| Top Message | Interview to Head of Corporate Environmental Strategy Unit | Special Feature 1: Fujitsu Group Environmental Action Plan Stage VIII | Special Feature 2: Digital Innovation | Chapter I Contribution to Society | Chapter II Reducing Our Environmental Burden | Environmental Management | Data Overview |

Reducing Greenhouse Gases (GHG) Emissions and Boosting Energy Intensity at Our Business Sites | Promoting Environmentally Conscious Data Centers | Reduce CO₂ Emissions from Logistics and Transportation | Promoting CO₂ Emission Reductions with Our Business Partners | Increasing Amounts of Renewable Energy Used | Efficient Use of Water Resources | Reducing Chemical Substances Emissions | Limiting Amounts of Waste Generated | Product Recycling

Promoting Environmentally Conscious Data Centers

Our Approach

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

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

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

Summary of FY 2015 Achievements

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

* Average over three years from FY 2013 through 2015.

FY 2015 Performance and Results

Promoting the Power Usage Effectiveness (PUE)

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

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

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

PUE Values and PUE Calculation Method

PUE values	PUE calculation method, etc.
Average: 1.63 Range: 1.33–2.10 Applicable DCs: 34 centers	- The Green Grid's method used - Improvement initiatives using the organization's DCMM
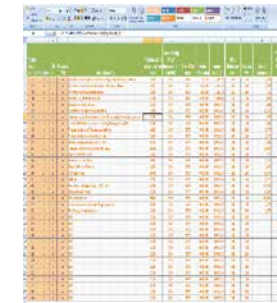
Quick Wins Calculator
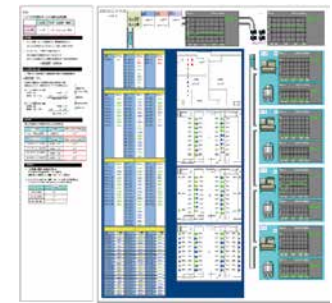
Screen showing summaries of energy usage and other parameters

FY 2016 Targets and Plans

Formulating Activity Targets

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

Promoting Activities for Achieving Targets

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

Promoting Environmentally Conscious Data Centers

Main Activities of FY 2015

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

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

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

Building layout
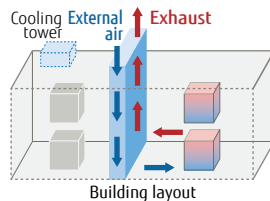
New air-conditioning approach
Reduces ventilation fan operation by mixing heat from ICT equipment and external air inside server rooms.


Cutout view of server room
*Temperature example
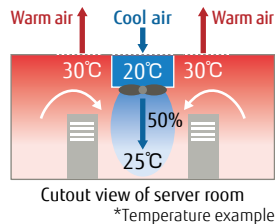
External view of the Tatebayashi Data Center's new annex

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

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

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

Overview of JIT modeling
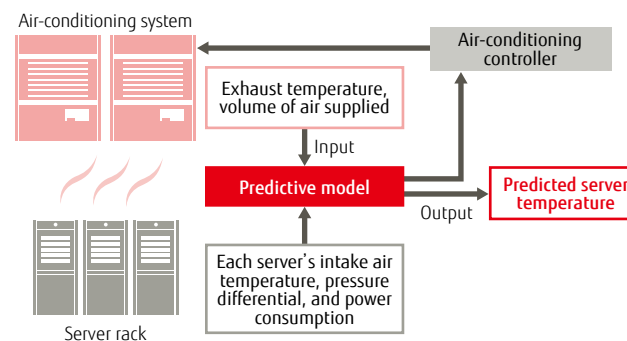
Data Center Environmental Efforts in Australia

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

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

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