IBM and Climate Change

- IBM recognizes climate change is a serious concern that warrants meaningful action on a global basis to stabilize the atmospheric concentration of greenhouse gases (GHGs).
- IBM believes all sectors of society, the economy and governments worldwide must participate in solutions to climate change.
- IBM supports joint efforts by the private and public sectors to reduce global GHG emissions. These initiatives are most effective when they are implemented through market-driven mechanisms and are economically efficient, environmentally effective and sustainable.
- IBM believes a diverse energy portfolio is necessary to achieve an orderly adaptation to a world in which GHG emissions are constrained while maintaining successful economies and secure supplies of energy, and also meeting the needs of humanity.
- IBM considers energy conservation to be a cornerstone of climate protection. IBM will continue to conserve energy and continually improve the energy efficiency of its operations, products and services while collaborating with and encouraging its global suppliers to do likewise.
- Consistent with its values, IBM will collaborate with its clients to create new innovations and solutions that are protective of the climate.

IBM

© 2008 International Business Machines Corporation

IBM Corporate Environmental Affairs
294 Route 100
Somers, New York 10589

For more information about IBM's environmental initiatives, see www.ibm.com/ibm/environment

Printed in the United States of America
All rights reserved

Printed with soy inks on recycled paper containing a minimum of 30% post-consumer waste fiber.

IBM, the IBM logo, ibm.com, Cool Blue, IBM® Systems Director Active Energy Manager, POWER6 and System z are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (®or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trade marks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at www.ibm.com/legal/copytrade.shtml

Other company, product and service names may be trademarks or service marks of others.

October 2008

STEWARDSHIP

IBM

IBM: Early Action for Climate Protection

building on a legacy of leadership

"We want to be in the forefront of those companies which are working to make our world a better place."

— Thomas J. Watson Jr.
(excerpt from IBM principles, 1969)

IBM: Early Action for Climate Protection

building on a legacy of leadership

Long-standing Commitment

Climate change is one of the most critical global environmental challenges facing the planet. There exists scientific consensus that global warming is occurring and that it is affected by emissions of greenhouse gases (GHGs) related to human activities. Although the understanding of the effects of climate change continues to evolve, climate change could impact the economy and the quality of life for this and future generations.

IBM has been committed to protecting the environment for more than three decades. The company's first formal environmental and energy conservation corporate policies date back to 1971 and 1974 respectively, and programs supporting them have been embedded within IBM's global environmental management system since that time. The policies have been a cornerstone of IBM's energy management and climate protection programs.

Comprehensive and Multifaceted Programs

IBM is committed to leadership in energy efficiency and climate protection. Its focus includes:

- Reducing GHG emissions associated with the company's operations by:
  – Conserving energy
  – Using renewable energy
  – Supporting alternate employee commute options
  – Reducing perfluorocompound (PFC) emissions
  – Increasing the efficiency of its logistics
- Developing energy efficient products and providing diverse solutions for energy efficient data centers
- Collaborating with its clients and others on innovations that help protect the world's climate, consistent with IBM's values: dedication to every client's success, innovation that matters—for our company and the world, and trust and personal responsibility in all relationships

Results of IBM's Operational Leadership

Conserving Energy: Energy conservation and related GHG emissions reductions are major components of IBM's climate protection programs.

CO_2 Emissions Reductions

From 1990-2007, IBM saved **4.6 billion** kWh of electricity consumption, avoided nearly **3.1 million** metric tons of CO_2 emissions (equal to **45%** of the company's 1990 global CO_2 emissions) and saved over **$310 million** through its annual energy conservation actions.

These results include only those energy conservation projects which actually reduced or avoided energy use. Reductions from downsizings or the sale of operations are not included.

To further extend its CO_2 emissions reduction achievements, IBM set a new goal in 2006 to reduce CO_2 emissions associated with its energy use 12 percent between 2005 and 2012 through:

a) Energy conservation
b) Use of renewable energy and/or
c) Funding an equivalent CO_2 emissions reduction by the procurement of Renewable Energy Certificates (RECs) or comparable instruments

Using Renewable Energy: Another important way IBM is reducing its GHG emissions is its increasing use of renewable energy. Between 2006 and 2007, IBM's purchase of renewable energy—both direct purchases and purchases of RECs—grew by 24 percent.

Procurement of Renewable Energy

IBM's procurement of renewable energy and RECs increased from **11 million kWh** in 2001 to **455 million kWh** in 2007, which accounted for **8.5%** of IBM's total 2007 global electricity purchases.

Supporting Alternate Employee Commute Options: IBM pioneered programs to reduce employee commuting and has sustained them for nearly two decades. Two key aspects are its (a) work-at-home program, and (b) mobile employees program. Today, more than 100,000 employees globally participate in one of these programs. IBM also deployed a human resources IT tool that manages and tracks the programs.

In the U.S. alone, IBM's work-at-home program conserved approximately 7.75 million gallons of fuel and avoided more than 64,000 metric tons of CO_2 emissions in 2007. More than 2,000 metric tons of CO_2 emissions were avoided in the same year by employees using other commute-choice programs such as carpooling, vanpooling, bicycling, walking, etc.

Reducing PFC Emissions: In 1998, IBM became the first semiconductor manufacturer to publicly announce a specific PFC emissions reduction target. IBM's current PFC goal is to reduce PFC emissions from semiconductor manufacturing 25 percent by 2010 from a 1995 base year.

PFC Emissions Reductions

In 2007, IBM's PFC emissions were **31.7%** below the 1995 baseline amount of 381,000 metric tons of CO_2 equivalent.

Increasing the Efficiency of its Logistics: IBM is reducing the CO_2 emissions associated with transporting parts and products through the efficient design of its packaging, working with suppliers on their packaging designs and optimizing logistics. As a member of the U.S. Environmental Protection Agency's (EPA) SmartWay℠ Transport Partnership, 85 percent (in U.S. dollars) of IBM's 2007 transport spend in North America (within the U.S. and from the U.S. to Canada and Mexico) was with SmartWay carriers. IBM is shipping 100 percent of its System z® and supercomputer families in North America with SmartWay carriers.

Innovation that Matters for the World

IBM's commitment to energy efficiency and climate protection spans the breadth of its global business—from its operations to its technology, products and services.

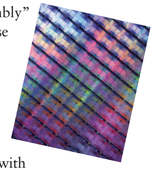
With decades of leadership in environmental stewardship, unmatched talent in IT and business innovation, and unparalleled global reach, IBM is unique in its ability to foster a sustainable future for its clients, for itself and for society as a whole.

Examples of IBM's innovations for product and data center energy efficiency and other client solutions follow.

Innovations—Energy Efficient Microprocessors

IBM has a rich history of innovation that has enabled significant increases in the energy efficiency of microprocessors. Beginning with the use of copper for chip wiring, IBM announced 10 semiconductor innovations over 10 years that have made possible the production of computers and many other kinds of electronic devices that are smaller, less expensive, more powerful and more energy efficient. Some of the latest innovations include:

Airgap Microprocessors—The natural pattern-creating process that forms snowflakes has been harnessed by IBM to form trillions of holes that create insulating vacuums around miles of nanoscale wires. IBM plans to use this innovation inside next-generation microprocessors. Using this breakthrough "self-assembly" technology, researchers have proven that these chips can consume 15 percent less energy compared to the most advanced chips using conventional methods.



POWER6™ Microprocessor—The POWER6 chip contains many technological breakthroughs that provide twice the performance with virtually no increase in energy consumption.

Innovations—Energy Efficient Products

An early leader in addressing the environmental design of its products, IBM formally established its Product Stewardship program in 1991. This program brought additional focus to the development of products with improved energy efficiency and other environmental attributes.

Energy efficient products require the integration of innovative microprocessors, energy management and energy technology. Below are some of IBM's technologies and solutions that are providing significant advancements in product energy efficiency:

- **IBM® Systems Director Active Energy Manager™**—energy management software that helps optimize existing computing resources by allocating, matching and capping power limits in the data center at the system, chassis or rack level
- **Rear Door Heat eXchanger**—"cooling doors" that reduce server heat output into data centers up to 60 percent by utilizing chilled water to dissipate heat generated by computer systems while requiring no additional fans or electricity
- **"Software for a Greener World"**—broad software capabilities to help businesses optimize infrastructure, workloads and people for energy efficiency

Innovations—Energy Efficient Data Centers

In May 2007, IBM announced that it was redirecting $1 billion per year across its businesses to dramatically increase the energy efficiency of data centers. The company expects to double the computing capacity of its data centers by 2010 without increasing power consumption. IBM has engaged with clients to deliver hardware, software and services that have helped them reduce data center energy consumption and cut energy costs 15 to 40 percent. Here are some examples of the company's capabilities:

- **Enterprise Modular Data Center**—"shrink-wrapped" and standardized to create data centers ranging in size from 5,000 to 20,000 square feet, it can save up to 50 percent over traditional data centers
- **Portable Modular Data Center**—includes power and cooling systems, remote monitoring and a secure operating environment just like traditional "raised-floor" data centers
- **Mobile Measurement Technology**—a mobile sensor platform that maps 3-D temperature distributions in data centers and identifies hot spots, air leakages and other inefficiencies

Innovations—Intelligent Systems and Solutions

Intelligent Utility Network (IUN)—A combination of information architecture and infrastructure continuously monitors a utility's assets and operations as well as the electricity usage of its customers: "on demand" information that can be used to improve service, reliability and efficiency. In one IUN pilot project, IBM used smart appliances, measurement devices and a virtual marketplace to achieve a 50 percent reduction in short-term peak electricity distribution loads and a 15 percent reduction in overall peak loads.

Intelligent Transportation Systems—With Intelligent Transport Systems, city governments can have real-time monitoring and forecasting of congestion in major urban areas. This enables real-time action to reduce it, for example, by charging drivers of vehicles for access to city centers at the point of use. Results from IBM's solution for Stockholm show a 25 percent reduction in peak-hour traffic congestion and a 15 percent reduction in carbon emissions.

Energy, Environment and Sustainability Consulting and Solutions—IBM has developed a range of consulting capabilities and solutions to help clients understand and manage their energy use, impact on the environment and the overall sustainability of their operations.

For more information, visit www.ibm.com/green.

Collaborating and Partnering on Voluntary Initiatives

An important aspect of IBM's climate protection programs is its collaboration and participation with governments and nongovernmental organizations through numerous voluntary agreements and partnerships.

Examples of IBM's leadership in these areas:

1992	Charter member of U.S. EPA's ENERGY STAR® Computers Program
1995	One of the first 3 manufacturers to report under U.S. Department of Energy (DOE) Voluntary Greenhouse Gas Emissions (1605b) Reporting at its inception
1996	Signed Memorandum of Understanding (MOU) with U.S. EPA to voluntarily reduce PFC emissions from semiconductor manufacturing processes
2000	Charter member of World Wildlife Fund's (WWF) Climate Savers Program
2000	First IT company invited to join Pew Center on Global Climate Change's Business Environmental Leadership Council
2000	Charter member of World Resources Institute's (WRI) Green Power Market Development Group
2002	Signed second MOU with U.S. EPA, which commits to an absolute reduction in PFC emissions
2002	Charter member of U.S. EPA's Climate Leaders program
2002	Participated in the Carbon Disclosure Project (CDP) at its inception (and in all the CDPs since)
2003	Charter member of Chicago Climate Exchange®
2006	Joined U.S. EPA's SmartWay Transport Partnership
2007	Founding member of The Green Grid℠
2008	Joined The Climate Group

History of Accomplishments

IBM has continually expanded its energy efficiency focus and has enhanced its record of leadership in climate protection. Some of IBM's milestones since 1990 >

1990
Received World Environment Center's Gold Medal for International Corporate Environmental Achievement

1990
Initiated programs to reduce work-related commuting

1991
Established formal Product Stewardship program

1992
Received U.S. President's Environment and Conservation Challenge Award

1992
Charter member of U.S. EPA's ENERGY STAR Computers Program

1995
One of 3 manufacturers to begin voluntary reporting of GHG emissions under U.S. DOE program

1996
Established corporate-wide energy conservation goal

1996
Signed MOU with U.S. EPA to voluntarily reduce PFC emissions from semiconductor manufacturing – extended this U.S. commitment worldwide

1998
Received U.S. EPA's Climate Protection Award in its first year

1998
First semiconductor manufacturer to publicly announce a numeric PFC emissions reduction goal – IBM met its goal early, before year-end 2002

1998
Named U.S. EPA's ENERGY STAR Computer Partner of the Year

1998
Received Alliance to Save Energy's Star of Energy Efficiency Award

1999
Named U.S. EPA's ENERGY STAR Computer Partner of the Year

1999
Received U.S. EPA's Climate Wise Partner Achievement Award

2000
Joined Pew Center on Global Climate Change's Business Environmental Leadership Council

2000
Charter member of WRI's Green Power Market Development Group

2000
Charter member of WWF's Climate Savers Program – met goal in 2004

2001
Received U.S. EPA's ENERGY STAR Excellence in Corporate Commitment Award

2001
IBM's North Castle, N.Y., facility earned ENERGY STAR Buildings Label

2002
Signed second MOU with U.S. EPA, which commits to an absolute reduction in PFC emissions

2002
IBM's Tivoli building in Austin, Texas, certified by the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System™

2002
Charter member of U.S. EPA's Climate Leaders program – exceeded both CO_2 and PFC emissions reduction goals in 2005

2003
Charter member of Chicago Climate Exchange – committed to reduce IBM's direct and indirect CO_2 emissions from its energy use

2004, 2005, 2006
Named in U.S. EPA's Top 20 Best Workplaces for Commuters among the FORTUNE 500 Companies

2004
IBM Zurich's headquarters building received the Minergie® Certificate of the Swiss Minergie Association

2005
Received Low Carbon Leaders Award from The Climate Group in the U.K.

2005
Recognized by WWF for attaining the company's Climate Savers goal

2006
Purchased 96 million kWh of RECs and 272 million kWh of electricity generated by wind turbines, solar panels or biomass

2006
Recognized by U.S. EPA under the Climate Leaders program for attaining its Climate Leaders goals

2006
Joined U.S. EPA's Green Power Partnership

2006
Received U.S. EPA/DOE's Green Power Leadership Award

2006
Joined WRI's Green Power Market Development Group-Europe

2006
Received U.S. EPA's Climate Protection Award – first company to receive the Award twice

2007
Announced second generation GHG reduction goal through U.S. EPA's Climate Leaders program

2007
Received U.S. EPA's SmartWay Excellence Award