difficult. Through this approach, we aim to encourage design from the product development stage that takes into consideration the ease of post-use dismantling.

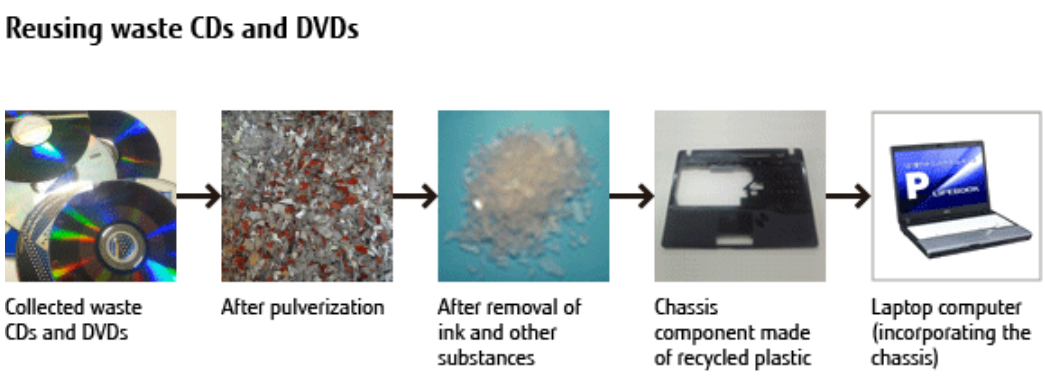
Case Study

Reusing waste CDs and DVDs

The Fujitsu Group has established a recycling system in which waste CDs and DVDs are collected at Group recycling centers and the plastic recycled from them is reused in our products. This is the first example in the industry, and we have started production under this system with LIFEBOOK P772/E, a laptop released in the summer of 2012 for business customers.

Plastic from waste products is actually a mix of various types of plastic. That is why the quality of recycled plastic is not enough to use in products. In addition, using recycled plastic makes it difficult to comply with the RoHS Directive and other regulations because of the risk that it might contain heavy metals or other impurities. To overcome these problems, we noticed that our recycling centers have collected large amounts of waste CDs and DVDs, which are made of pure materials, and we made it possible to use these recycled materials in the manufacture of laptops, under quality control based on a chemical substance risk-management database created by Fujitsu Laboratories Ltd.

It is expected that this recycling system will make it possible to reduce the use of virgin plastic by 10 tons or more per year, and cut CO2 emission by about 15%, both in comparison to a conventional laptop manufacturing process. Looking ahead, we aim to build a recycling system that can handle waste plastic from sources other than CDs and DVDs, and expand the use of recycled material in our products to further reduce our resource consumption and environmental burden.



Eco-Friendly Packaging

Fujitsu is working on a variety of methods for reducing its use of packaging and cushioning materials. Conventionally, a notebook computer is shipped individually packed in a cardboard box, but now, by packing several products in a single returnable container, we have reduced shipping space and cardboard waste. For larger products, we have replaced conventional cushion foam with returnable air packs. With this new packagingstyle, we are repeatedly using packaging materials, and can use the same materials for various products. Greater efficiency in the use of packaging materials has reduced the amount of cushioning materials and wasteper shipment, thereby, significantly reducing CO2 emissions. We also use vegetable oil inks, which are lower involatile organic compounds (VOCs), a known atmospheric pollutant, to print the boxes used for packaging PCs and other equipment.

ICT Database System for Management of the Environmentally Conscious Product Design

We use ICT systems for the preparation and registration of Product Environmental Green Assessments and LCAs. We use these systems to centrally manage information on aspects of environmentally conscious design related to legal and regulatory compliance; materials and chemical content of purchased components; efforts to make products smaller, lighter, or more energy efficient; ease of recycling and dismantling.

Fujitsu Group Environmental Action Plan (Stage VII) Product Targets

For ICT equipment, the Fujitsu Group has positioned energy efficiency and resource efficiency as two critical themes of the Fujitsu Group Environmental Action Plan (Stage VII). As we move forward with efforts to develop environmentally conscious products, our goals in these areas are to "achieve top-level energy efficiency*8 for 50% of newly developed products" and "increase resource efficiency of newly developed products by 20% compared to 2011."

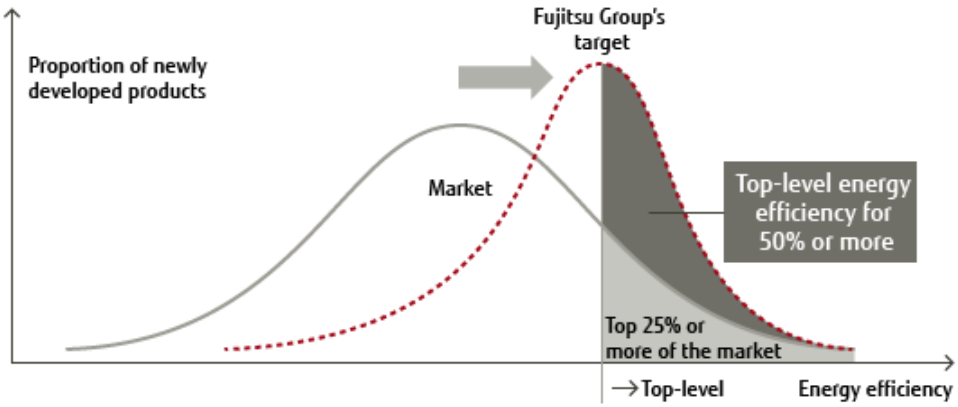
*8 Top-level:
Achieve more than 25% of market benchmark in energy efficiency such as top-runner products (first in the world or industry, top of the world or industry).

Development of Products Leading the Way in Energy Efficiency

The Fujitsu Group in developing new products over the FY 2013-2015 period will contribute to the lowering of environmental burden when products are in use. We will do this by continuously expanding the number of our products that are top-level performers in terms of energy efficiency.

We have established standards for recognizing top-level energy efficiency - in comparison to either the market or past products - by product group. Our aim is to clear these standards for 50% or more of the product series we develop over the three years ending with FY 2015. Products that clear their respective standards will be recognized as "Top-level Energy Efficiency Products." In setting target standards, we e emphasized comparability and transparency, and adopted standards that were as open as possible to public awareness.

Development of Top-Level Energy Efficiency Products



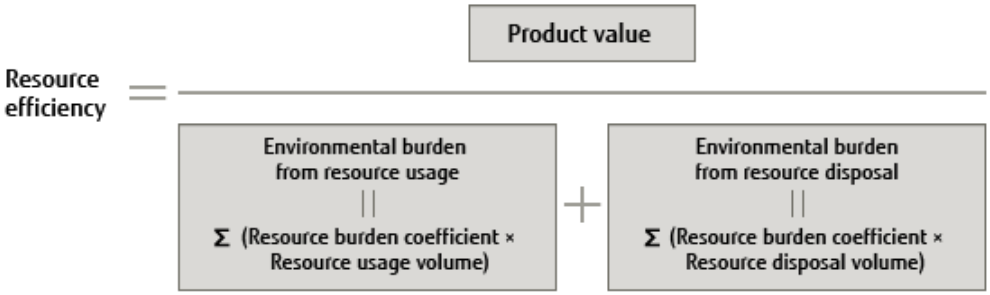
Improving the Resource Efficiency of New Products

The Fujitsu Group believes it is important to improve the efficiency of resource usage and pursue product development that uses the least amount of resources possible. We, therefore, have redefined "resource efficiency" as an indicator for quantitatively evaluating the extent to which environmental burden, due to the use of resources in products and the disposal of products, has been lowered. The specific goal we aim to achieve by FY 2015 is to increase resource efficiency per product newly developed by Fujitsu*9 by 20% compared to FY 2011.

Resource efficiency is evaluated by dividing the value of a product, by the environmental burden (in terms of use and disposal) of the elements (resources) comprising the product (Refer to the diagram below.) As we pursue development focused on reducing resource usage, we will continue to consider the roles product value, resource burden coefficient, and resource disposal volume in improving our resource efficiency indicator.

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

Calculating Resource Efficiency



Product value	To place emphasis on the valuation of reductions in environmental burden due to resource usage and disposal, product value is limited to those that related to resource usage and is set on a per-product basis. (Example of factor not considered: CPU performance improvement)
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.
Resource disposal volume	Mass of each resource disposed of (not reused) in connection with a post-use product. Activities will begin with this figure set to a value of "0."

Reducing Chemical Substances in Products

We cooperate with our business partners in striving for strict management of chemical substances whose use is restricted by laws and regulations in Japan and overseas, as well as of other potentially harmful substances.

Management of Legally Prohibited and Regulated Chemical Substances in Products

The Fujitsu Group designates substances that are harmful to people and the environment and whose use is either prohibited or regulated by law as "Fujitsu Group Specified Banned Substances." We use both Japanese and overseas regulations to determine what substances to include on this list. The "Fujitsu Group Specified Banned Substances" list is comprised of two categories – one for substances commonly prohibited throughout the world and another for substances prohibited in certain countries or regions.

- **Fujitsu Group Specified Banned Substances** [145KB]
- **Fujitsu Group Specified Reportable Substances** [150KB]
- **Fujitsu Group Specified Controlled Substances** [65KB]

We have also established a Fujitsu Group Green Procurement Direction and strengthened control of the chemicals in our products by taking the initiative in directing our suppliers to construct chemical management systems (CMSs). By excluding banned substances through green procurement activities, we are providing products free of Fujitsu Group Specified Banned Substances.

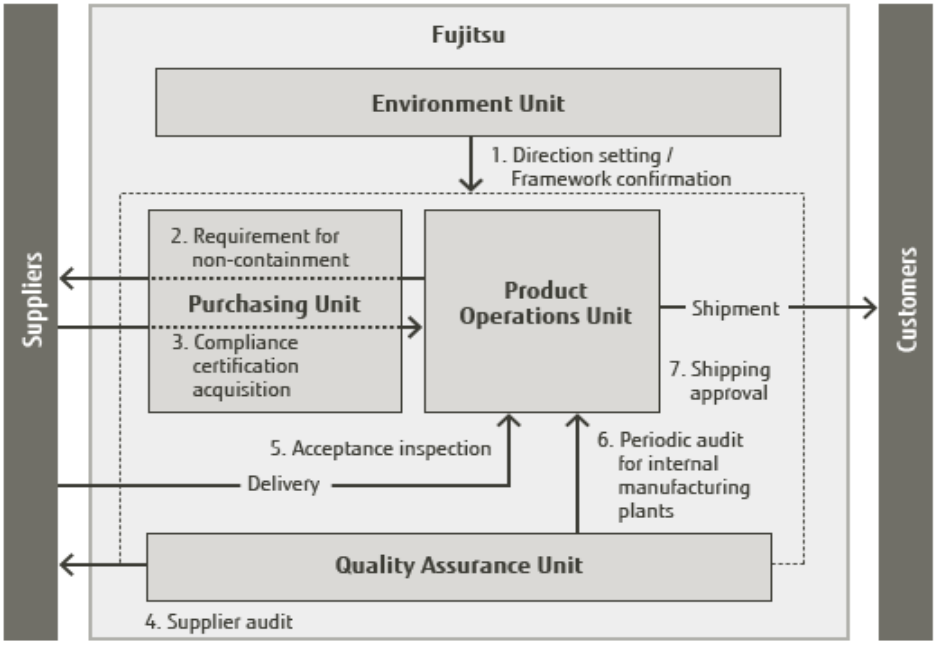
- Green Procurement

In response to regulations such as the RoHS Directive*1, we have taken systematic action covering the entire supply chain by constructing a system headed by our product business division and including our quality assurance, purchasing, and environmental divisions, to manage chemical substances from design through to delivery. In FY 2012, we revised our internal systems to comply with the CE marking*2 requirements of the revised RoHS Directive. We changed them from the previous configuration, based on internal standards, to systems suited to standards consistent with the RoHS Directive. As a result, we were in compliance with the revised RoHS Directive, including CE marking provisions, when the revised directive came into effect.

*1 RoHS Directive:
Restriction of the use of certain hazardous substances in electrical and electric equipment

*2 CE marking:
Mark that is applied to products to show they are in compliance with the safety requirements of EU (EC) directives.

Framework for RoHS Directive Compliance



Controlling Substances of Concern

The Fujitsu Group sees the minimization of risk associated with specified chemical substances as a high priority for protecting the safety of customers. Therefore, when we have concerns about the harmfulness of substances, we designate them as Fujitsu Group Specified Controlled Substances or Fujitsu Group Specified Reportable Substances, even if they have not been scientifically shown to be harmful. Based on the principle of prevention, we manage our use of chemical substances in a way that allows us to ban their use immediately if it becomes clear they are harmful.

The Fujitsu Group Specified Reportable Substances list includes substances that are REACH regulation*3 candidate substances*4, and we collect information on substance amounts from suppliers and then manage these quantities on a per-product basis. Moreover, the Specified Controlled Substances list also includes data from suppliers on amounts for substances that may not be restricted by every country's regulations, but which we consider to be of concern.

As far as PVC is concerned, we not only control the amounts included in our products but also require in our Green Procurement Direction that it be used as little as possible, and restrict its use in everything except sheathing for cables and insulating materials for electronic components.

*3 REACH regulation:
Regulation concerning the Registration, Evaluation, Authorization, and Restriction of Chemicals

*4 REACH candidate substances for Authorization:
Selected chemical substances with properties (carcinogenicity, mutagenicity, reproductive toxicity, etc.) regulated by REACH. If these substances are present in products, data on the amounts must be displayed.

Case Study

The ESPRIMO Q920, with Halogen-Free Parts

The ESPRIMO Q920, with its compact design incorporating an onboard power supply, is an extremely energy-efficient desktop computer.

It is also, however, distinguished by the reduced level of chemical substances that go into its manufacture. It uses a halogen-free mainboard - technology Fujitsu has been actively developing over the years - cable insulation and plastic fan parts that include no PVC, and other parts made from materials we have worked to ensure are environmentally conscious. We even offer customers the option of using a PVC-free power cable.

ESPRIMO Q920

Contributing to Creating Mechanisms for Chemical Substance Management

In the Fujitsu Group, we see efforts towards chemical substance management as an issue for the whole supply chain and so participate in activities such as the Joint Article Management Promotion consortium (JAMP) to contribute to the design, construction and widespread adoption of mechanisms that can transmit information effectively.

Among these industry groups, we were involved from the planning stages with the input format and entry support tools for the AIS (article information sheet), which is an included chemical substance information transmission sheet, and also participated in creating guidelines for appropriate management of included chemical substances and in practical education for business partners to promote the use of AIS throughout the industry. Furthermore, we are energetically engaging in activities promoting the use of the JAMP information distribution infrastructure (JAMP-IT), which supports information exchange requests from multiple companies to create an environment for the smooth transmission of information.

The Fujitsu Group, through its AIS usage, is identifying and managing information on whether and how particular chemical substances are being used in particular products. These substances include not only those covered by REACH regulations but also substances that have been put on the Fujitsu Group Specified Controlled Substances list because there are concerns they may be harmful. Moving forward, we aim to help minimize the significant adverse impact of chemical substances on people and the environment by finding alternatives for procured products containing chemical substances recognized as harmful based on AIS data on chemical substances included in procured products.

Using ICT to Control the Chemicals in Our Products

From requesting surveys by outside organizations through to gathering information by our own efforts, the Fujitsu Group maintains an integrated system for managing the information on the chemicals contained in the components and materials it purchases from its suppliers throughout its supply chain. Further, we use the large volumes of chemical-related data we collect to calculate amounts on a per-product basis, pinpointing the amounts of designated chemicals at the product level and managing them accordingly.

The Group also offers an environmental business solution called PLEMIA/ECODUCE, a software package that utilizes this in-house expertise.

- The PLEMIA/ECODUCE website (in Japanese)

Product Recycling

We are advancing collection and recycling of end-of-life ICT products from a global perspective to help create a recycling-minded society.

Recycling Activities that Conform to the Concept of Producer Responsibility

In accordance with the concept of Extended Producer Responsibility (EPR*1), under which the producer's responsibility for its products is not limited to the product design and manufacturing stages but extends to the disposal and recycling stages as well, the Fujitsu Group carries out recycling programs that comply with the waste disposal and recycling laws and regulations of the various countries in which it operates. We also try to do as much collection, reuse and recycling as we can even in countries where recycling is not obligatory, in line with the concept of Individual Producer Responsibility (IPR), which sees each producer as responsible for its own products.

IPR is a major challenge for the Fujitsu Group in expanding its 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.

*1 EPR:
Extended Producer Responsibility. This concept was made explicit in Japan's Fundamental Law for Establishing a Sound Material-Cycle Society enacted in June 2000.

Targets and Achievements in Stage VI of the Environmental Protection Program

Targeting a sustained 90% resource reuse rate*2 of business ICT equipment globally at Fujitsu recycling centers, in FY 2012 we achieved a rate of 94.3% (91.5% within Japan and 99.2% overseas). This target remains in effect in the Fujitsu Group Environmental Action Plan(Stage VII).

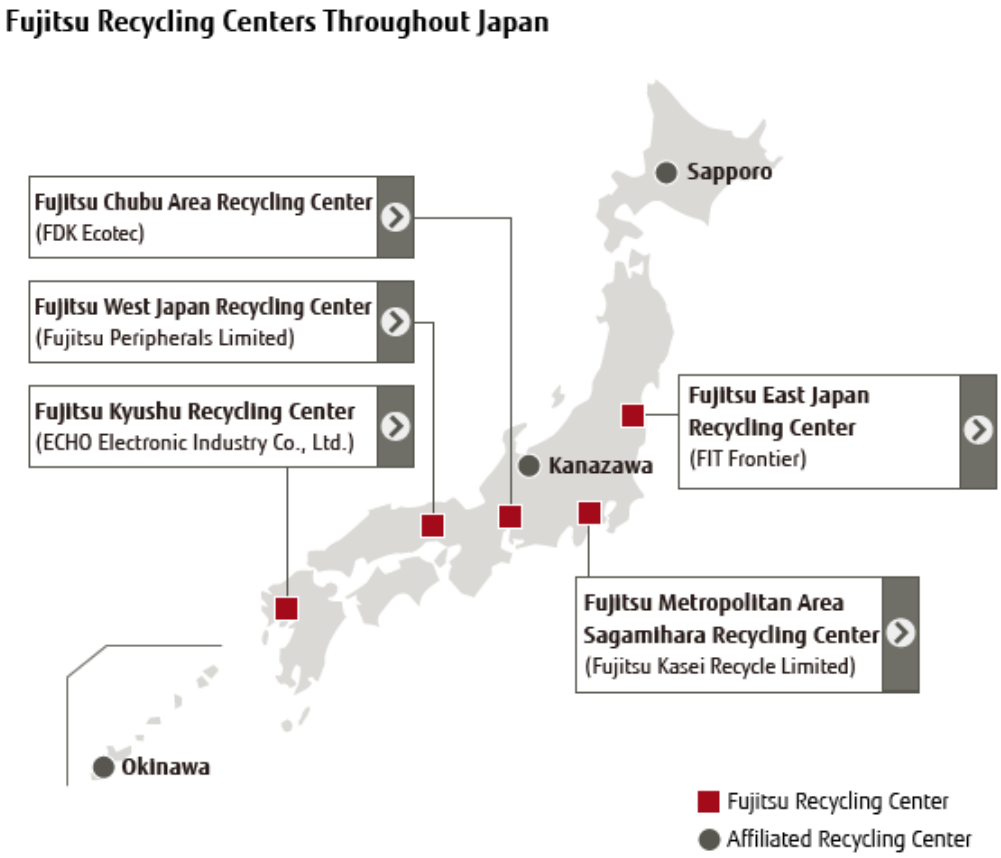
*2 Resource reuse rate:
The ratio of the amount (by weight) of recycled parts and resources to the amount of end-of-life business ICT products processed.

Promoting product recycling efforts in Japan

As an enterprise with official designation for wide-area industrial waste disposal in Japan, Fujitsu engages in various kinds of contracts for accepting industrial waste for appropriate processing.

We have established Fujitsu recycling centers throughout Japan to create a nationwide recycling system. This system provides for rigorous traceability and security, and achieves a high resource reuse rate. By providing this safe and secure service, we are fully discharging our Extended Producer Responsibility (EPR).

Wide Area Industrial Waste Disposal Certificate



Achievements in Collecting and Recycling End-of-Life ICT Products

Although the volume of materials collected is declining due to progress in miniaturization and reduced product weights, we processed 5,297 tons of recycled ICT products from corporate customers (used ICT products for business applications) in FY 2012, and achieved a resource reuse rate of 91.5%. Also, we have now collected a total of 85,381 end-of-life PCs from individual customers.

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

FY	2009	2010	2011	2012
Resource reuse rate	90.8%	90.6%	90.9%	91.5%

Providing Product Recycling Information

In order to properly dispose of end-of-life ICT products, since FY 2004 Fujitsu has been operating a digital management system for its product disassembly manual.

Through this system, Fujitsu recycling centers can download from our website, as animated disassembly manuals, all the information they need to recycle products. The system also provides instructions on how to deal with items containing restricted chemical substances and plastic materials, and with products that contain customer data.

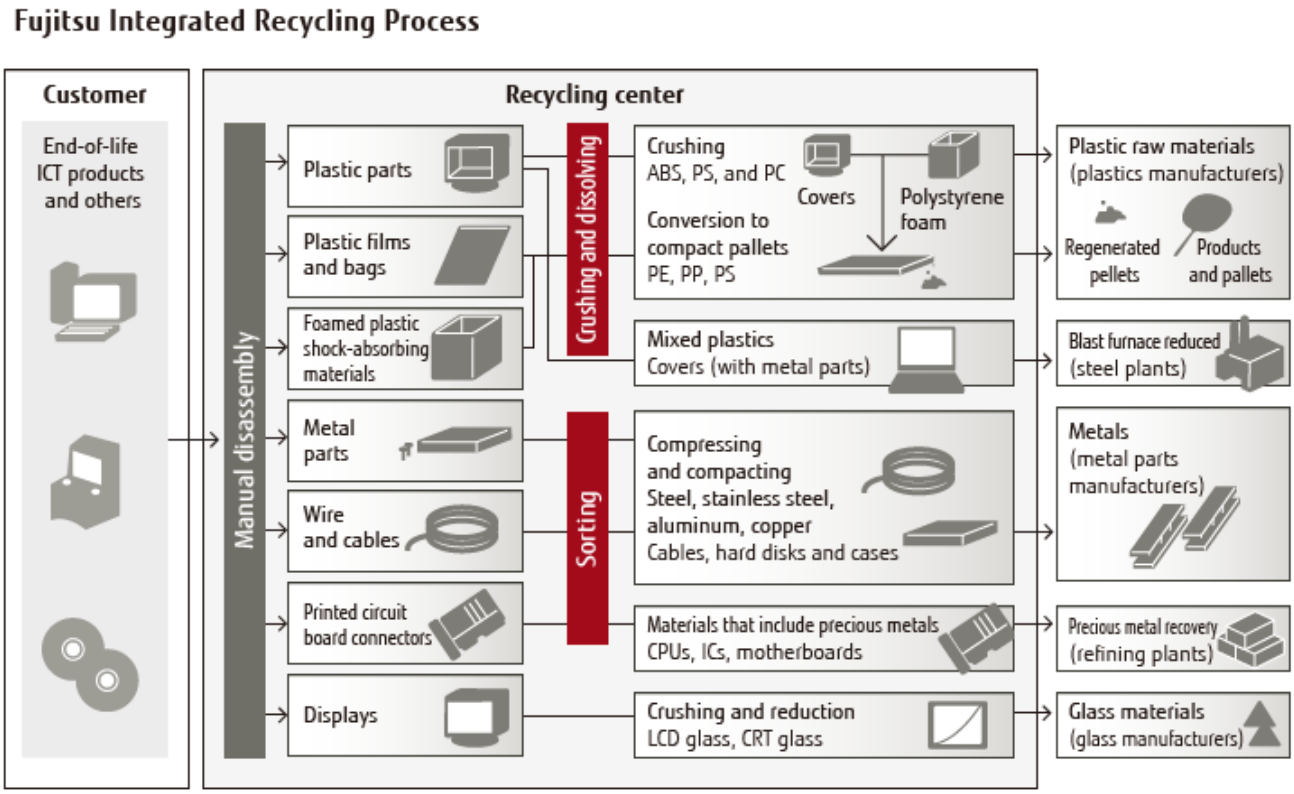
Promoting Recycling

Experienced workers carefully disassemble collected products by hand and separate the materials into categories such as steel, copper, aluminum, precious metals, glass and 20 different types of plastic. They also strive to raise their manual disassembly standards through the use of animated disassembly manuals. Materials recognition equipment has been introduced for plastics that are difficult to discriminate, so as to allow the complete segregation of different types of plastic. In addition to minimizing the quantity of waste materials in this way, we are continually trying to recycle resources that can be reused to make products.

Plastic material identification equipment

Ballpoint pens and folders made from recycled plastic

Also, to keep our customers informed of these initiatives, we distribute ballpoint pens and folders made from recycled plastic at exhibitions and other events, as well as demonstrating PCs being manually disassembled.



Developing a Traceability System

We developed an integrated recycling information management system and since FY 2007 have adopted it at the Fujitsu recycling centers.

Using this system prevents theft and illegal dumping by attaching barcodes to customers' ICT products and managing data on the history of the recycling process from acceptance at the recycling center through disassembly and destruction of the hard disks on a per-customer basis.

Integrated Information Management System for Recycling

Operation of Security Systems

A high level of security is maintained at Fujitsu Recycling Centers by using infrared cameras to monitor automatically for intruders and check the storage status of the accepted products.

Security system

Security camera monitoring system

Providing services to customers

We provide recycling services for our customers.

- ICT product disposal and recycling (in Japanese)

Promoting Product Recycling Overseas

The Fujitsu Group recycles products in EMEA (Europe, Middle East, Africa), the Americas (the United States, Canada, and Brazil) and Asia (Singapore, the Philippines, Australia, Hong Kong, Taiwan, and South Korea).

In addition, through its partner companies, Fujitsu Technology Solutions (Holding) B.V. (FTS) recycles waste ICT products for corporate and individual customers in 27 countries in the EU, as well as in Norway and Switzerland. In addition, since 1988 at Paderborn, the Group's own recycling center in Germany, we have been contributing to the reuse of waste resources by disassembling products by hand so we can precisely classify and then appropriately recycle the materials. In FY2012, we processed 2,901 tons of waste ICT products and achieved a resource reuse rate of 99.2%.

Also at other overseas sites we have linked up with local recycling partner companies and promoted the recycling of ICT products.

- **Singapore: Fujitsu PC Asia Pacific Pte. Ltd. (FPCA)** (from 2007)
- **Brazil: Fujitsu do Brazil Ltda. (FBR)** (from 2010)
- **Australia: Fujitsu Australia Ltd. (FAL)** (from 2006)
- **South Korea: Fujitsu Korea Ltd. (FKL)** (from 2003)

Environmental Labeling and Information Disclosure

We will actively disclose environmental information about our products to customers.

Disclosure of Environmental Information on Products

We actively disclose environmental information on our products, both via the Internet and in the form of environmental labels.

Since the end of FY 2006, we have registered notebook PCs under the EPEAT (Electronic Products Environmental Assessment Tool) system, which encourages the purchase of green PCs and is used chiefly by US government bodies. In Japan, we disclose on the website given below information on products that conform to the International Energy Star Program in Japan or the PC Green Label Specification, as well as products registered under the EcoLeaf Program or certified under the Eco Mark program.

- EPEAT website: Information on the US Institute of Electrical and Electronics Engineers' (IEEE) EPEAT standard.
- International ENERGY STAR Program website: Information on products conforming with the International ENERGY STAR Program in Japan
- List of PC Green Label System-compliant products (In Japanese): Information about Fujitsu Products in compliance with the PC Green Label System formulated by Japan's PC3R Promotion Association
- List of registered EcoLeaf label products (In Japanese): Information about Fujitsu products that have obtained the "EcoLeaf" label developed by the Japan Environmental Management Association for Industry.
- List of products with Eco Mark certification (In Japanese): A list of Fujitsu products that are certified with the Eco Mark distinction developed by the Japan Environment Association

Environmental Labeling

The main environmental labels displayed by the Fujitsu Group.

The main environmental labels displayed by the Fujitsu Group

International Energy Star program The International Energy Star Program label is displayed on computers (PCs, workstations), displays, printers, and scanners registered with the program. • International Energy Star Program	
Energy Efficiency Labeling System This label is displayed on products meeting standards prescribed by Japan's Act on the Rational Use of Energy. • Energy Efficiency Labeling System [171KB]	
PC Green Label System For PCs, Fujitsu displays this mark on products meeting standards stipulated by the PC3R Promotion Association. • PC3R Promotion Association	
EcoLeaf Environmental Label (Japan Environmental Management Association for Industry) In May 2003, Fujitsu notebook PCs were the first in Japan to be certified under this label. • Japan Environmental Management Association EcoLeaf Environmental Label [176KB]	
Eco Mark (Certified by the Japan Environment Association) In January 2001, Fujitsu desktop PCs became the first in Japan to receive certification. At present, certifications have been obtained for both PCs and printers. • Japan Environment Association Eco Mark	
Green Policy Innovation Logo The Fujitsu Group's own environmental label. The Group displays this logo on Green and Super Green products, which are especially eco-friendly. • Green Policy Innovation logo	