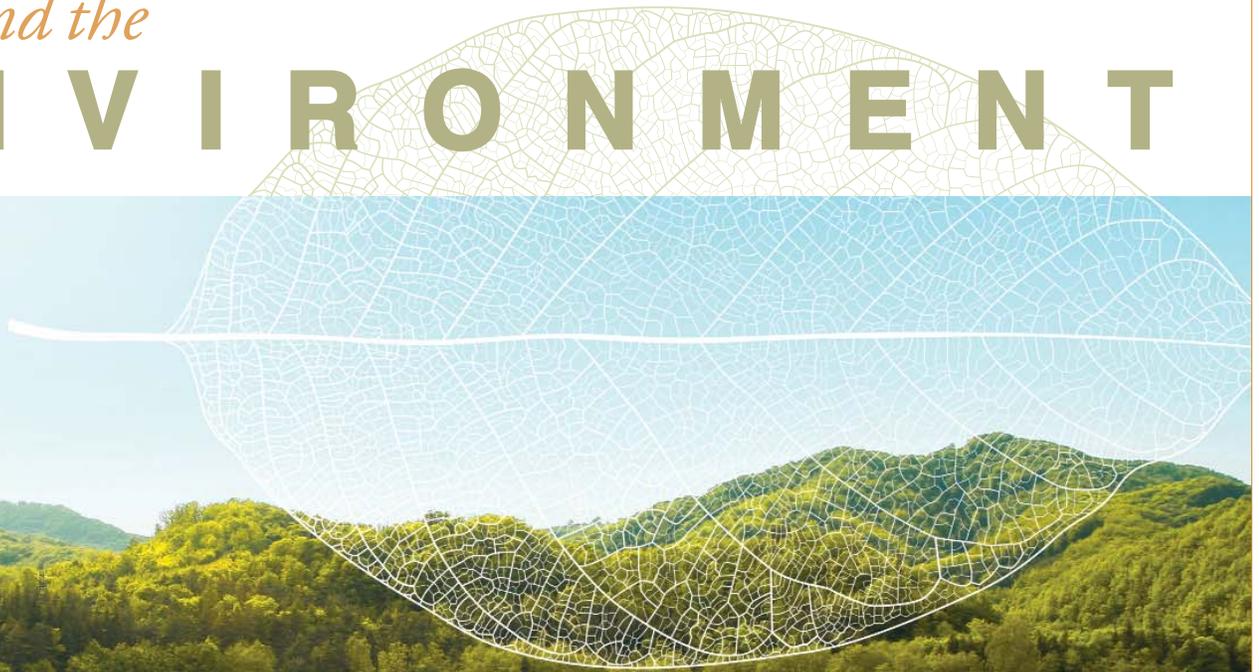


**20**  
years of  
environmental  
reporting



*IBM and the*

# ENVIRONMENT



*2009 Annual Report*

IBM *and the*

# E N V I R O N M E N T

## TABLE OF CONTENTS

**A Message from the Vice President,  
Corporate Environmental Affairs and  
Product Safety, Wayne S. Balta 1**

**A Commitment to Environmental  
Protection 3**

**Global Governance and Management 4**  
Global Environmental Management System 4  
Stakeholder Engagement 5  
Voluntary Partnerships and Initiatives 6  
Environmental Investment and Return 8

**Process Stewardship 10**  
Environmentally Preferable Substances  
and Materials 10  
Nanotechnology 13

**Pollution Prevention 13**  
Hazardous Waste 13  
Nonhazardous Waste 14  
Chemical Use and Management 15

**Water Conservation 17**

**Product Stewardship 18**  
A Systems Approach 18  
Product Design 19  
Product Energy Efficiency 21  
Product Recycling and Reuse 22  
Product Packaging 23  
Product Safety 25

**Energy and Climate Programs 25**  
A Five-Part Strategy 25  
Conserving Energy 26  
CO<sub>2</sub> Emissions Reduction 30  
PFC Emissions Reduction 31  
Procuring and Fostering Renewable  
Energy 32  
Voluntary Climate Partnerships 33  
Transportation & Logistics Initiatives 33

**Supply Chain Programs 35**  
Environmental Evaluation of Suppliers 35  
Energy and Climate Requirements 36

**Audits and Compliance 38**  
Accidental Spills and Releases 39  
Fines and Penalties 39

**Remediation 40**

**Awards and Recognition 41**  
Internal Recognition 41  
External Recognition 43

**IBM Environmental Affairs Policy 45**

**2009 Environmental Performance  
Summary 46**



*A Message from the*

Vice President, Corporate Environmental  
Affairs and Product Safety

Wayne S. Balta



“Green” is not a new topic for IBM. Environmental protection has been an IBM imperative for decades. And as far as disclosure is concerned, this report marks the twentieth consecutive annual environmental report (since 1990) that our company has published. We are particularly proud to have sustained this practice for 20 years, during periods when the environment was not always as popular a subject as it is today; during profound changes in the global economy, our industry and our business model; and during periods of differing financial results. At IBM, our record shows we believe in sustaining sustainability. We execute accordingly. And, we continue to be in this for the long term.

At present, concern regarding climate change has appropriately captured the attention of many. That is understandable and very important. At the same time, it’s appropriate to remind ourselves on occasion that climate change does not represent the entirety of environmental interests and needs. There is—and has always been—much more to it.

Accordingly, you will continue to see matters like pollution prevention, waste management, material selection and water stewardship covered in our environmental report in addition to energy efficiency and climate change.

As we continue IBM’s 20 years of leadership in environmental reporting, we recognize that we couldn’t write a report without content. And for that, we rely upon IBM’s long-standing global environmental management system, which compels our colleagues to identify what matters, to measure it and to manage it. We focus on integrating environmental leadership throughout the fabric of our business and we aim for responsibility and opportunity that is systemic across the entirety of IBM.

Speaking of opportunity, we are also dedicated to creating solutions that help protect the world’s environment, consistent with the dialogue IBM has created regarding a Smarter Planet™. At the core of creating a smarter and more sustainable world is innovation that matters. This is not innovation just for the sake of developing a cool gadget, but innovation that will have more far-reaching effects on society and the planet.

Many of IBM’s present-day solutions leverage the company’s own leadership and expertise,



integrating and extending benefits to our clients. Some examples:

- **Data Centers:** All of the innovations for energy efficiency being implemented in IBM's data centers are available to our clients. We're partnering with clients around the globe on best practices, thermal management, virtualization, consolidation, software and even construction to improve data center energy efficiency across the global economy.
- **Water:** IBM's own monitoring, tracking and reporting processes helped inform and provide a basis for the company's Green Sigma™ approach, which applies Lean Six Sigma principles to systemically measure, monitor and control water and energy use throughout an organization's operations.
- **Logistics:** An IBM business analytics solution named the Carbon Trade-Off Modeler

(CARBAN) began with IBMers from our Research Division working with IBMers in our Global Logistics function. The CARBAN tool analyzes various supply chain policies, transport modes and network configurations to optimize logistics solutions based on trade-offs between carbon emissions, cost and service level.

During the past 20 years of our annual environmental reporting, we have consistently shared our environmental programs and performance with you, and we will continue to do so. I invite you to read this latest information about IBM's ongoing commitment to environmental leadership.

Wayne S. Balta

*Vice President, Corporate Environmental Affairs and Product Safety*

## About This Report

For 20 consecutive years (since 1990), IBM has publicly disclosed its environmental performance in the company's annual IBM and the Environment report. IBM's environmental stewardship has also been included in IBM's Corporate Responsibility Report since 2002, the first year of that report. The IBM and the Environment report provides a more comprehensive update on the company's environmental programs and performance than is possible in the more space-constrained Corporate Responsibility Report. For additional information, visit the IBM and the Environment website at [ibm.com/environment](http://ibm.com/environment). IBM's Global Reporting Initiative (GRI) Report is also available on this website.

## A COMMITMENT TO ENVIRONMENTAL PROTECTION

*IBM has a long history of environmental leadership. The company's corporate policy on environmental protection, first established in 1971, is supported by a comprehensive global environmental management system that governs IBM's operations worldwide.*

IBM's long-standing recognition of the importance of protecting the environment arises from two key aspects of its business. The first is the intersection of the company's operations and products with the environment. The second is the enabling aspects of IBM's innovation, technology and expertise.

IBM's operations can have an effect on the environment in a number of ways. For example, chemicals needed for research, development and manufacturing must be properly managed from selection and purchase through storage, use and disposal. Data center operations are energy-intensive, and some manufacturing processes are energy- and/or water-intensive. IBM continually looks for ways to reduce consumption of these and other resources.

In the product area, IBM designs its products to be energy efficient and utilizes environmentally preferable materials that are capable of being reused, recycled or disposed of safely at the end of their useful lives. Moreover, as IBM has

outsourced more of its manufacturing, its supply chain increased in relevance with respect to environmental protection. Evaluation of suppliers' overall environmental responsibility and the environmental attributes of the parts and products suppliers provide to IBM has become increasingly important.

The enabling aspect of IBM's innovation and technology makes it a significant force in developing solutions that can help both IBM and its clients to be more efficient and protective of the environment. In addition, the massive computational power, software advancements and visualization capabilities of IBM's technology can bring increased understanding and swifter solutions to some of the world's most demanding scientific and environmental problems. This report describes IBM's programs and performance in both areas.

## GLOBAL GOVERNANCE AND MANAGEMENT

### GLOBAL ENVIRONMENTAL MANAGEMENT SYSTEM

IBM's corporate environmental affairs policy calls for environmental affairs leadership in all of the company's business activities. The policy objectives range from workplace safety, pollution prevention and energy conservation to product design for the environment, continual improvement and the application of IBM's expertise to help address some of the world's most pressing environmental problems. The policy may be found on page 45 of this report or at [www.ibm.com/environment/policy](http://www.ibm.com/environment/policy).

The policy is supported by corporate directives that govern IBM's operations worldwide. These directives cover areas such as pollution prevention, chemical and waste management, energy conservation and climate protection, environmental evaluation of suppliers, product stewardship, and incident prevention and reporting.

IBM's commitment to environmental protection is implemented through its global environmental management system (EMS).

### *Employee & Management Responsibility*

Every employee is expected to follow the corporate environmental affairs policy and its directives and report any environmental, health or safety concern to IBM management. Managers are expected to take prompt action when faced with a potential violation of the policy or directives.

In addition, all employees are required by the company's **Business Conduct Guidelines** to comply with environmental laws and with IBM's own environmental, health and safety programs.

IBM executives are responsible for the environmental performance of their organizations. Site location executives are responsible for the environmental performance of their site.

IBM's environmental programs and performance are reviewed annually by the Directors and Corporate Governance Committee of IBM's Board. This committee was formed in 1993 and its charter established its responsibility for reviewing and considering IBM's position and practices on significant issues of corporate public responsibility, including protection of the environment.

## Environmental Goals

Environmental goals are an important part of IBM's EMS. The company's key environmental performance indicators cover the following areas: climate protection, energy and water conservation, pollution prevention, waste management and product stewardship. These goals and IBM's performance against them are discussed in their respective sections of this report.

## ISO 14001 Environmental Management System Standard



IBM became the world's first major company to earn a single global registration to ISO 14001 in 1997, over a decade ago—and the company achieved this credential within just one year of the finalization of the Standard.

The registration covered IBM's manufacturing, product design and hardware development operations across its business units worldwide. IBM has since expanded its global ISO 14001 registration to include its chemical-using research locations, several country organizations covering their nonmanufacturing locations and its Global Asset Recovery Services business function.

As its business model has evolved to include more services offerings, IBM continues to update its EMS to appropriately address environmental opportunities and challenges in the services area.

More information about IBM's EMS and programs supporting its environmental objectives may be found at [www.ibm.com/environment](http://www.ibm.com/environment).

## STAKEHOLDER ENGAGEMENT

IBM has a variety of outreach programs through which it engages with various groups and individuals on the subject of the environment.

Though they may vary by location, the company's community environmental outreach programs range from open houses and emergency preparedness drills with local organizations to the support of and participation in local environmental projects and environmental education efforts.

IBM also has ongoing dialogues with many stakeholders, including socially responsible investors and other shareholders, environmental nongovernmental organizations (eNGOs), governments, employees and others on a range of environmental issues. These dialogues are valuable, as they allow the company to share ideas and obtain feedback about its programs, activities and performance.

Another example is engagement for “collaborative innovation.” IBM believes integrating different minds and different perspectives can accelerate new solutions to long-standing problems.



### Global Eco-efficiency Jam Smarter solutions for energy & environment

Since 2001, one way the company has done that is with IBM's Jams, which enable global online conversations on strategic business and societal issues across industries, disciplines, stakeholders and national borders.

In 2010, IBM brought together 1,600 business executives, government officials, non-governmental organization (NGO) leaders, journalists, analysts and environmental experts from more than 60 countries for the company's Eco-efficiency Jam—a two-day online, interactive discussion of the opportunities for continued advancement of eco-efficiency. The IBM Institute for Business Value report from the Jam—“The emergence of the eco-efficient economy” may be found at [www.ibm.com/services/us/gbs/bus/html/ibv-eco-efficiency-jam.html](http://www.ibm.com/services/us/gbs/bus/html/ibv-eco-efficiency-jam.html).

### **VOLUNTARY PARTNERSHIPS AND INITIATIVES**

IBM is strongly committed to participation in voluntary programs and has joined a number of voluntary initiatives and partnerships with governmental and nongovernmental organizations.

Among the many, some governmental examples include the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® and Climate Leaders programs, and the OECD Committee on Industry, Innovation and Entrepreneurship.

Partnerships with eNGOs include, among others: charter member of the World Resources Institute's (WRI) Green Power Market Development Group (U.S. and Europe); charter member of the World Wildlife Fund's Climate Savers program; charter member of the Chicago Climate Exchange®; and membership in the Pew Center on Global Climate Change and The °Climate Group. IBM also works with and supports organizations such as The Conservation Fund, the Environmental Law Institute, the World Environment Center and the WRI. In addition, IBM is a founding member of The Green Grid<sup>SM</sup> and a member of the World Business Council for Sustainable Development.

A more complete listing of IBM's voluntary partnerships and initiatives can be found at [www.ibm.com/environment/initiatives/](http://www.ibm.com/environment/initiatives/).

IBM partners with the Wildlife Habitat Council (WHC) to manage many of its properties in ways that enhance habitats. Seven IBM sites (Armonk, New York [Corporate Headquarters]; Boulder, Colorado; Research Triangle Park, North Carolina; Rochester, Minnesota; San Jose, California [IBM's Almaden Research Center and Silicon Valley Laboratory]; and Toronto, Canada [IBM's Software Lab]) have had their land management and wildlife habitat programs certified by the WHC.

IBM also encourages its employees to support environmental efforts. For example, through its Matching Grants program, the company matches contributions made by U.S. employees to groups ranging from The Nature Conservancy and the World Wildlife Fund to smaller groups dedicated to preserving lands and habitats in local communities.

In addition, IBM employees can support environmental organizations in their local communities through IBM's On Demand Community (ODC) program. ODC is a first-of-its-kind global initiative to encourage and sustain corporate philanthropy through volunteerism. It provides IBM employees and retirees with a rich set of IBM technology tools they can use to help schools and the nonprofit community organizations in which they volunteer, including environmental organizations. The program combines the expertise, interests and skills of IBMers with the power of the company's innovative technologies and solutions to help nonprofit organizations be more effective in addressing community needs.

## THE ECO-PATENT COMMONS

The Eco-Patent Commons is a unique opportunity for global business to make a difference—sharing innovation to foster sustainable development. The Commons, an online collection of environmentally beneficial patents pledged by companies for free use by anyone, was designed to facilitate the use of existing innovation to protect the environment and encourage collaboration for new innovation.

The Eco-Patent Commons was initiated by IBM and the World Business Council for Sustainable Development and launched in January 2008 with Nokia, Pitney Bowes and Sony. Bosch, DuPont and Xerox joined the Commons in September 2008.

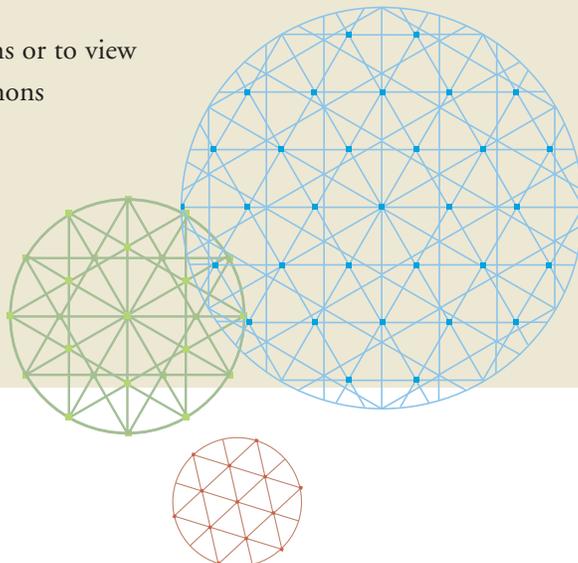
Taisei and Ricoh joined in March 2009, and Dow and Fuji Xerox joined in October 2009.

Examples of the environmental benefits of patents that may be pledged to the Eco-Patent Commons include:

- Energy conservation or improved energy or fuel efficiency
- Pollution prevention (source reduction, waste reduction)
- Use of environmentally preferable materials or substances
- Water or materials use reduction
- Increased recycling opportunity

To date, the 11 member companies have pledged more than 100 patents to the Eco-Patent Commons, 28 of which were pledged by IBM. Many of the member companies have been contacted directly about their patents.

For more information, to join the Commons or to view pledged patents, visit the Eco-Patent Commons website at [www.wbcsd.org/web/epc/](http://www.wbcsd.org/web/epc/).



## COALITION FOR ENERGY AND ENVIRONMENTAL LEADERSHIP IN LEASED SPACE

IBM, along with DuPont, Fluor Corporation, Pitney Bowes Inc. and the Switzer Group, has formed a coalition to drive an increase in the availability of competitively priced leased space that also provides energy efficiency and other environmental attributes. By joining together, the Coalition hopes to make more environmentally sustainable leased spaces increasingly the standard rather than the exception in the marketplace.

To aid in accomplishing its objective, the Coalition developed a baseline Environmental and Energy Efficiency Attributes Checklist. It addresses requirements in four areas: sustainable site management, water efficiency, energy efficiency, and materials and resources.

Members of the Coalition commit to:

- Make the Checklist a standard part of their requests for proposal (RFPs) for new leases and lease renewals for office space in the U.S.
- Include the providers' response as a factor in making lease decisions
- Develop appropriate metrics to measure progress

Actions under this initiative are intended to complement, not replace, individual companies' activities for improving building environmental and energy efficiency such as those pursuant to the U.S. Green Building Council's LEED® green building certification program.

Membership in the Coalition is open to all organizations willing to make and carry out the same commitment.

## ENVIRONMENTAL INVESTMENT AND RETURN

Over the past 5 years, IBM has spent \$150.5 million in capital and \$502.4 million in operating expense to build, maintain and upgrade the infrastructure for environmental protection at its plants and labs, and to manage its worldwide environmental programs.

### ENVIRONMENTAL CAPITAL AND EXPENSE WORLDWIDE

*(\$ in Millions)*

	2005	2006	2007	2008	2009
Capital	\$ 55.0	\$ 19.5	\$ 30.0	\$ 31.7	\$ 14.3
Expense	105.6	96.6	100.4	103.8	96.0
<b>TOTAL</b>	<b>\$160.6</b>	<b>\$116.1</b>	<b>\$130.4</b>	<b>\$135.5</b>	<b>\$110.3</b>

IBM compares its environmental expenses to the estimated savings resulting from its policy of environmental leadership. Savings come from energy, material and water conservation; recycling; packaging improvement initiatives; reductions in chemical use and waste; and process improvements from pollution prevention. Ongoing savings from the previous years' initiatives are not carried over in this comparison, yielding very conservative estimates.

IBM also realizes savings through the avoidance of costs that likely would occur in the absence of its EMS. These savings are not measurable in the same way that expenses are, but avoiding these environmental costs does result in savings for IBM, and a reasonable attempt has been made to estimate them.

Consistent with the evolution of IBM's business model to one less focused on manufacturing and more on services, in 2008 the company changed its methodology for estimating compliance cost avoidance and established a more conservative process that includes compliance cost efficiency and potential fine, penalty and litigation avoidance. The tables that follow provide the analysis of IBM's environmental expenses and estimated savings and cost avoidance for 2009.

IBM's experience has shown that annual savings from its focus on pollution prevention and design for the environment consistently exceeded environmental expenses, thus demonstrating the value of proactive environmental programs and performance. In 2009, the estimated environmental savings and cost avoidance exceeded environmental expenses worldwide by a ratio of 1.6 to 1.

## 2009 ENVIRONMENTAL EXPENSES WORLDWIDE

*(\$ in Millions)*

Personnel	\$ 31.2
Consultant fees	4.2
Laboratory fees	1.9
Permit fees	0.4
Waste treatment and disposal	11.0
Water and wastewater management operations	3.8
Air emission control operations	1.6
Groundwater protection operations	0.8
Other environmental systems operations	1.6
Waste and materials recycling	2.4
Superfund and former IBM site remediation	32.4
Miscellaneous/other	4.7
<b>TOTAL</b>	<b>\$ 96.0</b>

## 2009 ESTIMATED ENVIRONMENTAL SAVINGS AND COST AVOIDANCE WORLDWIDE

(\$ in Millions)

Location pollution prevention operations	\$ 34.7
Corporate operations*	3.0
Packaging improvements	19.3
Environmentally preferable materials usage	0.2
Energy conservation and cost avoidance	26.9
Superfund and site remediation efficiencies	4.7
Spill remediation cost avoidance**	2.2
Compliance cost efficiency***	19.2
Potential fine, penalty and litigation avoidance****	42.2
<b>TOTAL</b>	<b>\$152.4</b>

\* Savings or costs avoided by having internal professional staff and tools versus using external consultants and tools.

\*\* These savings are estimates based upon certain assumptions. The figure for spill remediation cost avoidance is estimated from IBM's actual experience with remediation costs.

\*\*\* Compliance cost efficiency considers the cost avoided through proactive compliance.

\*\*\*\* The estimation for the avoidance of potential fines, penalties and litigation does not include the environmental expenses attributed to product development, procurement and customer fulfillment for complying with product environmental laws and regulations. It also does not include the cost avoidance of potential business interruption or fines related to noncompliance with product environmental laws and regulations (e.g., E.U. REACH or RoHS requirements).

## PROCESS STEWARDSHIP

### ENVIRONMENTALLY PREFERABLE SUBSTANCES AND MATERIALS

Among its objectives, IBM's environmental policy calls for the company to use development and manufacturing processes and provide products that are protective of the environment. As an integral part of its EMS supporting this objective, IBM routinely and consistently monitors and manages the substances it uses in its manufacturing and development processes and in its products.

The company's precautionary approach includes the careful scientific review and assessment of certain substances prior to their use in IBM's processes and products. In specific instances, IBM has chosen to proactively prohibit, restrict

or substitute substances used in IBM processes and products when the weight of scientific evidence determines an adverse effect upon human health or the environment, even when law permits their use.

In addition, IBM conducts scientific assessments of existing approved substances when new processes or major modifications to existing processes are being developed. The objective of these scientific assessments is to identify potential substitutes that may be environmentally preferable. IBM believes that the same scientific rigor is required when investigating the human health and environmental effects of potential substitutes as was given to the investigation of the substance currently in use.

The following provides a sampling of IBM's early leadership in prohibiting or restricting many substances of concern from its processes and products before regulatory requirements were imposed:

- **Chlorofluorocarbons (CFCs):** In 1989, IBM became the first major Information Technology (IT) manufacturer to announce a phase-out of CFCs, a Class I ozone-depleting substance, from its manufacturing and development processes.
- **Class I and II ozone-depleting substances:** IBM completed the phase-out of Class I ozone-depleting substances in 1993. Subsequently, IBM eliminated Class II ozone-depleting substances from its manufacturing processes in 1995.
- **Trichloroethene (TCE), ethylene-based glycol ethers and dichloromethane:** Examples of other chemicals that IBM voluntarily prohibited from its manufacturing processes include TCE in the late 1980s, ethylene-based glycol ethers in the mid-1990s and dichloromethane in 2003.
- **Polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs):** IBM prohibited PBBs and PBDEs from its product designs in the early 1990s and then extended the prohibition to purchased commodities through its procurement specifications in 1993.

- **Cadmium:** IBM prohibited the use of cadmium in inks, dyes, pigments and paints in 1993; in plastics and plating in 1994; and in CRT monitors along with nickel cadmium batteries in the mid-1990s.
- **Polyvinyl chloride (PVC) and tetrabromobisphenol A (TBBPA):** IBM ceased the specification of PVC in its IT system enclosures in 2000 and prohibited the use of TBBPA as an additive flame retardant in IT system enclosures for newly released products in 2007.
- **Specific perfluorinated compounds (Perfluorooctane sulfonate [PFOS] and perfluorooctanoic acid [PFOA]):** IBM prohibited the compounds' use in the development of new materials in 2005, in new manufacturing applications in 2007, and eliminated the use of PFOS and PFOA in manufacturing, development and research processes as of January 31, 2010.

A table summarizing IBM's voluntary material prohibitions and restrictions from 1978 through 2010 may be found at [www.ibm.com/environment/products/materials.shtml](http://www.ibm.com/environment/products/materials.shtml).

IBM's restrictions on specific substances and other environmental requirements for its products are identified in the company's Engineering Specification: Baseline Environmental Requirements for Supplier Deliverables to IBM, which can be found at [www.ibm.com/environment/products/especs.shtml](http://www.ibm.com/environment/products/especs.shtml).

## TWO INDUSTRY FIRSTS

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### IBM ELIMINATES PFOS AND PFOA

IBM eliminated all known uses of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) from its chip manufacturing processes, becoming the first in the industry to announce elimination of these two compounds.

In 2003, IBM began a staged phase-out of PFOS and PFOA, a plan that required the work of hundreds of IBM scientists and engineers, IBM partners and suppliers.

IBM prohibited the compounds' use in the development of new materials in 2005 and in new manufacturing applications in 2007.

IBM successfully eliminated PFOS and PFOA in its wet etch processes at the end of 2008 and eliminated them from its photolithography processes as of January 31, 2010.

Developing alternatives for these chemicals was an ambitious technological challenge. The transition to the new formulations had to be implemented and qualified across a large array of processes without impacting customer product delivery commitments. In addition, several companies in at least five countries have had access to this solution through their technology development alliances with IBM.

### FLUORINE-FREE PHOTO-ACID GENERATOR INNOVATION

In another industry first, IBM Research recently announced its invention of a new type of fluorine-free photo-acid generator for use in the production of semiconductors using 193nm lithography. The photo-acid generator is one of several components of a system of chemicals used in the photolithography process to transfer circuit patterns onto semiconductor wafers.

IBM's solution, on which it holds several patents, is an example of "green chemistry" in action—applying molecular design to invent new, more environmentally benign compounds. IBM researchers have demonstrated that the new chemicals meet the performance requirements, and the company is in discussions with a number of chemical suppliers regarding their possible production.

## NANOTECHNOLOGY

Nanotechnology is the application of scientific and engineering principles to make and utilize very small things (dimensions of roughly 1 to 100 nanometers). An important aspect of nanotechnology is creating materials in the nanoscale, where unique properties enable novel and useful application.

Nanotechnology is already part of a wide variety of products—from cosmetics and sunscreens to paints, clothing and golf equipment. It can make products lighter, stronger, cleaner, less expensive and more precise, and has been critical to the success of the IT industry.

A pioneer in the field, IBM has achieved numerous breakthroughs that are fundamental to the development of nanotechnology. One significant example is the scanning tunneling microscope. As is often the case with the introduction of new technologies, there are some environmental, health and safety questions related to nanoparticles because of the relatively limited information available about them.

IBM has taken proactive steps to respond to this uncertainty. IBM was one of the first companies to create safe work practices and health and safety training for its employees working with nanoparticles. IBM has also provided nanowire materials for assessment by the National Institute of Occupational Safety and Health and is collaborating with the Center for Environmental Implications of Nanotechnology (Duke University/Carnegie Mellon University) to study the potential environmental impact of other materials relevant to the IT and microelectronics industries.

## POLLUTION PREVENTION

### HAZARDOUS WASTE

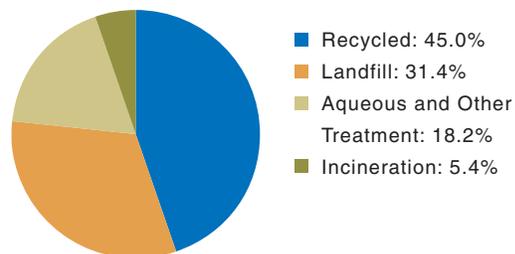
One way to prevent pollution is to reduce the generation of hazardous waste at its source. This has been a basic philosophy behind IBM's pollution prevention program since 1971.

Where possible, IBM redesigns processes to eliminate or reduce chemical use and substitute more environmentally preferable chemicals. Chemicals needed for research, development and manufacturing must be properly managed, from selection and purchase through storage, use and disposal.

For waste that is generated, IBM focuses on preventing pollution through a comprehensive, proactive waste management program. IBM's total worldwide hazardous waste generation decreased by 69 metric tons or 0.8 percent from 2008 to 2009.

### HAZARDOUS WASTE MANAGEMENT WORLDWIDE

*(2009 Quantities: 8,187 Metric Tons)*

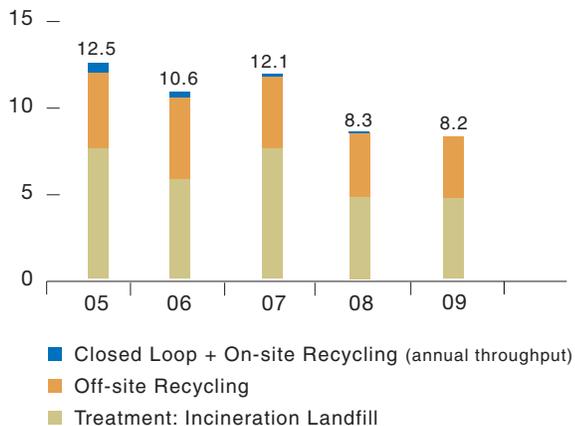


In 2009, IBM recycled 45 percent of its hazardous waste and 31.4 percent was sent to landfills. Of the total amount that went to landfills, 93 percent was sludge from industrial wastewater treatment plants. Local government regulations required disposition of this sludge in secure hazardous waste landfills.

*Since 2005, IBM's total hazardous waste has decreased by 33.9 percent.*

### HAZARDOUS WASTE QUANTITIES WORLDWIDE

*(2009 Quantities: Metric Tons x 1,000)*



In 1992, IBM developed a methodology to correlate the hazardous waste generated from its manufacturing operations to its production and expanded it to its sites worldwide in 1993. In 1995, IBM established a goal based on this methodology: to continually reduce the waste generated from IBM's manufacturing operations relative to production.

This goal covers approximately 90 percent of IBM's manufacturing and hardware development-related hazardous waste, which currently comes from 3 manufacturing sites. Hazardous waste from other operations, such as assembly and facility operations, is not included in this metric.

### HAZARDOUS WASTE GENERATION

**GOAL:** Achieve year-to-year reduction in hazardous waste generation from IBM's manufacturing processes indexed to output.

**RESULT:** In 2009, IBM's hazardous waste generation indexed to output increased 8.4%.

The 8.4 percent increase in hazardous waste generation indexed to output was largely attributable to process changes during the transition to lower line width microprocessor technologies at one of the company's semiconductor manufacturing facilities. IBM has already made changes to reduce its hazardous waste generation related to these processes and is continuing to evaluate its opportunities to further optimize its operations.

### NONHAZARDOUS WASTE

IBM also has focused for decades on recycling its nonhazardous waste.

Nonhazardous waste includes waste such as paper, metals, plastics, deionized resins and nonhazardous chemicals. The goal also includes end-of-life (EOL) IT product waste generated by IBM's business (e.g., equipment scrapped from IBM locations) as well as IBM-owned equipment returned by external customers at the end of lease.

## NONHAZARDOUS WASTE RECYCLING

**GOAL:** Send an average of 75% of the nonhazardous waste generated at locations managed by IBM to be recycled.

**RESULT:** In 2009, IBM sent 76% of its nonhazardous waste to be recycled.

IBM generated 79,139 metric tons of nonhazardous waste in 2009, representing a decrease of 16.5 percent when compared to 2008 volumes. This reduction is mainly due to a reduction of EOL IT product waste processed and a reduction in construction activities/projects, which is reflected directly in the amounts of nonhazardous construction debris and soil generated by IBM.

## NONHAZARDOUS WASTE GENERATED AND RECYCLED WORLDWIDE

*(Metric Tons x 1,000)*

YEAR	05	06	07	08*	09
Total recycled	83	102	84	62	60
Total generated	108	134	107	82	79
Percent recycled**	77%	76%	78%	76%	76%

\* Data for 2008 has been revised.

\*\* Percent recycled versus goal of 67% (2005–2006) and 75% (2007–2009)

## CHEMICAL USE AND MANAGEMENT

Under the U.S. Superfund Amendments and Reauthorization Act (SARA) of 1986 and the U.S. Pollution Prevention Act (PPA) of 1990, companies are required to file an annual inventory of routine releases to the environment and off-site transfers of waste for treatment and disposal in addition to recycling, treatment and energy recovery activities (collectively, “reportable quantities”) for more than 600 chemicals listed on the U.S. Toxic Release Inventory (TRI) list.

IBM’s operations rely on the use of some chemicals on the TRI list.

### *International Performance Measure*

IBM has used TRI reportable quantities as a metric to track the environmental performance of its operations globally since 1993. One of

IBM’s objectives continues to be identifying opportunities to minimize its TRI releases to the environment.

*Since 2005, IBM has reduced its total TRI reportable quantities worldwide by 35 percent.*

In 2009, IBM sites worldwide used 18 of the TRI-listed chemicals in amounts greater than the reporting threshold of 10,000 pounds (4.54 metric tons) of use per year.

IBM’s 2009 total reportable releases to the environment and waste transferred off-site for treatment and disposal from its worldwide operations amounted to 485 metric tons, a reduction of 75 metric tons from 2008.

The company's total TRI reportable quantities also decreased in 2009, compared to 2008. The decrease was primarily due to the reduction in off-site transfer for recycling of copper, copper compounds, lead and lead compounds from IBM's operations in Endicott, New York, which

amounted to 383 metric tons or 88 percent of the total reductions in IBM's 2009 TRI reportable quantities. IBM's reverse logistics operations in Endicott, which contributed these releases, were sold in 2009.

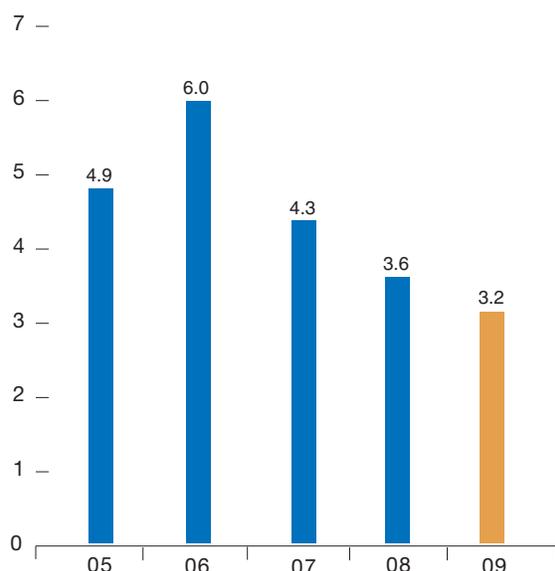
### 2009 WORLDWIDE REPORTABLE QUANTITIES\* ASSOCIATED WITH CHEMICALS ON THE U.S. TOXIC RELEASE INVENTORY LIST

CHEMICAL	METRIC TONS
Sulfuric acid (aerosol only)	968
Nitrate compounds	599
Xylene	578
n-methyl-2-pyrrolidone	134
Hydrogen fluoride	124
Ethylbenzene	123
Nitric acid	115
Copper and compounds category	418
All others	146
<b>TOTAL</b>	<b>3,205</b>

\*As defined by U.S. SARA Section 313 and PPA.

Includes recycling, treatment, energy recovery, releases and off-site transfers for treatment and disposal.

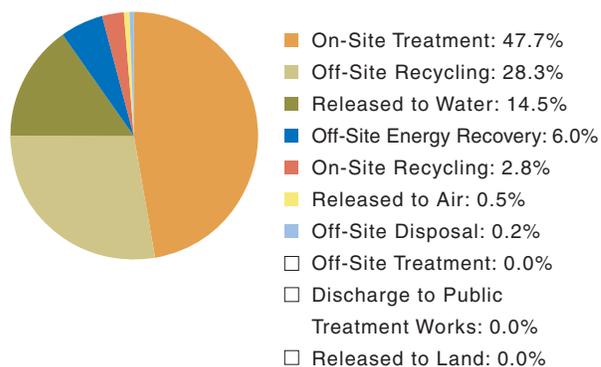
### WORLDWIDE REPORTABLE QUANTITIES\* ASSOCIATED WITH CHEMICALS ON THE U.S. TOXIC RELEASE INVENTORY LIST (Reportable Quantities in Metric Tons x 1,000)



\*As defined by U.S. SARA Section 313 and PPA.

Includes recycling, treatment, energy recovery, releases and off-site transfers for treatment and disposal.

### WORLDWIDE REPORTABLE QUANTITIES\* ASSOCIATED WITH CHEMICALS ON THE U.S. TOXIC RELEASE INVENTORY LIST (Reportable Quantities: 3,205 Metric Tons)

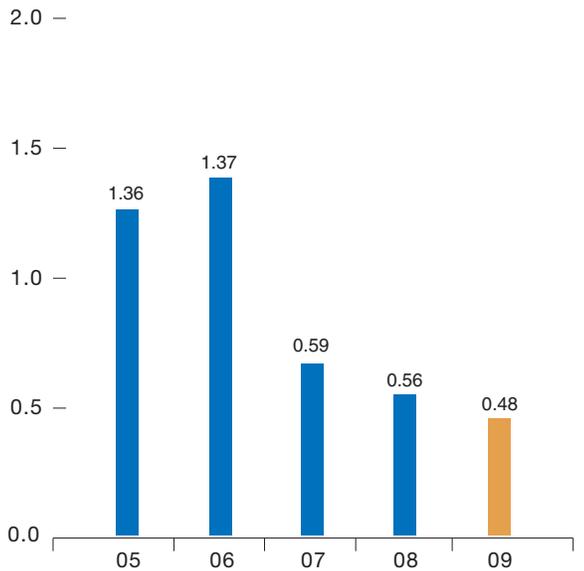


\*As defined by U.S. SARA Section 313 and PPA.

Includes recycling, treatment, energy recovery, releases and off-site transfers for treatment and disposal.

**TOTAL RELEASES TO ENVIRONMENT AND WASTES TRANSFERRED OFF-SITE FOR TREATMENT AND DISPOSAL WORLDWIDE\***

*(Metric Tons x 1,000)*



\* Includes releases and off-site transfers for treatment and disposal, as defined by U.S. SARA Section 313 and PPA.

**WATER CONSERVATION**

IBM’s evaluation of water use at its plants and labs indicates that IBM’s microelectronics operations represent its most water-intensive operations at these facilities.

In 2009, the microelectronics manufacturing operations that are primarily located in North America represented 82 percent (9,461 thousand cubic meters [TCMs]) of the total annual water used (11,590 TCMs) at IBM’s plants and labs worldwide.

In 2000, IBM established an annual water savings goal of 2 percent of total annual water usage in its microelectronics manufacturing operations, based on the water usage of the previous year and measured as an average over a rolling 5-year period.

**WATER CONSERVATION IN MICROELECTRONICS MANUFACTURING OPERATIONS**

**GOAL:** To achieve an annual water savings equal to 2% of total annual water usage in its microelectronics manufacturing operations, based on the water usage of the previous year and measured as an average over a rolling 5-year period.

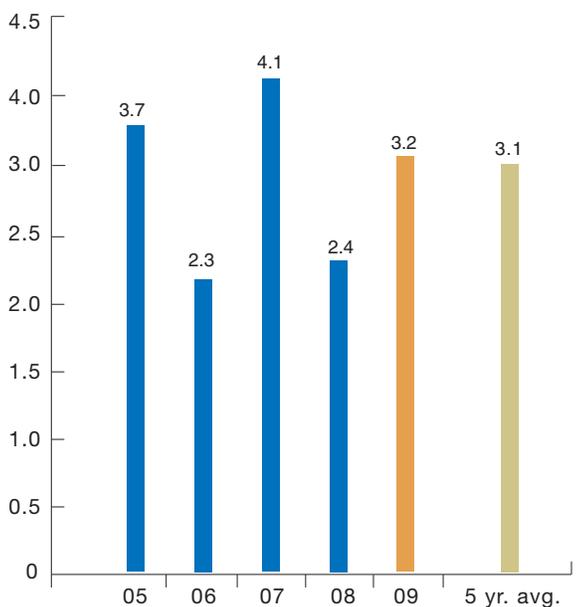
**RESULT:** As of year-end 2009, IBM’s microelectronics manufacturing operations had achieved an average annual water savings of 3.1% over the past 5 years versus the 2% goal.

New water conservation and recycling initiatives in IBM’s microelectronics manufacturing operations during 2009 achieved a 3.2 percent savings. These savings were achieved through ongoing efficiency enhancements that reduced water usage in certain operations. Over the past 5 years, new water conservation and recycling initiatives at IBM’s microelectronics manufacturing operations have achieved an average 3.1 percent savings versus the 2 percent goal.

In 2009, the total annual water conservation savings for the microelectronics manufacturing operations from reduction, recycle and reuse activities was 761 TCMs of water. The total accumulated conservation savings over the past 5 years was 8,174 TCMs of water resource.

### ANNUAL WATER SAVINGS IN MICROELECTRONICS MANUFACTURING OPERATIONS

*(Savings as percentage of previous year's total water use)*



## PRODUCT STEWARDSHIP

IBM's Product Stewardship program was established in 1991 as a proactive and strategic approach to the company's environmental management of products. The program's mission is to develop, manufacture and market products that are increasingly energy efficient; can be upgraded and reused to extend product life; incorporate recycled content and environmentally preferable materials and finishes; and can be recycled and disposed of safely.

### A SYSTEMS APPROACH

IBM's product stewardship objectives and requirements are implemented through internal standards, product specifications and other requirements in IBM's Integrated Product Development process. Product environmental attributes such as energy efficiency, materials content, chemical emissions testing, design for recycling, end-of-life management plans and packaging data must be documented and reviewed in IBM's Product Environmental Profile tool at various checkpoints during the development process. Compliance management tools like the Product Content Declaration for IBM Suppliers support the assessments required for a complete Product Environmental Profile prior to product release.

IBM's design and compliance controls, including a baseline environmental requirements specification, Product Content Declaration, and compliance assessment protocols are managed through

an interdisciplinary team with representatives from all IBM organizations that design, procure, deliver and service IBM's product offerings. The team's activities are coordinated by IBM's Center of Excellence for Product Environmental Compliance.

## PRODUCT DESIGN

IBM's product development and supply chain organizations are working steadily toward eliminating the lead (Pb) solder in server applications that continue to be exempted from lead restrictions of the European Union Restriction on Hazardous Substances (RoHS) Directive 2002/95/EC. The reason this has been exempted is because elimination is much more technically complex than applications in consumer products. Lead-free card assembly was introduced in 2009 for numerous IBM System x® servers, the iDataPlex™ dx360 server and the BladeCenter® HS22. The HS22 also uses a halogen-free laminate material for its planar board. Lead-free assemblies for custom memory dual in-line memory modules were implemented in IBM System i®, System p® and System z® portfolios.

Additional RoHS exemptions that were fully eliminated from IBM products in 2009 included the following:

- Lead as an impurity in RIG (rare earth iron garnet) Faraday rotators used for fiber optic communications systems

- Lead used in C-press compliant pin connector systems
- Lead in solders consisting of more than two elements for the connection between the pins and the package of microprocessors with a lead content of more than 80 percent and less than 85 percent by weight

IBM led the development and release of industry standard J-STD-075, Classification of Non-IC Electronic Components for Assembly Processes, to evaluate and classify components for the capability to withstand Pb-free assembly processes. IBM technical experts also participated in numerous consortia with suppliers to drive the development and evaluations of new materials for polyvinyl chloride (PVC) and brominated flame retardant replacement in data center class cables while meeting all agency standards and National Electrical Code® requirements.

## IBM HAS A NUMBER OF GOALS FOR ITS PRODUCT STEWARDSHIP PROGRAM

### 2009 GOALS AND PERFORMANCE

#### Powder Coatings

IBM achieved this voluntary goal and, as of January 1, 2009, the use of powder coatings for decorative metal finishes became a requirement in IBM's Environmental Engineering Specification 46G3772: Baseline Environmental Requirements for Supplier Deliverables to IBM.

#### Recycled Plastics

The recycled content of plastics used in IBM's products can range in their recycled content fractions from 25 to 100% by weight of the commercial resin. In 2009, 22.4% of the total weight of plastic resins procured by IBM and its suppliers through IBM's corporate contracts for use in IBM's products had recycled content ranging from 25 to 100%. Comparing only the weight of the recycled fraction to the total weight of plastics (virgin and recycled) purchased, 13.2% of IBM's total weight of plastic purchases in 2009 was recycled plastic versus the corporate goal of 5% recycle.

#### Use of Landfills

IBM's product end-of-life management operations worldwide processed approximately 41,400 metric tons of end-of-life products and product waste, and sent only 0.5% of the total to landfills or to incineration facilities for treatment, versus IBM's corporate goal of minimizing its combined landfill and incineration rate to no more than 3% of the total amount processed.

#### Servers\*

**IBM System p:** Of the two models released with a previous generation model, reductions of 38% and 43% in the typical power consumption per relative performance were achieved.  
**IBM System x:** Of the four models released with a previous generation model (2007), improvements of 23%, 93%, 95% and 96% were achieved as measured by the Japan Energy Law watts/MTOPS\*\* metric.  
**IBM System z:** No new models were released in 2009.

#### Point-of-Sale Systems\*

Two new IBM SurePOS™ point-of-sale systems were introduced. The SurePOS 500-4846 achieved a 69% reduction in maximum power consumption in watts per composite theoretical performance (CTP) and a reduction in standby power from 80 watts to 2 watts. For the SurePOS 300-4810, there was an increase in maximum power consumption in watts per CTP, but a reduction in standby power consumption from 42 watts to 2 watts. Since point-of-sale systems can spend significant time in standby mode, this major improvement in standby power delivers significant energy savings. The SurePOS 300 employs a deep sleep technology that allows clients to place checkout systems in a low-power mode that can save almost as much energy as when the system is completely powered off. It has the potential to reduce store power use by up to 66%.

#### Storage Subsystems\*

IBM released a new storage model, the IBM System Storage® DS8700. The DS8700 halved the wattage required per gigabyte of capacity when compared to the DS8300 at product launch and doubled the system throughput due to the increased capabilities of the POWER6® processor when compared to the POWER5™ processor.

A tape drive product was introduced in 2009, but there was no previous generation model.

\* IBM's product energy goal is to continually improve the computing power delivered for each kilowatt-hour (kWh) of electricity used with each new generation or model of a product.

\*\* MTOPS-Million theoretical operations per second is a calculation of machine operations based on a specified formula.

Note: IBM is no longer selling IBM logo'd monitors and IBM System i products have been subsumed into the IBM System p product line.

## PRODUCT ENERGY EFFICIENCY

Product energy efficiency has long been one of IBM's environment and climate protection objectives. It was formalized as one of the company's corporate objectives when IBM's Product Stewardship program was established in 1991.

In addition to its ongoing program and objectives regarding energy efficient products, IBM has initiated and invested in innovations and integrated solutions involving its hardware, software and services business to address the energy efficiency of IT equipment and the data center.

As described in the table on page 20, the new server models released in 2009 for which comparable products existed delivered from 23 to 96 percent more computing power for each kilowatt-hour (kWh) of electricity used than the previous model/product. IBM continues to utilize innovations in semiconductor, hard drive/storage system and networking technologies to improve server and storage system performance for each unit of power consumed by the equipment.

### *Product Energy Efficient Technology*

#### **ENERGY EFFICIENT SERVERS:**

- IBM has qualified four enterprise server systems (IBM Power 750 Express, IBM Power 755, IBM System x3650 M2 and the IBM System x3550 M2) to the ENERGY STAR Computer Server Requirements. The Power 750 Express and Power 755 models were the first 4-processor systems in the global industry to be qualified to the ENERGY STAR requirements. These servers meet the U.S. EPA's requirements for power supply efficiency, idle power limits or power management capability, and data reporting. IBM is currently working to qualify other



*IBM Power 755*

enterprise server systems to the ENERGY STAR requirements.

- IBM continues to drive improvements in the performance/power capabilities and reduce idle power demands of server systems. The IBM System x iDataPlex dx360 M3 was the first server system to achieve an overall score of greater than 3,000 on the Standard Performance Evaluation Corporation's (SPEC®) SPECpower\_ssj2008 benchmark. As measured by this benchmark, the dx360 M3 also reduces the power used by the system when no workload is present (idle) to 21.2 percent of the power required at maximum workload, significantly reducing the power and cooling required to support the system when no workload is present.
- IBM System x and BladeCenter systems offer low-power memory, low-power processor options, 2.5 inch and solid state drives, smaller, more efficient power supplies and innovative Calibrated Vecteded Cooling™ technologies. These capabilities provide more performance and workload per unit of energy consumed and reduce idle power use compared to maximum power use by up to 78 percent to significantly reduce power use when no workload is performed.

#### **PROCESSOR SYSTEMS:**

IBM's POWER7 Systems™ feature unique Intelligent Energy technology, which allows customers to power on and off various parts of the system or to dynamically increase or decrease processor clock speeds based on thermal conditions and system utilization, on a single server or across a pool of multiple servers. As a result, the system dynamically balances between energy usage and performance and systems utilization based on policy, delivering more workload for each unit of energy consumed as compared to previous generation IBM systems. POWER7 Systems can also support over 1,000 virtual servers or “partitions” on a single system to reduce costs and energy use by consolidating systems and driving higher systems utilization.

#### **STORAGE SYSTEMS:**

IBM is leveraging technology developments in improved system controllers and storage device advances, such as solid state and 2.5 inch drives, to improve the performance/power capabilities of storage systems. In addition, IBM is the leader in storage virtualization, allowing customers to take advantage of virtualization technology to leverage their investment in current storage devices, storing more data in less space and using less energy.

#### **RETAIL STORE SYSTEMS:**

IBM is implementing deep sleep technology in its point-of-sale retail systems to reduce energy use. This enables systems to significantly reduce power use during idle and off-hour periods and improve the energy efficiency of the system.

#### **PRODUCT RECYCLING AND REUSE**

As part of its product end-of-life management (PELM) activities, IBM began offering product take-back programs in Europe in 1989 and has extended and enhanced them over the years. IBM's Global Asset Recovery Services organization offers Asset Recovery Solutions to commercial customers in countries where IBM does business, including:

- Management of data security and disk overwrite services
- Worldwide remarketing network for product resale
- State-of-the-art refurbishing and recycling capability for IT equipment
- Optional logistic services such as packing and transportation

Additionally, in many countries and individual U.S. states, IBM offers solutions to household consumers for the end-of-life management of computer equipment, either through voluntary IBM initiatives or programs in which the company participates.

In 2009, IBM's PELM operations worldwide processed approximately 41,400 metric tons of end-of-life products and product waste. This represents 61.5 percent of the estimated 67,000 metric tons of new IBM IT equipment manufactured and sold in 2009.

## PRODUCT END-OF-LIFE MANAGEMENT (PELM)

**GOAL:** Reuse or recycle end-of-life products such that the amount of product waste sent by IBM's PELM operations to landfills or to incineration for treatment does not exceed a combined 3% of the total amount processed.

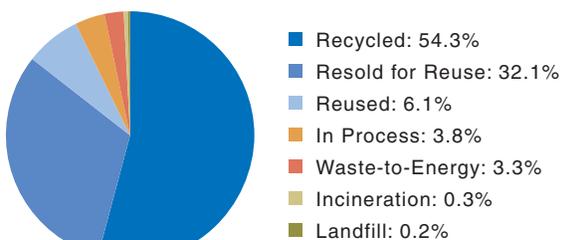
**RESULT:** In 2009, IBM's PELM operations sent only 0.5% to landfills or to incineration facilities for treatment.

IBM's PELM operations also reused or recycled 95.8 percent of the total amount processed.

*Since 1995, when IBM first began including in its annual corporate environmental report the volumes of product waste it collects and recycles, IBM has documented the collection and recovery of more than 1.7 billion pounds (770,553 metric tons) of product and product waste worldwide through year-end 2009.*

## PRODUCT END-OF-LIFE MANAGEMENT OPERATIONS

(2009: Percentage by Weight)



Data does not equal 100% due to rounding.

## PRODUCT PACKAGING

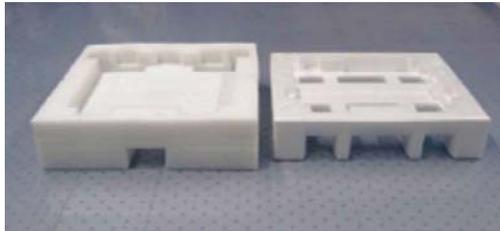
IBM has had a program focused on the environmental attributes of its product packaging since the late 1980s. Under the program, IBM packaging engineers design solutions that minimize toxic substances and packaging waste by specifying non-toxic materials and inks, keeping packaging to a minimum while continuing to provide protection to the product being shipped to clients, collaborating with suppliers to use recycled content and recyclable materials and promoting reuse.

IBM's environmental requirements for packaging are included in its Environmental Packaging Guidelines, first published in 1990 and updated as needed over the years. Key elements of IBM's Packaging Guidelines have also been embedded in various engineering specifications and procurement documents, which extend their reach beyond IBM to include its supply chain and other business partners. These documents may be found at [www.ibm.com/procurement/proweb.nsf/ContentDocsByTitle/United+States-Information+for+suppliers](http://www.ibm.com/procurement/proweb.nsf/ContentDocsByTitle/United+States-Information+for+suppliers).

In 2009, the packaging engineering team saved 1,346 metric tons of packaging material from the implementation of 60 projects worldwide. These projects delivered an annual cost savings of \$9.3 million. The following highlights a few of the projects implemented in 2009:

- **New molded cushion design:** IBM designed a molded cushion using expanded polypropylene (EPP) material for the high volume 2U rack mountable server, machine type 3650. Use of the EPP material reduced the total package mass per unit by 0.890 kilograms compared

to the expanded polyethylene material previously used. This resulted in an annual estimated packaging material savings of 178 metric tons, an annual material cost savings of \$3.2 million and annual transportation cost savings of \$404,000.



*Molded cushion (on right) is a lower density and smaller in size, delivering a material source reduction of 35 percent.*

- **Packaging reuse and waste reduction program with major retail client:** During the last quarter of 2009, IBM implemented a closed-loop returnable packaging process with a major retail client, which allowed IBM and the client to reuse packages several times, reducing the amount of new packaging materials used. In addition, several packages were redesigned to reduce the size and increase the number of products on a pallet for shipment by truck. The results for December 2009 were as follows:
  - Saved 10 metric tons of paper and wood materials
  - Eliminated the use of 330 pallets
  - Avoided an estimated six trucks of return shipments per quarter and associated fuel use and vehicular emissions
  - Increased units shipped per truck for particular machine type 4800 orders, from 300 units to 360 units

- Increased units shipped per truck for particular machine type 4820 orders, from 720 units to 960 units

- **100 percent recycled thermoformed nestable cushions:** IBM developed 100 percent recycled thermoformed nestable cushions for various products across its server brands and retail store systems. When these products are shipped inbound, up to 10 times the typical quantity can be carried on a 40-foot truck. In addition, the 100 percent recycled polyethylene materials of which they are made are reusable. Utilizing these cushions, in 2009, IBM reused an estimated 91 metric tons of polyethylene plastic and saved approximately \$1.9 million in material and transportation costs.

#### *Collaboration with Suppliers*

In 2009, the IBM packaging team implemented 22 packaging design projects with its suppliers. The resulting packaging solutions reduced the packaging materials from incoming parts by 175 metric tons and saved \$1.4 million in both material and transportation costs.

One 2009 example: In collaboration with a supplier, IBM redesigned a server motherboard package that originally held only 5 cards per carton to a 21 card per carton package, which delivered a total annual material savings of 90.87 metric tons and a cost savings of \$965,200, primarily from transport and storage.

When suppliers apply the design improvements achieved through collaboration with IBM to packaging designs for other customers, the environmental benefits and cost savings can be far-reaching.

### *Voluntary Environmental Goal for Packaging Materials*

IBM's voluntary environmental goal for packaging materials states that paper-/wood-based packaging directly acquired by the company will be procured from suppliers who source from sustainably managed forests where such sources exist.

In 2002, when IBM first established this goal, sufficient quantities of sustainable sourced packaging materials were not yet available for much of the company's needs. With a continued focus on this objective over the years, however, in 2009, approximately 99 percent of the paper-/wood-based packaging acquired under IBM contracts came from sustainably managed sources.

### **PRODUCT SAFETY**

IBM's product safety requirements are included in various steps of the product design, development, manufacture and test process, and include the supply chain for both IBM hardware and solutions. Required reviews by IBM Product Safety Review Boards help product and project managers comply with applicable standards and national regulations, and help IBM to obtain third-party certifications where required.

Programs for continual improvement include internal and third-party assessment of IBM's products' safety and conformity assessment programs. These assessment results are continually fed back into the evaluation and planning cycle. This process is augmented by incident management tools that provide effective capture and management of any product safety-related incident.

## **ENERGY AND CLIMATE PROGRAMS**

IBM recognizes climate change as 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. More about the company's policy and position on climate change may be found at [www.ibm.com/environment/climate/position.shtml](http://www.ibm.com/environment/climate/position.shtml).

IBM has been a leader in addressing climate change through its energy conservation and climate protection programs for decades. The company's leadership has been defined by its:

- Long-standing global commitment
- Comprehensive and multifaceted programs—covering the company's operations, products and services
- Leading-edge innovations and client solutions
- Significant results, both early and ongoing, benefiting IBM, its clients and the world

### **A FIVE-PART STRATEGY**

IBM has a five-part strategy to reduce GHG emissions:

1. Designing, building, updating and operating facilities and manufacturing operations to optimize their use of energy and materials and minimize GHG emissions
2. Purchasing electricity generated from low CO<sub>2</sub>-emitting and renewable energy-generating sources where feasible

3. Minimizing the use and emissions of perfluorocompounds (PFCs—a family of GHGs) in semiconductor manufacturing
4. Reducing employee commuting and business travel
5. Increasing the efficiency of IBM's logistics operations

In addition, in the area of hardware and software products and services, IBM's strategy includes designing energy efficient products and providing the company's clients with energy efficient solutions that also help protect the climate.

The company does not have plans to use emissions offsets to become "carbon neutral" for all or part of its operations. IBM's efforts to reduce its GHG emissions are focused on delivering results in the areas where the company can make the greatest positive impact on climate protection—by devoting its available resources to actions, products and solutions that actually increase energy efficiency and reduce GHG emissions for both the company and its clients, rather than offset them.

### CONSERVING ENERGY

IBM's commitment to energy conservation dates back to 1974 and has continued, unabated, over the intervening years. Energy conservation is a major component of IBM's comprehensive, multifaceted climate protection program because the release of CO<sub>2</sub> by utility companies powering the company's facilities, or from the use of fuel for heating or cooling, represents the greatest potential climate impact associated with IBM's operations.

### *Energy Conservation Goal*

#### ENERGY CONSERVATION

**GOAL:** Achieve annual energy conservation savings equal to 3.5% of IBM's total energy use.

**RESULT:** In 2009, IBM's energy conservation projects across the company delivered savings equal to 5.4% of its total energy use.

In 2009, IBM's energy conservation projects across the company delivered savings equal to 5.4 percent of its total energy use versus the corporate goal of 3.5 percent. These projects avoided the consumption of over 246,000 megawatt-hours (MWh) of electricity and over 410,000 million BTUs of fuel oil and natural gas, representing the avoidance of over 142,000 metric tons of CO<sub>2</sub> emissions. The conservation projects also saved \$26.8 million in energy expense. These strong results are due to the increased, across-the-board focus on energy efficiency and the implementation of standard, global energy conservation strategies for facility operating systems.

IBM's energy conservation goal recognizes only identified projects that actually reduce or avoid the consumption of energy in its operations. Reductions in energy consumption from downsizings, the sale of operations and cost avoidance actions, such as fuel switching and off-peak load shifting, are not included in the energy conservation goal. Moreover, the above results are conservative in that they include only the first year's savings from the conservation projects. Ongoing conservation savings beyond the first year are not included in the tally. Accordingly, the total energy savings and CO<sub>2</sub> emissions avoidance from these conservation actions is actually greater than this simple summation of the annual results.

*Between 1990 and 2009, IBM saved 5.1 billion kWh of electricity consumption, avoided nearly 3.4 million metric tons of CO<sub>2</sub> emissions (equal to 50 percent of the company's 1990 global CO<sub>2</sub> emissions) and saved over \$370 million through its annual energy conservation actions.*

## **ELECTRICITY AND FUEL USE AND RELATED CO<sub>2</sub> EMISSIONS**

*(Scope One and Two)*

<b>YEAR</b>	<b>ELECTRICITY AND FUEL USE</b> <i>(Thousand MMBTU)</i>	<b>CO<sub>2</sub> (EST)</b> <i>(Metric Tons x 1,000)</i>
2005	22,630	2,489*
2006	22,491	2,420
2007	23,638	2,541
2008	22,443	2,502
<b>2009</b>	<b>21,507</b>	<b>2,436</b>

*\*Actual operational CO<sub>2</sub> emissions without adjustments for acquisition and divestiture-driven baseline changes.*

*The above figures include estimates for portions of IBM's office space that are leased. CO<sub>2</sub> emissions are calculated for all energy use, including electricity, fuel oil and natural gas.*

*IBM uses the greenhouse gas reporting protocol developed by the World Resources Institute and the World Business Council for Sustainable Development to gather and report its CO<sub>2</sub> emissions.*

*CO<sub>2</sub> emissions data includes the CO<sub>2</sub> avoidance associated with IBM's purchases of renewable energy.*

IBM's global energy management program leverages the expertise of over 40 IBM energy management professionals deployed around the world. The team has created best practices checklists that set minimum expectations for building systems and operations including controls and equipment for lighting, HVAC, central utility plants (CUPs), compressed air, data center and IT systems, cafeterias and office systems. All sites using more than 2,000 MWh/year of energy must complete the checklists, perform a gap analysis and develop an energy conservation implementation plan a minimum of every 3 years. The program is buttressed by several enterprise-level databases that collect and store energy use data, conservation project results and completed checklists enabling monthly metrics reporting to the management team. The

continuous review of energy use and conservation results has driven the strong results noted above.

IBM uses a full range of energy efficiency initiatives in achieving its results. In 2009, nearly 1,900 energy conservation projects were completed at 270 IBM locations around the world. Some examples:

- 199 locations implemented projects to match building lighting and occupancy schedules or install more efficient lighting systems, reducing 25,300 MWh of electricity use and saving \$2.3 million.
- 149 locations modified HVAC systems or operating schedules to reduce 42,100 MWh of electricity use and 139,000 MMBTU of fuel use, and saving \$5.9 million.

- 20 locations had continuous commissioning projects that delivered reductions of 20,500 MWh of electricity use and 133,000 MMBTU of fuel use, and saved \$2.6 million.

The IBM team is also implementing innovative, leading-edge technologies that enable real-time management of energy use.

- IBM is expanding its use of data monitoring and analytics to improve building energy performance, including “plug-in” analytics to collect sensor and operating data to analyze individual events and system trends to optimize building energy use. At two locations that already had strong energy management programs, implementing this approach enabled operational improvements that further reduced energy use by over 2 percent within a matter of months. IBM plans to further expand this practice at additional locations.
- IBM installed a central utility plant optimization package at one of its locations, achieving energy savings of 16 percent against the total site annual energy use in 2009. Plans are being made to deploy this system to additional IBM locations during 2010 and beyond.

### *Data Centers*

With more than 450 data centers it owns or operates around the world, IBM devotes significant resources to developing products and services that can maximize the efficiency of data centers for itself and clients. The company leverages its wide range of technologies and solutions to make its extensive data center operations ever more energy efficient.

In 2009, over 160 projects at 60 existing data center locations reduced energy use by 64,000 MWh and cost by over \$4.5 million. Two examples of technologies contributing to these reductions:

- The impact of data center best practice assessments, which generated 34,000 MWh of savings in IBM’s existing data centers, is being augmented with IBM’s Measurement and Monitoring Technology (MMT) 1.5, which places permanent thermal sensors in data centers to enable real-time monitoring of data center thermal conditions, optimization of cool air delivery and increases of room temperatures to the 2008 ASHRAE data center temperature and humidity standards. Continuous monitoring and the use of analytics can further improve data center energy management beyond that achieved with the implementation of best practices alone.
- IBM is also utilizing virtualization technologies to consolidate multiple workloads from servers with low utilization onto single servers. These projects increase the utilization of the virtualized servers, deliver more workload for less energy and reduce the number of servers and the data center floor space required to perform a given workload. In 2009, virtualization and consolidation projects reduced data center energy use by over 30,000 MWh. Not only do these projects reduce energy use, but they free

up data center space for business growth or new business opportunities. One project freed up approximately 10,000 square feet (6.6 percent) of data center space for other uses.



**IBM's Research Triangle Park (RTP), North Carolina, Leadership Data Center (LDC):** The new data center at IBM's RTP campus reduces technology infrastructure costs and complexity for the clients it serves, improving quality and speeding the deployment of services while using only half the energy required of a similar-size facility. In constructing the new data center, the use of recycled materials and the energy characteristics of the space enabled the LDC to become LEED® Gold certified, the first IBM data center to achieve a LEED Gold rating. IBM renovated an existing building on its RTP campus by reusing 95 percent of the original building's shell, recycling 90 percent of the materials from the original building and ensuring that 20 percent of newly purchased material came from recycled products. Key energy efficiency aspects of the data center follow:

- **Energy efficiency and smarter data center management:** The data center uses half the energy cost to operate compared to data centers of similar size by taking advantage of free cooling—using outside air to cool the data center. Intelligent systems use sensors to continuously read temperature and relative humidity

throughout the data center and dynamically adjust cooling in response to changes in demand.

- **Cloud computing capability:** Support for cloud computing workloads allows clients to use only the resources necessary to support their IT operations at any given moment—eliminating the need for up to 70 percent of the hardware resource that might have been previously needed to perform the same task.
- **Built for expansion:** Due to an innovative modular design method, IBM will be able to rapidly scale capacity to meet demand by quickly adding future space, power and cooling to the data center with no disruption to existing operations while avoiding hardware installation, energy use and operational costs for the period when the space would be “idled.”

**Syracuse University Data Center:** IBM, together with Syracuse University (SU) and New York State, constructed a new “green” data center—a showcase of world-class innovations in advanced energy-efficient information technology and building systems. Constructed in just over 6 months, the \$12.4 million, 12,000-square-foot facility (6,000 square feet of infrastructure space and 6,000 square feet of raised floor data center space) uses an innovative on-site power generation system for electricity, heating and cooling, and incorporates IBM's latest energy efficient servers, computer-cooling technology and system management software.

The SU data center features an on-site electrical tri-generation system that uses natural gas-fueled microturbines to generate all the electricity for the center and cooling for the computer servers, enabling it to operate completely off-grid. The

data center was also designed to take direct current (DC) power directly from the microturbines to power the servers, avoiding the energy losses incurred in the typical grid system to transform the energy from DC to alternating current (AC) and back to DC power, further improving the efficiency of the data center.

The data center converts the waste heat from the microturbine exhausts to liquid cooling for the data center using double-effect absorption chillers. The chilled water is delivered directly to “cooling doors” on the servers to directly remove the heat from each rack more efficiently than conventional room-cooling methods. Sensors monitor server temperatures and usage to tailor the amount of cooling delivered to each server—further improving efficiency.

Furthering data center best practices: IBM is supportive of the European Union Code of Conduct on Data Centres Energy Efficiency (CoC) and provided input and recommendations on the CoC during the public development process. The CoC provides a solid framework of best practices to inform and encourage data center operators and owners to reduce energy consumption in a cost-effective manner while enabling operators to maintain the mission-critical function of data centers.

The CoC framework and best practices are consistent with the recommendations of IBM’s data center energy efficiency services, emphasizing the following:

- Best management practices for established IT and facility infrastructure
- The opportunity to transform a data center through the consolidation and virtualization of IT equipment, application and data

- The introduction of power storage systems
- Data center energy management software to improve energy utilization in the data center

The CoC program provides a visible, voluntary public program that emphasizes the importance of this effort. IBM has registered the data center operations it performs for the Department for Environment, Food and Rural Affairs (Defra) to the CoC and is evaluating the applicability of the CoC guidelines to other data center operations and hardware and services offerings.

## CO<sub>2</sub> EMISSIONS REDUCTION

Between 1990 and 2005, IBM’s energy conservation actions reduced or avoided CO<sub>2</sub> emissions by an amount equal to 40 percent of its 1990 energy use. To further extend this achievement, IBM set itself an aggressive “2nd generation” goal: to reduce the CO<sub>2</sub> emissions associated with its energy use 12 percent by 2012 against a 2005 base year through energy conservation and the procurement of renewable energy.

As of year-end 2009, the company’s energy conservation results and procurement of renewable energy resulted in a 5.7 percent reduction in IBM’s energy-related CO<sub>2</sub> emissions from the 2005 base year of this goal. While this is solid progress, there remains a significant amount of work to be done to meet the company’s goal.

In 2009, IBM’s significant conservation results delivered a 2.6 percent reduction in its energy-related CO<sub>2</sub> emissions over 2008. The company’s procurement of renewable energy equaled 11.3 percent of IBM’s total 2009 energy use.

### CO<sub>2</sub> EMISSIONS REDUCTION

**GOAL:** Between 1990 and 2005, IBM's energy conservation actions reduced or avoided CO<sub>2</sub> emissions by an amount equal to 40% of its 1990 emissions. To further extend this achievement, IBM set itself an aggressive "2nd generation" goal: to reduce the CO<sub>2</sub> emissions associated with IBM's energy use 12% between 2005 and 2012 through energy conservation and the procurement of renewable energy.

**RESULT:** As of year-end 2009, the company's energy conservation results and procurement of renewable energy resulted in a 5.7% reduction in IBM's energy-related CO<sub>2</sub> emissions from the 2005 base year of this goal.

### PFC EMISSIONS REDUCTION

IBM releases some perfluorocompounds (PFCs) from its semiconductor manufacturing operations. Although the releases are in relatively small amounts (in carbon dioxide equivalents, when compared to indirect CO<sub>2</sub> emissions), IBM was the first semiconductor manufacturer to set a numeric reduction target for PFCs in 1998.

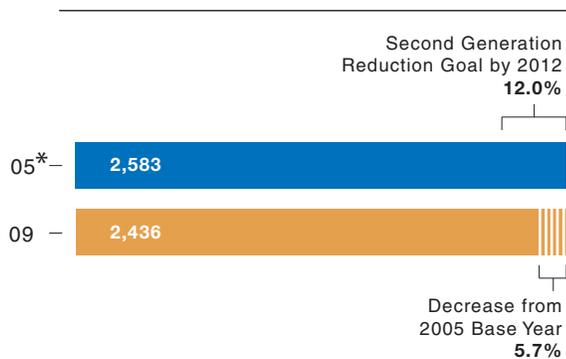
### PFC EMISSIONS REDUCTION

**GOAL:** To reduce PFC emissions from semiconductor manufacturing 25% by 2010 against a base year of 1995.

**RESULT:** As of year-end 2009, IBM's emissions were 48.8% below the 1995 baseline amount of 381,000 metric tons of CO<sub>2</sub> equivalent.

### CO<sub>2</sub> EMISSIONS REDUCTION

(Metric Tons x 1,000)



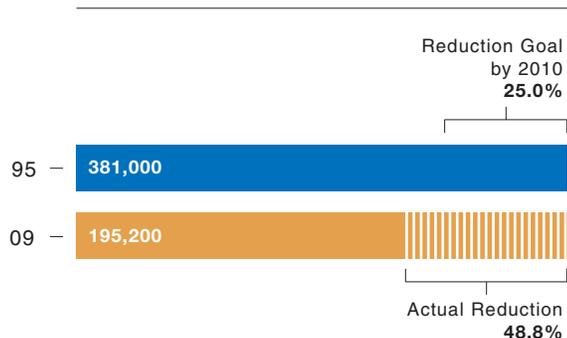
\*2005 emissions baseline adjusted for acquisitions and divestitures of operations.

PFC emissions were down year-to-year in 2009 primarily due to reduced manufacturing volumes for much of the year and the product mix at the semiconductor manufacturing facilities.

A portion of the reduction also was achieved by replacing some C<sub>2</sub>F<sub>6</sub> based process cleans with C<sub>4</sub>F<sub>8</sub> process cleans; C<sub>4</sub>F<sub>8</sub> has a lower global warming potential than C<sub>2</sub>F<sub>6</sub>.

### PFC EMISSIONS REDUCTION

(In Carbon Dioxide Equivalent)

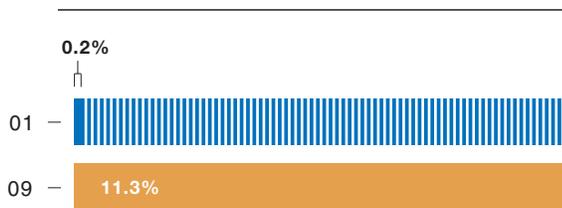


## PROCURING AND FOSTERING RENEWABLE ENERGY

In 2009, IBM purchased 560 million kWh of renewable energy, an increase of 18 percent over 2008 purchases of 460 million kWh. These purchases represented 11.3 percent of the company's global electricity usage and a CO<sub>2</sub> emissions avoidance of 191,000 metric tons. IBM continued to contract for renewable energy purchases in Austria, Belgium, Denmark, Finland, Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States in 2009. Additional contracted purchases of electricity generated from renewable sources were procured in Italy in 2009, and purchases in the Nordics, Germany and Switzerland were increased.

IBM's energy conservation efforts and its procurement of renewable energy in 2009 combined to avoid the emissions of more than 334,000 metric tons of CO<sub>2</sub>.

### RENEWABLE ENERGY PROCURED *(Percentage of Total Electricity)*



In addition to procuring renewable energy for its own use, IBM is working to further the availability and affordability of renewable energy by investing in IT-related research and development. One focus area is advancing solar technology:

- **New solar cell manufacturing approach:** In February 2010, IBM announced it had built a solar cell in which the key layer that absorbs most of the light for conversion into electricity is made entirely of readily available elements and is manufactured using a combination of solution and nanoparticle-based approaches, rather than the popular, but expensive, vacuum-based technique. This solar cell set a new world record for efficiency and holds the potential for producing low cost energy that can be used widely and commercially.
- **Ultra-high concentrator photovoltaic technology:** In April 2010, IBM announced that it is collaborating with the King Abdulaziz City for Science and Technology (KACST), Saudi Arabia's national research and development organization, on a research project aimed at creating a water desalination plant powered by solar electricity, which could significantly reduce water and energy costs. A new, energy efficient desalination plant with an expected production capacity of 30,000 cubic meters per day will be powered with the ultra-high concentrator photovoltaic (UHCPV) technology that is being jointly developed by IBM and KACST. This technology is capable of operating a CPV system at a concentration greater than 1,500 suns. Inside the plant, the desalination process will hinge on another IBM-KACST jointly developed technology, a nanomembrane that filters out salts as well as potentially harmful toxins in water while using less energy than other forms of water purification.

## VOLUNTARY CLIMATE PARTNERSHIPS

IBM is a charter member of the Chicago Climate Exchange (CCX), a voluntary emissions trading system with binding commitments for GHG emissions reduction by its member companies. IBM's participation in CCX covers Scopes 1 and 2 GHG emissions from the company's operations in Canada, Mexico and the U.S.

By the end of 2009, IBM had reduced its GHG emissions 20.7 percent against the 1998-2001 CCX baseline, compared to the commitment of a 5 percent reduction in 2009.

IBM continued its participation in the U.S. EPA's Climate Leaders and the World Wildlife Fund's Climate Savers program in 2009, working toward the committed reduction goals for these programs:

- **Climate Leaders:** IBM pledges to reduce total global GHG emissions by 7 percent from 2005 to 2012. IBM achieved its initial goal by reducing total global energy-related GHG emissions by an average of 6 percent per year and PFC emissions by 58 percent from 2000 to 2005.
- **Climate Savers:** Between 1990 and 2005, IBM reduced or avoided CO<sub>2</sub> emissions by an amount equivalent to 40 percent of its 1990 emissions through its global energy conservation program. To extend this achievement, IBM intends to reduce CO<sub>2</sub> emissions associated with IBM's operational energy (electricity and fuel) use by 12 percent between 2005 and 2012 through energy conservation and the purchase of renewable energy.

Under Climate Savers, IBM has also committed to improving the energy efficiency and energy utilization of its internal and clients' data centers through activities and offerings for data center best practices, measurement and

monitoring programs, and virtualization and consolidation programs. Activities in support of this commitment are detailed in the Data Centers section beginning on page 28.

## TRANSPORTATION & LOGISTICS INITIATIVES

### *Employee Commuting and Leased/Rental Vehicles*

IBM has been active in promoting programs that reduce the commute to work for its employees. Key contributors to this effort are IBM's two flexible work programs:

- **Work-at-home:** Enables many employees to have their offices in their homes
- **Mobile employees:** Enables many other employees to work from home a designated number of days each week

More than 118,000 employees (over 29 percent) globally participate in one of these two programs, which not only helps employees balance their work and personal responsibilities, but also benefits the environment. In the U.S. alone, IBM's work-at-home program conserved approximately 2.9 million gallons of fuel and avoided more than 25,400 metric tons of CO<sub>2</sub> emissions in 2009.

IBM joined the reconstituted U.S. Best Workplaces for Commuters program in 2009, registering 19 locations and its work-at-home population in the U.S., which represented 62 percent of the company's U.S. employees. Many locations actively work with their local or regional transit commissions to integrate IBM's programs with regional programs to increase commuting options for the company's employees.

Globally, many IBM locations provide support for the use of public transit systems, including

shuttles from locations to mass transit stations, and alternate transportation or “loaner” cars for business trips during the workday. Where IBM provides leased vehicles for employees, the company continues its effort to move to more fuel-efficient vehicles.

### *Business Travel*

IBM’s main sources of business travel are airline and rental car use, with some miles also attributed to train travel. IBM has developed an inventory of travel miles and continues to ensure an understanding of travel patterns and opportunities for optimization in meeting business needs and minimizing environmental impact.

While IBM’s businesses require employees to travel to fulfill client and other business needs, IBM has also developed, deployed and continued to enhance a full suite of IT tools to reduce business travel where feasible. IT tools enable real-time collaboration without travel and are widely deployed throughout IBM. Web conferencing tools are used widely across the corporation, with over 140,000 meetings (2,700 per week), 953,000 participants (7 participants per meeting), and 74 million connection minutes in 2009. Videoconferencing is available, with over 400 specially equipped IBM rooms, including Direct Presence systems, which are available globally.

### *Efficiency of Logistics*

IBM is reducing the CO<sub>2</sub> emissions associated with transporting its products through the efficient design of its packaging, working with suppliers on their packaging designs and optimizing logistics. In the area of logistics, IBM has been an active member of the U.S. EPA’s SmartWay<sup>SM</sup> Transport Partnership since 2006. SmartWay is a voluntary initiative to improve

fuel efficiency and reduce GHG emissions associated with logistics operations.

In 2009, 100 percent of IBM’s spend for shipping goods within the U.S. and from the U.S. to Canada and Mexico went through a SmartWay logistics provider. IBM also continued to ship 100 percent of its IBM System z and supercomputer product families to customers in North America (within the U.S. and from the U.S. to Canada and Mexico) exclusively using a SmartWay carrier. This commitment makes IBM part of a select few SmartWay shippers allowed to use the SmartWay logo on product packaging for these product families and shipments. IBM also voluntarily applies specific SmartWay requirements to its distribution operations globally.

One way in which IBM endeavors to optimize its logistics operation is with the IBM-developed Carbon Trade-Off Modeler. This tool models the interaction among various levers: transportation mode, fuel, packaging weight, load consolidation, alternate sourcing and service level agreement. The tool draws data directly from IBM’s transactional systems as a basis for calculating CO<sub>2</sub> emissions, differentiating it from other currently available industry tools. The Carbon Trade-Off Modeler is Web-based (WebSphere® application) and uses IBM’s Cognos® reporting capabilities. The Modeler enables IBM to make decisions that optimize the benefits identified across these levers and associated CO<sub>2</sub> emissions at the same time.

IBM’s packaging programs also help reduce transport-associated CO<sub>2</sub> emissions by reducing the volume and weight of the company’s product shipments through innovative packaging design. Accomplishments in this area were discussed earlier in the report (see pages 23-24).

## IBM'S COMMITMENT TO WORKING WITH ENVIRONMENTALLY RESPONSIBLE SUPPLIERS SPANS FOUR DECADES:

**1972** – Established a corporate directive requiring the environmental evaluation of suppliers of hazardous waste services

**1980** – Expanded its environmental evaluations of suppliers by establishing a second corporate directive that required the environmental evaluation of certain production-related suppliers

**1991** – Further expanded its environmental evaluations of suppliers, adding a requirement that its product recycling and product disposal suppliers be evaluated

**1998** – Explicitly encouraged its suppliers to align their own environmental management systems with ISO 14001 and to pursue registration under this international standard

**2002** – Expanded its supplier evaluation requirements to include assessments of subcontractors that suppliers may use to handle recycling and/or disposal operations in non-OECD countries to address concerns at the time about electronic waste being exported to some non-OECD countries where it was then being improperly handled

**2004** – Published its Supplier Conduct Principles to articulate the company's overall supply chain social and environmental requirements

**2008** – Joined the Carbon Disclosure Project's Supply Chain program to focus on energy and climate programs of its suppliers and to encourage their action in this area

**2010** – Established new supply chain management system requirements for all of its suppliers

## SUPPLY CHAIN PROGRAMS

### ENVIRONMENTAL EVALUATION OF SUPPLIERS

For decades, IBM has been committed to working with environmentally responsible suppliers. IBM's environmental management system includes environmental requirements for its supply chain. IBM conducts substantive evaluations of the environmental responsibility of a relevant subset of its suppliers. The requirements for these evaluations were established by an IBM corporate directive in 1972 requiring environmental assessments of hazardous waste services suppliers, and were expanded over time, as shown in the left-hand column. The directive was designed to prevent the transfer of responsibility for environmentally sensitive operations to any company lacking the commitment or capability to manage such operations properly.

IBM also has criteria to avoid the sale of technologically obsolete or nonfunctional equipment to brokers for resale. Moreover, brokers who procure used products or parts from IBM for resale are required to sign an agreement not to resell into non-OECD countries if the broker knows or has reason to believe that the equipment and/or parts will not be used for their originally intended purpose, without the need for disassembly or disposal.

The evaluations mentioned above are in addition to the audits conducted in association with IBM's Supplier Conduct Principles, which outline the company's expectations and requirements of suppliers doing business with IBM in regard to forced or involuntary labor, child labor, wages and benefits, working hours, nondiscrimination,

respect and dignity, freedom of association, health and safety, protection of the environment, laws (including regulations and other legal requirements), ethical dealings, communications and monitoring/record keeping.

The Principles are integrated into IBM's contracts and relationships with suppliers, and the company actively monitors suppliers' performance against them as a means to promote sound business practices across IBM's extended supply chain.

With the assistance of a third-party auditor, IBM has undertaken hundreds of on-location supplier audits against its Supplier Conduct Principles. The suppliers audited are selected on a risk-based priority, focusing on suppliers in markets where noncompliance may be more likely to occur.

Since 2004, more than 600 supplier audits against IBM's Supplier Conduct Principles have been conducted by third-party firms with local personnel in more than 15 growth market countries.

IBM's supplier audit program encompasses both manufacturing (production) and distribution (logistics) suppliers—which are historically where social audits are focused—as well as services and general procurement suppliers.

In 2004, IBM was among the companies that developed the Electronic Industry Citizenship Coalition's (EICC) Code of Conduct, an initiative that provides a single common code of standards and best practices for the electronics industry and their suppliers. By consolidating and standardizing compliance, audit and reporting efforts, suppliers can focus on achieving the high standards of performance set forth by the Code. IBM accepts the EICC Code of Conduct as equivalent and an alternative to its Supplier Conduct Principles.

The company currently holds the EICC Chair of the Board position, and it has participated in work groups such as Communications/Stakeholder Engagement, Extractives and the Validated Audit Process. As part of its environmental management leadership, IBM also encourages its suppliers to pursue ISO 14001 registration. In April 2010, IBM announced that suppliers will now be required to establish a management system to address their corporate and environmental responsibilities. For more details on this new requirement, see the next section on "Energy and Climate Requirements."

## ENERGY AND CLIMATE REQUIREMENTS

### *New Management System Requirements for Suppliers*

IBM, through its own practices, has long recognized that a strong management system is critical for developing and sustaining programs that address responsibilities such as workplace safety, increasing energy efficiency and reducing waste. IBM has one of the largest and most complex supply chains in the world, spanning more than 28,000 suppliers in close to 90 countries. To build the capability of its supply chain to manage its intersections with the environment and society, IBM announced in April 2010 that those suppliers will now be required to establish a management system to address their corporate and environmental responsibilities.

Specifically, first-tier suppliers are required to do the following:

- Define, deploy, and sustain a management system that addresses corporate responsibility, including supplier conduct and environmental protection

- Measure performance and establish voluntary, quantifiable environmental goals
- Publicly disclose results associated with these voluntary environmental goals and other environmental aspects of their management systems

These requirements are not being implemented with a “one-size-fits-all” approach. The company expects each supplier to deploy a management system, measure performance, set goals and disclose results in a way that reflects their particular intersections with corporate responsibility and the environment. IBM is also requiring its first-tier suppliers to communicate these new requirements to their own suppliers who perform work that is material to the products, parts or services supplied to IBM. For more details on the new supply chain management system requirements, see [www.ibm.com/ibm/environment/supply/](http://www.ibm.com/ibm/environment/supply/).

### *Energy and Climate Protection in the Supply Chain*

IBM is also focusing on the energy and climate programs of its suppliers to understand where they are with regard to having energy conservation and GHG reduction programs and to encourage their action and leadership in climate protection. The following are two specific initiatives the company has undertaken in this area:

- As a member of the EICC, IBM is part of the Environmental Working Group that is developing a sector-wide strategy for encouraging electronics industry suppliers to inventory, disclose and reduce their GHG emissions and other environmental impacts. The EICC Environmental Working Group has developed education modules to assist suppliers in developing their energy use and GHG emissions inventories and a simple system

for suppliers to disclose these emissions to EICC members.

- Through the CDP’s Supply Chain program, IBM and other member companies are focused on how suppliers are addressing climate change and working to reduce GHG emissions. As a participant in the program, IBM invited 121 of its suppliers to respond to the CDP’s Supplier Questionnaire in 2009. These 121 suppliers represent 80 percent of IBM’s expenditures with production-related suppliers and a sampling of key suppliers in service categories, such as third-party data centers, logistic suppliers and rental car companies, which have high levels of energy use and associated GHG emissions.

Of the 121 IBM suppliers that received questionnaires, 88 responded. This 73 percent response rate exceeded the 64 percent average response rate for the member companies in this program. The following are highlights of the findings from the responding suppliers:

- 75 percent report Scope 1 GHG emissions.
- 76 percent report Scope 2 GHG emissions.
- 61 percent have a board committee or other executive body responsible for climate change.
- 52 percent have a GHG emissions and/or energy reduction target in place.

IBM continues to participate in this endeavor because the company wants to work with its critical suppliers to gain an understanding of their operational impacts and assess where the suppliers are with regard to having a GHG emissions inventory and reduction plans. Survey responses showed that about one-third of production suppliers had reduction plans,

and about one-half of non-production suppliers had plans.

In 2010, IBM is again participating in this initiative and further collaborating with its core suppliers—both those who did and did not respond to the latest CDP Supplier Questionnaire—in order to encourage their work to understand and reduce their GHG emissions from their operations.

### *IBM's Position on the Determination of Scope 3 Emissions*

Gross approximations of Scope 3 GHG emissions can help entities recognize where the greatest amounts of GHGs may occur during the lifecycle of a general product or service on a macro level. This can be helpful when assessing what phases of a general product's evolution, use and disposal are ripe for improved energy efficiency and innovation. However, IBM does not assert on a micro level what the Scope 3 GHG emissions are from the operations of its suppliers and external distribution partners in their work that is specific to IBM. The necessary estimating assumptions and corresponding variability simply do not allow for adequate credibility, let alone calculations that could be perceived as deterministic.

Like many manufacturers, IBM has thousands of suppliers around the world. They are in all types of businesses and very few, if any, work solely for IBM. Furthermore, the sources of energy used by these suppliers vary, and IBM does not believe it could determine a credible estimate or apportionment of the energy used by these suppliers that would be associated with the products or services provided to IBM versus that associated with products or services provided to other companies/customers. In addition, IBM's specific scope of

business with any given supplier remains dynamic, as it is driven by business need.

Moreover, one company's asserted Scope 3 emissions are another company's Scope 1 and Scope 2 emissions. Since the ultimate goal for climate protection is for global societies to achieve demonstrable reductions in actual GHG emissions, IBM believes real results in GHG emissions reduction are directly achieved when each enterprise takes responsibility to address its own emissions and improve its energy efficiency. This is reinforced by IBM's recent announcement that all of its first-tier suppliers will be expected to develop a management system, inventory their key environmental impacts including GHG emissions and develop reduction plans for those key impacts.

## **AUDITS AND COMPLIANCE**

IBM measures its environmental performance against both external and internal requirements. Every manufacturing, hardware development and research site completes a comprehensive self-assessment every year, some more frequently. Each year, certain sites are audited for environmental, health and safety compliance by IBM's Corporate Internal Audit staff. Audit results are communicated to top management. Follow-up, accountability and actions are clearly delineated.

In addition, as part of IBM's single, global registration to ISO 14001, approximately 20 sites or registered entities are audited annually by an independent ISO 14001 registrar. The company's manufacturing, hardware development and chemical-using research sites are audited, by either the Corporate Internal Audit team or the external ISO 14001 registrar, at least once every two years.

## ACCIDENTAL SPILLS AND RELEASES

IBM sites around the world report environmental incidents and accidental releases to IBM management through the company's Environmental Incident Reporting System (EIRS). Every event meeting IBM's environmental incident reporting criteria, which equal or surpass legal reporting requirements, must be reported through EIRS.

Each IBM location must have a documented incident prevention program (including provisions for preventing environmental incidents or their recurrence) and reporting procedure.

In 2009, a total of 32 accidental releases related to IBM operations were reported through EIRS. Of these, 9 were released to secondary containment (3 fuel oil, 2 hydraulic fluid and 1 each of cooling tower water, base concentrate, motor oil and an unknown oil sheen) leaving 23 actual accidental releases to the environment. Of those

23, there were 7 to air, 10 to land, 3 to water, and 3 to both land and water.

The seven releases to the air included six refrigerants and one opacity incident due to the burning of fuel oil.

The 13 releases to land included 4 of untreated industrial waste water, 2 of fire protection water, 4 of fuel oil and 1 each of potable water, dilute water and cooling water.

The six releases to water included two releases of dilute water solution, two releases of chilled water, and one release each of potable water and fire sprinkler water.

The root cause was investigated for all releases, and corrective actions were taken as appropriate. None of the releases were of a duration or concentration to cause long-term environmental impact.

## FINES AND PENALTIES

One significant measure of a company's environmental performance is its record of fines and penalties.

In 2009, IBM received 111 successful agency visits worldwide with no fines being assessed. IBM did pay two fines in 2009 for two Notices of Violation (NOV) that were issued during inspections that occurred at two facilities in 2007. Both 2007 NOVs related to the interpretation of requirements for secondary containment of fuel oil tanks and whether IBM's existing containment systems for fuel oil at these facilities required modification. A \$15,000 fine was assessed for each NOV. Actions have been undertaken to address the NOVs at both locations.

Over the past 5 years, IBM has paid 3 fines for a total amount of \$31,000.

## FINES AND PENALTIES WORLDWIDE

*(\$ in Thousands)*

	05	06	07	08	09
Number	0	0	1	0	2
Fines	\$0.0	\$0.0	\$1.0	\$0.0	\$30.0

## REMEDIATION

When groundwater contamination was first discovered at one of IBM's sites in 1977, the company initiated groundwater monitoring at all of its manufacturing and development locations worldwide. Today, IBM has 2,783 monitoring and 110 extraction wells.

In 2009, 15,480 pounds of solvents from past contamination were extracted while remediating, controlling and containing groundwater at 6 currently operating sites and 9 former sites in 2 countries. At 4 of these sites, an additional 4,239 pounds of solvents were removed by soil vapor extraction or other methods. IBM also has financial responsibility for remediation at two other former sites.

As a result of the U.S. Superfund law, IBM is involved in cleanup operations at some non-IBM sites in the U.S. The Superfund law creates a retroactive responsibility for certain past actions even though they may have been technically and legally acceptable at the time.

As of year-end 2009, IBM had received notification (through federal, state or private party) of its potential liability at 110 sites, since the beginning of the U.S. Superfund program back in 1980. Of these, 57 are on the U.S. National Priority List. At the majority of the 110 sites, it has been determined that IBM either never had liability or has resolved liability. As a result, IBM believes it may have potential liability at only 14 sites.

When investigation and/or remediation at an IBM location or an off-site facility is probable, and its costs can be reasonably estimated, IBM establishes accruals for loss contingency. Estimated costs connected with closure activities (such as removing and restoring chemical storage facilities) are accrued when the decision to close down a facility is made. As of December 31, 2009, the total accrual amount was \$258 million.

## AWARDS AND RECOGNITION

### INTERNAL RECOGNITION

#### *Corporate Environmental Innovation Program*

IBM introduced an updated Corporate Environmental Innovation Program in 2009 to highlight the best solutions developed by its employees to address energy and environmental challenges for the company and its clients. It builds upon a prior recognition program that IBM had run in previous years. The goal is to stimulate and encourage leadership by the company's employees in the areas of energy and the environment. Five internally developed solutions that significantly improve energy efficiency or reduce environmental impact were selected for recognition under the program:

- **SmartBay Galway:** Marine and Coastal Environmental Monitoring, Protection and Management—This system provides real-time environmental monitoring of water quality, wave conditions and weather for Galway Bay, Ireland. It monitors for marine and coastal research, commercial fishing, fish and shellfish farming, flood condition monitoring, wave energy research and development, advanced sensor development and beach health conditions.
- **Stockholm Congestion Pricing Solution:** This intelligent transportation solution directly charges drivers who use city center roads during peak business hours, reducing traffic in Stockholm, Sweden, by 18 percent and helping to increase the proportion of “green,” tax-exempt vehicles to 9 percent. The reduction in traffic has lowered vehicular emissions by 8-14 percent and GHG emissions by 40 percent in the inner city.



*Award recipients attending the 2009 Corporate Environmental Innovation Program reception with Wayne Balta, vice president, Corporate Environmental Affairs and Product Safety. Top row (Left to right): Harry Kolar, John Pearce, Wayne Balta, Karl Dittus and Jenseng Chen. Bottom row (Left to right): Tom Brey, Hendrik Hamann, Robert McCarthy, Gunnar Johansson and Whitcomb Scott.*

- **Measurement and Management Technology:** A solution that provides real-time measurement and analysis of temperatures and humidity within data centers to optimize cooling and reduce energy consumption, improving energy efficiency by 10 percent or more. MMT technology is now being used in more than 60 data centers.
- **iDataPlex Server:** The most power efficient high-volume server in the world, using up to 40 percent less electric power overall compared to comparable servers. The IBM patented design reduces air flow restrictions and allows two servers to share one fan cooling system and high efficiency power supply, reducing cooling system energy use by 66 percent.

- **IBM Systems Director Active Energy Manager™ (AEM):** A software solution that helps identify efficient and inefficient use of energy in data centers and simplifies equipment level power management. AEM allows control of processor level energy states and capping of server power use, provides power and thermal trending of servers, and integrates IT and infrastructure energy management in data centers. This solution can reduce system administration and energy costs in a typical data center by nearly 30 percent.

The Corporate Environmental Innovation Program will recognize up to five solutions each year. Nominated solutions are judged by a diverse team of environmental, technical and business experts from within IBM.

#### *Chairman's Environmental Award Program*

IBM established the Chairman's Environmental Award Program in 1991 to encourage leadership and recognize achievement and progress in environmental affairs on the part of IBM's organizations.

Similar to the past three years, the 2009 Award Program focused on energy conservation and energy efficiency across IBM's operations, products and services, and the competition continued to be among major business units.

The recipient was selected based on degree of leadership, results, and innovation and integration with regard to their programs and initiatives in the areas of energy conservation and energy efficiency. IBM Research received the 2009 IBM Chairman's Environmental Award.



*(Left to right) IBM Chairman Sam Palmisano presents the 2009 IBM Chairman's Environmental Award trophy to John Kelly III, Senior Vice President and Director of Research.*

With eight research centers in six countries around the world, IBM Research develops industry-leading inventions and drives technologies that enable and deliver significant energy efficiency improvements for IBM and its clients. Here are some highlights of the IBM Research innovations and initiatives this award recognized:

- **Mobile Measurement Technology (MMT):** Developed and deployed this thermal mapping tool with rapid survey capabilities that enable real-time identification of opportunities to reduce energy use of buildings including data centers.
- **Maximo® for Energy Optimization (MEO):** Collaborated with other IBM organizations in the development of MEO software to provide information to make better decisions about energy management. Data available from MEO includes mapping capabilities for energy and environmental metrics to identify opportunities for conservation.

- **EnergyScale™ Technology:** Drove the development of this technology, which advances energy efficiency of microprocessors and provides functions that help users understand and control IBM server power and cooling usage.
- **“Hydro-air cooling”:** Developed this system in which air is repeatedly re-used by the introduction of large air-to-water heat exchangers between adjacent racks. The new hydro-air cooling system reduces the space requirement for Blue Gene®/P by 25 percent.
- **Carbon Trade-Off Modeler (CARBAN):** Developed this business analytics tool that considers CO<sub>2</sub> emissions as a lever in transportation logistics optimization.
- **Solar cell technology achievements:**
  - Development of thin film solar cells from liquid precursors, without requiring expensive and slow vacuum deposition processes, yielding solar cell efficiencies of ~13.5 percent with a material called CIGS (Copper Indium Gallium Selenide) and reduced production costs, without compromising efficiencies; demonstration of world record 9.7 percent efficiencies with solar cells of an earth-abundant material called CZTSS (Copper Zinc Tin Sulfur Selenide).
  - Concentrator photovoltaics—Using IBM’s proprietary solutions in chip cooling and other areas to develop ultra-high concentration photovoltaic technologies that have successfully concentrated sunlight to up to 2,300 times the normal power density onto

a commercial solar cell. Such approaches have allowed the extraction of up to 75 watts of electrical power from a single 1x1 cm triple junction solar cell.

- Significant solar cell technology work in the areas of nanostructured photovoltaics and silicon-based photovoltaics.

IBM Research also actively participates in both the GridWise® Alliance and the GridWise Architecture Council.

## EXTERNAL RECOGNITION

IBM’s environmental leadership and significant environmental accomplishments were externally recognized during 2009 in many ways. Some examples include:

- IBM ranked #1 for the second year in a row in IDG’s *Computerworld’s* annual Top Green-IT Vendors ranking.
- IBM was among the Top 5 in *Newsweek* magazine’s inaugural 2009 Green Rankings. The 500 largest U.S. companies were ranked based on their actual environmental performance, policies and reputation.
- IBM once again topped the Supercomputing “Green 500 List” published by The Green500.org with 18 of the Top 20 most energy efficient supercomputers in the world built on IBM high-performance computing technology. IBM also holds 69 of the Top 100 positions on this list.
- For the second consecutive year, IBM was selected as one of the top 20 companies in the 2009 SB20 List: The World’s Top Sustainable

Stocks. The SB20 is published annually by SustainableBusiness.com in Progressive Investor, one of the few newsletters that guide investors and analysts toward “green” investments. IBM was recognized as a “Corporate Pioneer” for greening its own and its customers’ data centers.

- Calvert included IBM in its new Global Sustainability Strategy portfolio based on IBM’s record of environmental leadership. It’s a multi-cap global strategy focusing on investment in sustainable companies that have strong growth prospects and that offer value to investors.
- IBM received the top rating in Bank Sarasin’s sustainability analysis and continues to be included in the Sarasin Sustainability Funds.
- IBM’s global environmental management system was the topic of research conducted and published by the Massachusetts Institute of Technology’s (MIT) Sloan School of Management.
- IBM’s Burlington, Vermont, site received a 2009 Most Valuable Pollution Prevention (MVP2) award from the National Pollution Prevention Roundtable for improvements to its wastewater treatment operations that contributed to a significant reduction in discharges from its facility. This is IBM Burlington’s second MVP2 Award.
- IBM Burlington, Vermont, received two Vermont Governor’s Awards for Environmental Excellence & Pollution Prevention (for 2008-2009 projects) under the Environmental Excellence in Resource Conservation category for its “Solid Waste and Packaging Reductions at the IBM Burlington Facility” and “Cooling

Load Reduction by Free Cooling in Cold Weather.” This marked 16 consecutive years that IBM has been recognized with at least 1 of these awards—which is every year the competition has been held.

- IBM’s interior leased office space known as the Bay Area Lab in Foster City, California, was LEED® Gold certified. This was IBM’s first LEED Gold certified project and was achieved in the LEED® for Commercial Interiors™ rating system.



- IBM’s Real Estate and Site Operations (RESO) organization received one of the two 2009 Industrial Energy Technology Conference Energy Awards for exemplary energy management and conservation. The award recognized IBM for RESO’s holistic approach to global energy management over the past two years and the results it achieved. IBM is the first IT company to win this award.
- IBM Canada and its Bromont, Quebec, site in Quebec won the Sustainable Development Award from the regional Chamber of Commerce. The new Sustainable Development award category was introduced in 2009 and IBM was recognized for its global achievements in the three components of sustainable development: 1) its environmental leadership, 2) its global health and safety programs, and 3) its overall economic sustainability and positive influence in the region.

## IBM ENVIRONMENTAL AFFAIRS POLICY

IBM is committed to environmental affairs leadership in all of its business activities. IBM has had long-standing corporate policies of providing a safe and healthful workplace, protecting the environment, and conserving energy and natural resources, which were formalized in 1967, 1971 and 1974, respectively. They have served the environment and our business well over the years and provide the foundation for the following corporate policy objectives:

- Provide a safe and healthful workplace and ensure that personnel are properly trained and have appropriate safety and emergency equipment.
- Be an environmentally responsible neighbor in the communities where we operate, and act promptly and responsibly to correct incidents or conditions that endanger health, safety or the environment. Report them to authorities promptly and inform affected parties as appropriate.
- Conserve natural resources by reusing and recycling materials, purchasing recycled materials, and using recyclable packaging and other materials.
- Develop, manufacture and market products that are safe for their intended use, efficient in their use of energy, protective of the environment, and that can be reused, recycled or disposed of safely.
- Use development and manufacturing processes that do not adversely affect the environment, including developing and improving operations and technologies to minimize waste; prevent

air, water, and other pollution; minimize health and safety risks; and dispose of waste safely and responsibly.

- Ensure the responsible use of energy throughout our business, including conserving energy, improving energy efficiency, and giving preference to renewable over nonrenewable energy sources when feasible.
- Participate in efforts to improve environmental protection and understanding around the world and share appropriate pollution prevention technology, knowledge and methods.
- Utilize IBM products, services and expertise around the world to assist in the development of solutions to environmental problems.
- Meet or exceed all applicable government requirements and voluntary requirements to which IBM subscribes. Set and adhere to stringent requirements of our own no matter where in the world the company does business.
- Strive to continually improve IBM's environmental management system and performance, and periodically issue progress reports to the general public.
- Conduct rigorous audits and self-assessments of IBM's compliance with this policy, measure progress of IBM's environmental affairs performance, and report periodically to the Board of Directors.

Every employee and every contractor on IBM premises is expected to follow this policy and to report any environmental, health or safety concern to IBM management. Managers are expected to take prompt action.

## 2009 ENVIRONMENTAL PERFORMANCE SUMMARY

### IBM'S 2009 VOLUNTARY KEY PERFORMANCE INDICATORS AND RESULTS

#### Conservation

- **Energy Conservation**

*Goal:* Achieve annual energy conservation savings equal to 3.5% of IBM's total energy use.

*Result:* In 2009, IBM's energy conservation projects across the company delivered savings equal to 5.4% of its total energy use.

- **Water Conservation**

*Goal:* Achieve average annual water conservation savings equal to 2% of IBM's annual water use at microelectronics manufacturing operations, based on the water usage of the previous year and measured over a rolling 5-year period.

*Result:* As of year-end 2009, IBM's microelectronics manufacturing operations had achieved an average annual water savings of 3.1% over the past 5 years versus the 2% goal.

#### Climate Protection

- **CO<sub>2</sub> Emissions Reduction**

*Goal:* Between 1990 and 2005, IBM reduced or avoided CO<sub>2</sub> emissions by an amount equivalent to 40% of its 1990 emissions through its global energy conservation program. To further extend this achievement, IBM set itself an aggressive "2nd generation" goal: to reduce the CO<sub>2</sub> emissions associated with its energy use 12% by 2012 against a 2005 base year through:

- A. Energy conservation
- B. Use of renewable energy

- C. Funding an equivalent CO<sub>2</sub> emissions reduction by the procurement of Renewable Energy Certificates (RECs) or comparable instruments

*Result:* In 2009, IBM's significant conservation results delivered a 2.6% reduction in its energy-related CO<sub>2</sub> emissions over 2008. The company's procurement of renewable energy equaled 11.3% of IBM's total 2009 energy use. Together, these efforts resulted in a 5.7% reduction in IBM's energy-related CO<sub>2</sub> emissions at year-end 2009 from the 2005 base year of this goal.

Between 1990 and 2009, IBM saved 5.1 billion kWh of electricity consumption, avoided nearly 3.4 million metric tons of CO<sub>2</sub> emissions (equal to 50% of the company's 1990 global CO<sub>2</sub> emissions) and saved over \$370 million through its annual energy conservation actions.

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

- **PFC Emissions Reduction**

*Goal:* Reduce perfluorocompound (PFC) emissions from semiconductor manufacturing 25% by 2010 against a base year of 1995.

*Result:* As of year-end 2009, IBM's emissions were 48.8% below the 1995 baseline amount of 381,000 metric tons of CO<sub>2</sub> equivalent.

In 1998, IBM became the first semiconductor manufacturer to publicly announce a specific PFC emissions reduction target.

## Product Stewardship

- **Recycled Plastics**

*Goal:* Ensure recycled plastics represent 5% or more of the total plastics procured by IBM and its suppliers annually under IBM's corporate contracts for use in IBM products.

*Result:* The recycled content of plastics used in IBM's products can range in their recycled content fractions from 25 to 100% by weight of the commercial resin. In 2009, 22.4% of the total weight of plastic resins procured by IBM and its suppliers through IBM's corporate contracts for use in IBM's products were commercial resins that had recycled content ranging from 25 to 100%. Comparing only the weight of the recycled fraction of these commercial resins to the total weight of plastics (virgin and recycled) purchased through IBM's corporate contracts, 13.2% of IBM's total weight of plastic purchases in 2009 was recycled plastic versus the corporate goal of 5% recycle for the total annual plastics procurement.

- **Product Recovery & Recycling**

*Goal:* Reuse or recycle end-of-life products such that the amount of product waste sent by IBM to landfills or to incineration for treatment does not exceed a combined 3% of the total amount processed.

*Result:* In 2009, IBM's product end-of-life management operations worldwide processed approximately 41,400 metric tons of end-of-life products and product waste, and sent only 0.5% of the total to landfills or to incineration facilities for treatment, versus IBM's goal to minimize its combined product landfill use and incineration for treatment rate to no more than 3%.

Since 1995, when IBM first began reporting this metric in the company's annual corporate environmental report, IBM has documented the collection and recovery of more than 1.7 billion pounds of products and product waste worldwide through year-end 2009.

- **Product Energy Efficiency**

*Goal:* IBM's product energy efficiency goal is to continually improve the computing power delivered for each kilowatt-hour (kWh) of electricity used with each new generation or model of a product.

*Result:* In 2009, new server products/models were released for which there were previous generation products/models for comparison that delivered 23 - 96% more computing capability for each kWh of electricity used than the previous model/product.

## Pollution Prevention

- **Hazardous Waste Reduction**

*Goal:* Achieve year-to-year reduction in hazardous waste generation from IBM's manufacturing processes indexed to output.

*Result:* In 2009, IBM's hazardous waste generation indexed to output increased 8.4%. This increase was largely attributable to process changes during the company's transition to lower line width microprocessor technologies at one of its semiconductor manufacturing facilities.

- **Nonhazardous Waste Recycling**

*Goal:* Send an average of 75% of the nonhazardous waste generated at locations managed by IBM to be recycled.

*Result:* In 2009, IBM sent 76% of its nonhazardous waste to be recycled.



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