



# 2010 Environment Report



From designing fuel-efficient new airplanes to pioneering research on cleaner energy, the people of Boeing are developing innovative ways to address the global issue of climate change.



### Creating a Better Tomorrow

Message from Jim McNerney, Boeing chairman, president and CEO, and Mary Armstrong, vice president of Environment, Health and Safety.



### Environmental Technologies

The 787 Dreamliner is just one of the ways Boeing is improving the environmental performance of the aerospace industry.



### Reducing Our Footprint

How we are reducing our environmental footprint at Boeing and cleaning up sites affected by past business practices.



### Measuring Our Progress

Detailed data about Boeing's energy and water consumption, emissions, hazardous waste and recycling rates.

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Creating A Better Tomorrow

## Message from Jim McNerney and Mary Armstrong



PHOTO: BOEING PHOTO

Jim McNerney, chairman, president and chief executive officer of The Boeing Company, and Mary Armstrong, Boeing vice president of Environment, Health and Safety

Boeing is developing innovative solutions to help address the global issues of pollution and climate change.

As a company, we recognize the importance of protecting our ecosystem. That is why we are unleashing the expertise of Boeing employees to design environmentally progressive products, research cleaner fuels, enhance the

### **Improving the Supply Chain's Environmental Performance**

Our life cycle approach to the environment starts with our global supply chain. In 2010, Boeing employees will lead more than 400 workshops educating suppliers about ways to reduce emissions and cut back on the amount of materials sent to landfills. Later this year, we will introduce new

recognized environmental standard for our global supply base. We have begun these discussions and hope to report meaningful progress in the coming year.

### **Achieving Aggressive Internal Targets**

Boeing employees, using Lean+ tools, are developing innovative ways to meet aggressive environmental targets inside our own facilities.

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Since December, two new Boeing jetliners — the 747-8 and the 787 — have entered flight test. Both airplanes will consume less fuel and produce a smaller carbon footprint than the jetliners they replace.

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global air traffic system to reduce the carbon footprint of air travel, and expand into new markets where Boeing technologies show tremendous promise.

contracting provisions establishing suppliers' environmental initiatives as a key factor in doing business with Boeing. The next step is to work with other major aerospace companies to establish a

Solutions can be as simple as using pillows to insulate the floors of our computer data centers, saving nearly 705,000-kilowatt hours of electricity per year. Or they can be systematic, as employees discovered by eliminating an annual two-mile waste stream of packing materials used for wrapping air ducts installed in 737s.



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This approach enabled our fabrication plant in Salt Lake City to be the first Boeing facility to send zero waste to landfills. Other sites, including our new 787 assembly facility in North Charleston, S.C., are adopting similar practices and setting zero waste to landfills as an achievable goal.

These efforts are delivering results. At our major U.S. facilities since 2002, we have reduced CO<sub>2</sub> emissions by 31 percent, energy consumption by 32 percent and hazardous-waste generation by 38 percent on a revenue-adjusted basis. We reduced water consumption by 43 percent on a revenue-adjusted basis, and earlier this year set a challenging target to continue this progress.

### Innovative Solutions

Operation of Boeing products represents our biggest potential impact on the environment and our greatest opportunity for a positive change. Commercial aviation accounts for 2 percent of man-made greenhouse gas emissions, and our industry is addressing this issue with credible actions.

Aerospace was the only industry to present a clear plan to the United Nations Climate Change Conference in Copenhagen. We called for global guidelines placing tough fuel-efficiency standards on new airplane designs, improvements in the global air traffic control system to cut air travel-related CO<sub>2</sub> emissions by 12 percent, and continued efforts to commercialize

sustainable biofuels — all with the aim of achieving carbon-neutral growth across the industry by 2020.

Even though the world did not reach a comprehensive agreement, we are pushing forward.

Since December, two new Boeing jetliners — the 747-8 and the 787 — have entered flight test. Both airplanes will consume less fuel and produce a smaller carbon footprint than the jetliners they replace.

Boeing has tested enhanced air traffic control systems at major airports in Australia, Europe and North America. At San Francisco International Airport alone, four airlines cut annual fuel consumption by 1.1 million pounds. If these innovations were adopted worldwide, airlines would reduce annual emissions by millions of tons. That is why we continue to urge governments to update aging air traffic control systems.

Together with leading researchers and industries, Boeing employees are advancing ways to develop sustainable biofuels made from algae and other feedstocks that reduce emissions over their life cycle without competing with food crops for land or water. In the past two years, five airlines have flown Boeing jetliners with sustainable fuels. Our government customers also have begun test flights powered by sustainable biofuels; one of these tests included an F/A-18 Super Hornet flight by the U.S. Navy on Earth Day this year.

Applying innovations designed to meet complex national-security challenges, Boeing is working with the U.S. Department of Energy and utilities to provide smart grid technology to improve the efficiency and security of power distribution systems. We also are adapting the clean technology that powers satellites and the International Space Station to produce the most efficient way to convert sunlight into electricity on Earth.

### End-of-Service Recycling and Recovery

We believe that when our products reach the end of their useful lives, they still can provide value. That is why Boeing helped bring together 11 companies to form the Aircraft Fleet Recycling Association.

This group has grown to 42 members that, combined, have efficiently recycled more than 7,000 commercial and military aircraft.

These are just a few ways Boeing is applying our technical leadership to enhance environmental performance across our industry.

We recognize that this is the start of a long journey. We also believe the innovative spirit that helped us conquer seemingly impossible challenges, such as landing on the moon, will help us pioneer new technologies to address environmental issues and enable people around the world to continue to grow and prosper. ■



Jim McNerney  
Chairman, President and Chief Executive Officer  
The Boeing Company



Mary Armstrong  
Vice President  
Boeing Environment, Health and Safety

## Pioneering Environmental Technologies



PHOTO: BOEING PHOTO

The new Boeing 747-8 and the 787 Dreamliner are designed to be 16 to 20 percent more fuel efficient, and generate significantly lower CO<sub>2</sub> emissions, than the airplanes they replace.

Boeing recognizes that climate change and pollution are serious global concerns. Commercial air travel accounts for 2 percent of man-made carbon dioxide (CO<sub>2</sub>) emissions, and that is expected to grow to 3 percent by 2050.

For our industry to continue growing and contributing to global prosperity, we recognize that we must take action.

Our most significant contribution to protect our ecosystem is to develop innovative new technologies and services that improve the environmental performance of our products. In the past year, we have introduced a number of new technologies, ranging from two new fuel-efficient commercial airplanes to demonstration concepts for systems designed to improve the efficiency of electrical grids. ■



▶ [Click to launch video on the website](#)

## Pioneering Environmental Technologies Improving Product Performance



PHOTO: BOEING PHOTO

In addition to developing fuel-efficient new airplanes, such as the 787 Dreamliner, we are improving the environmental performance of other airplanes including the 737, 767, 777, the Boeing NewGen Tanker and the F/A-18 Super Hornet.

Boeing currently is flight-testing the world's two newest commercial airplanes, the 787 Dreamliner and the 747-8. We remain on track to begin delivering these new airplanes by the end of 2010.

The 787, with its composite fuselage and wings, is designed to be 20 percent more fuel-efficient than today's airplanes of comparable size. The 747-8, with its advanced engines and systems, is designed to be 16 percent more fuel-efficient than the previous generation of jumbo jets.

Improved fuel consumption is at the core of our research-and-development efforts. Each kilogram of fuel not burned equates to 3.16 kilograms of CO<sub>2</sub> not emitted, according to the International Civil Aviation Organization, the United Nations body that establishes standards for global air travel.

These innovations continue a long trend in commercial aviation. Compared to the Boeing 707, Douglas DC-8 and other early jetliners, today's commercial airplanes generate 70 percent fewer

emissions and have a 90 percent smaller noise footprint. We continue embedding environmental design considerations in our products, and are committed to deliver at least a 15 percent improvement in fuel and CO<sub>2</sub> efficiency with each new generation of commercial airplane.

We also are making improvements to our existing airplanes to improve fuel efficiency while reducing CO<sub>2</sub> and nitrogen oxide emissions.

Boeing has announced performance enhancements to the Next-Generation 737 to improve fuel efficiency of the world's most-popular airplane by 2 percent. Airplane structural improvements will reduce drag on the 737, increasing fuel efficiency by approximately 1 percent. Hardware changes to the CFM engines will contribute the other 1 percent fuel savings. We will begin delivering 737s with these improvements starting next year.

For 767s in commercial service, Boeing offers a retrofit winglet package to improve fuel efficiency by approximately 5.5 percent.



▶ [Click to launch video on the website](#)

We are prepared to offer winglets as an option to the U.S. Air Force on the Boeing NewGen 767 Tanker. Boeing is offering operators of 777-200, -200ER and -300 airplanes a retrofit package to improve fuel efficiency by 1 percent.

Working with key members of the Hornet Industry Team, we are also making various environmental improvements to the F/A-18E/F Super Hornet. ■



## Pioneering Environmental Technologies

# Sustainable Biofuels



PHOTO: BOEING PHOTO

By late 2010 or early 2011, sustainable biofuels will be certified for use in commercial aviation. Boeing research demonstrates that sustainable biofuels perform as well, or better than, petroleum-based jet fuels while reducing lifecycle carbon emissions.

Boeing is sharing sustainable biofuel research and solutions throughout the industry.

As a company, we are focused on sustainable biofuels produced from algae and other renewable resources that do not compete with food crops for land or water. Sustainable biofuels reduce greenhouse gas emissions over their life cycle while offering the potential to lessen aviation's dependence on fossil fuels.

In 2008, Boeing and industry collaborators conducted the first commercial aviation flight using a blend of biofuel mixed with traditional kerosene-based fuel. Subsequent demonstration flights have used a variety of sustainable biological sources, including jatropha, camelina and algae. All flights were conducted on Boeing

airplanes with no modifications to the aircraft or engines.

In June 2009, Boeing and an industry team released a research study on sustainable biofuels. Based on laboratory, ground and flight tests, this study proved that biofuels performed as well as or better than typical petroleum-based jet fuel. Our tests included using blends of up to 50 percent petroleum-based jet fuel and 50 percent sustainable biofuels in several commercial airplane engine types. These tests demonstrated that biofuel blends meet or exceed all technical parameters for commercial jet aviation fuel, including freezing point, flash point, fuel density and viscosity.

In late 2009, the U.S. Navy conducted the military's first ground-based biofuels test of an F/A-18 engine. The U.S.

Air Force began a series of biofuel test flights in March 2010, and on Earth Day, the Navy flew a Boeing F/A-18 Super Hornet powered by sustainable biofuels. In the coming year, we anticipate that U.S. and international government customers will test sustainable biofuels on other Boeing products including the C-17 Globemaster and the F-15 Eagle.

To promote the development of sustainable biofuels, Boeing is a founding member of the [Sustainable Aviation Fuel Users Group](#) devoted to reducing greenhouse gases emissions from commercial aviation. We also participate in the [Commercial Aviation Alternative Fuels Initiative](#), a broad-based industry coalition that addresses fuel alternatives in commercial, noncommercial and military aviation. Boeing sponsors and serves on the

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board of the [Algal Biomass Organization](#), focused on creating commercial markets for algae-based fuels and greenhouse gas abatement. We also are a member of the [Roundtable on Sustainable Biofuels](#), an international initiative bringing together industry, investors, environmental organizations and producers of biofuel feedstocks.

We are investing in biofuel research around the world. To date, Boeing has helped establish research programs at universities and institutions in the United States, Australia, Europe, the Middle East, India and China. These include prestigious institutions such as Yale University, the University of Queensland in Australia, the Masdar Institute in Abu Dhabi, India's Jawaharlal Nehru University and the Chinese Academy of Sciences.

Boeing also works with leading experts at other companies, including GE,



PHOTO: BOEING PHOTO

Honeywell's UOP, Northrop Grumman, Pratt & Whitney and Rolls-Royce, to conduct laboratory research and engine tests with sustainable biofuels. The U.S. Air Force Research Lab is a valued collaborator in these efforts.

This ongoing research, combined with flight tests, is supporting international certification of sustainable biofuels for flight. By late this year or early 2011,

we anticipate ASTM International, a recognized standards body, will approve the use of sustainable biofuels for regularly scheduled commercial flights. ■



## Pioneering Environmental Technologies

# Efficient Air Transportation Systems



PHOTO: AIR TRAFFIC CONTROL OF THE NETHERLANDS (LVNL)

Flight control procedures developed by Boeing will help minimize delays at airports, getting passengers to their gates faster and reducing airplane emissions by millions of pounds.

Air traffic management improvements provide the greatest short-term opportunities to improve the environmental and fuel-efficiency performance of the transportation system.

Updating the world's aging air traffic control systems, which are based on 1950s-era technology, would reduce the carbon footprint of commercial travel by 12 percent, according to studies by the International Air Transport Association. Cutting the length of the average commercial flight by 1 minute would eliminate 4.8 million tons of CO<sub>2</sub> emissions annually.

One advanced procedure developed by Boeing, known as Tailored Arrivals, allows flight controllers, supported by ground automation, to tailor flight paths. This reduces fuel consumption and emissions. This procedure uses integrated data link technologies, as well as automation already installed on the airplane, to produce low-power, continuous-descent approaches to runways. More efficient landings mean airplanes will spend less time circling airports in holding patterns during congested periods.

Boeing researchers have demonstrated this new technique at major international airports in Amsterdam, Los Angeles, Melbourne, Miami, San Francisco and Sydney. At San Francisco International Airport, four airlines participated in these tests. Combined, the four carriers reduced fuel consumption by 1.1 million pounds (495,000 kilograms) and lowered CO<sub>2</sub> emissions by nearly 3.6 million pounds (nearly 1.6 million kilograms) over a one-year period. Similar results were generated at all airports involved in this research. ■

## Pioneering Environmental Technologies

# Alternative Energy Solutions



PHOTO: BOEING PHOTO

From designing solar panels to developing innovative ways to improve the efficiency of national electrical grids, Boeing is developing alternative energy solutions that offer the potential to conserve resources and reduce greenhouse gas emissions.

Boeing is pioneering advancements in solar cells, fuel cells and environmentally progressive energy sources offering the potential to reduce greenhouse gas emissions and conserve resources.

Our recently formed Energy Solutions group, part of Boeing Defense, Space & Security, is developing innovative solutions to increase the efficiency and security of local, regional and national energy systems.

In November 2009, Energy Solutions was awarded three U.S. government contracts, to demonstrate smart grid technologies. Starting mid-2010, Boeing will team with major utilities on the East Coast, West Coast and Midwest to demonstrate technologies that increase grid reliability, reduce system demands and costs, and increase energy efficiency.

Boeing Energy Solutions has teamed with Amplex, a Danish technology company, to offer a system with

the promise to decrease energy consumption by streetlights in major cities by 25 to 35 percent, significantly reducing their carbon footprint.

Boeing researchers and engineers in Madrid, Spain, are working on ways to incorporate clean fuel-cell technology in aerospace applications. In Japan, we announced a memorandum of understanding with IHI to research regenerative fuel cell technology for aviation.

Fuel cells directly convert hydrogen into heat and electricity without combustion. This eliminates emissions, except for heat and water, and reduces noise. Boeing is exploring the use of fuel-cell technology as a means of providing

cleaner, quieter secondary airplane power systems. Spectrolab, our wholly owned subsidiary, is one of the world's leading manufacturers of solar cells and panels, powering everything from

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**Boeing is pioneering advancements in solar cells, fuel cells and environmentally progressive energy sources offering the potential to reduce greenhouse gas emissions and conserve resources.**

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satellites to renewable solar energy projects in Arizona and California. Spectrolab's terrestrial concentrator cells currently hold the world's record with 41.6 percent efficiency in converting sunlight to electricity.

Boeing is currently in the initial stages of developing and installing a 100-kilowatt power facility at California State University, Northridge, that will use the Spectrolab's solar power technology. The facility is expected to be operational in the third quarter of 2010. ■

## Pioneering Environmental Technologies

# Chemical Reduction



PHOTO: BOEING PHOTO

An employee in Mesa, Ariz., applies chrome-free paint to an AH-64 Apache helicopter assembly. Using chrome-free paints and primers for commercial and military aircraft is one of the ways Boeing is reducing chemicals in our products.

Boeing-developed alternatives to chrome-based paints currently are in use on AH-64 Apache helicopters, C-17s, F-15s, F/A-18s, a 737-800 operated by GOL Airlines of Brazil and a 777-300ER operated by KLM Royal Dutch Airlines.

Chrome long has been used in aerospace because it provides necessary corrosion protection for aircraft exposed to the elements at multiple altitudes. Technically known as hexavalent chromium, it is considered a carcinogen and exposure levels are highly regulated. Chrome-free paints

and primers reduce environmental impacts and eliminate the need for special handling of paint waste.

Boeing also is researching ways to eliminate Halon, which is used as a fire-suppressing agent in commercial and military aircraft. Working with the U.S. Navy and key suppliers, Boeing has replaced Halon on new F/A-18s with an agent called HFC-125.

In May of this year, Boeing breaks ground on a new metal-treatment facility in Portland, Ore. The facility, which comes online in 2013, will use

new technologies to significantly reduce the amount of cadmium required for manufacturing processes. Cadmium, which is considered to be a carcinogen, long has been used to protect metal against corrosion.

We continue looking for other opportunities to reduce the chemicals used in our products and operations, including evaluating engineering specifications and working with our global supplier network to identify and reduce chemicals used in producing aerospace parts. ■



## Pioneering Environmental Technologies

# Life Cycle Approach to the Environment



PHOTO: BOEING PHOTO

Boeing employees worked with suppliers to develop reusable carts to deliver parts to the C-17 and other airplane programs, eliminating thousands of pounds of packing materials previously sent to landfills.

Boeing addresses environmental concerns throughout the life cycle of our products. Our research and development programs focus on reducing fuel consumption, emissions, noise and hazardous waste. More than 75 percent of Boeing Commercial Airplanes' research and development effectively contributes to improved environmental performance.

Boeing's goals for the use of environmentally progressive products and processes start with our supply chain and extend through end of service when aircraft are recycled in a safe and environmentally responsible way.

### Suppliers

Boeing continuously works with suppliers to identify and develop sustainable new products for aerospace.

One product, currently being tested on a Southwest Airlines 737, is a recycled carpet made without the use of harmful chemicals. These new recycled carpet tiles allow airlines to quickly replace only soiled or worn portions of carpeting, rather than re-carpet the entire passenger cabin. If this in-service test proves successful, this new carpeting could be introduced into commercial airplanes starting in 2011.

We also team with suppliers to help reduce waste in our own factories.

Employees in Long Beach, Calif., worked with suppliers to develop reusable carts to deliver parts, eliminating bubble wrap and other waste. This method now is being used to deliver more than 4,700 parts and assemblies to the C-17 production line. Similar efforts by employees on the 737 and 777 programs in Washington state



▶ [Click to launch video on the website](#)

have eliminated thousands of pounds of packing materials previously sent to landfills.

At the Kennedy Space Center in Florida, employees teamed with a subcontractor responsible for developing program documentation. Together, they identified ways to avoid unnecessary printing, saving 25,000 pounds (11,250 kilograms) of paper each year. Boeing intends to significantly expand these efforts in 2010 as we conduct more than 400

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PHOTO: AFRA, USED WITH PERMISSION

Technicians prepare to recycle a jetliner that has reached the end of its service life. Boeing is a founding member of the Aircraft Fleet Recycling Association, a group of companies that has efficiently recycled more than 7,000 commercial and military aircraft.

Lean+ workshops to help our supply chain reduce its environmental footprint.

We also are developing new contracting provisions for introduction in mid-2010 that encourage suppliers to maximize the use of recycled materials, minimize hazardous waste, conserve energy and prevent pollution.

### End-of-Service Recycling

Boeing has taken a leadership role in aircraft life cycle and end-of-service recycling strategies for more than 50 years. This remains an important environmental concern since 7,200 airplanes are expected to be retired from active service during the next 20 years.

We are a founding member of the [Aircraft Fleet Recycling Association](#), a global consortium of more than 40 companies that provides environmentally responsible options for aging aircraft. This includes maintaining and reselling reliable airplanes and returning them to service. Safe parts recovery, scrapping and recycling

services are available for airplanes that cannot be returned to service.

The association has established specifications for environmentally appropriate dismantling and recycling techniques. AFRA also provides a third-party audit program. Member companies annually recycle 25,000 tons of aircraft aluminum and 1,000 tons of special alloys used in aerospace manufacturing.

In addition, Boeing works with companies around the world to ensure that carbon fiber composite materials, such as those used in the 787 Dreamliner and advanced tactical aircraft, can be recycled for decades to come. Over the past several years, Boeing has worked with our manufacturing sites and suppliers to collect carbon fiber manufacturing scrap and develop processes to return this material back into aerospace manufacturing. This includes using recovered 787 manufacturing scrap carbon fibers to build several prototype

aircraft interior components that currently are undergoing testing. We also have tested the feasibility of using recycled carbon fiber for tooling used in the production of aerospace parts. ■



## Reducing Our Environmental Footprint



PHOTO: BOEING PHOTO

Chemical management specialist Ryan McNatt assists shop-floor employees on recycling, helping the Salt Lake City facility become the first Boeing plant to ship zero waste to landfills.

Boeing recognizes the serious global challenges of climate change and pollution. That is why we are working aggressively to improve the environmental performance of our products and operations around the world.

This was exemplified at our commercial airplane parts fabrication plant in Salt Lake City, which, in 2009, became the first Boeing site to send zero manufacturing waste to landfills. The site now recycles more than 24 tons of cardboard, more than 4 tons of plastic and virtually every piece of metal.

Hazardous materials are recycled, where safe and environmentally appropriate approaches exist. Solvent recovery processes produce recycled

solvents for use in other industries. Electronic components are recycled for future use.

Materials that cannot be recycled are sent to a qualified hazardous waste disposal facility and incinerated to produce energy. A small percentage (1.2 percent) of waste must be incinerated without energy recovery.

Salt Lake City is just one example of how Boeing is making steady progress to meet challenging environmental targets. We outperformed our 2009 goals for reducing energy consumption, greenhouse gas emissions and hazardous waste generation while increasing recycling rates.

Our commitment to continual environmental improvement was showcased in a number of milestones last year, from expanding ISO 14001 certification to additional sites and subsidiaries, to finalizing cleanup at 12 remediation sites, to continuing to implement Lean+ innovations to reduce waste and improve business performance. ■



## Reducing Our Environmental Footprint

# Our Environmental and Climate Change Policies

Boeing is committed to operating in a manner that promotes environmental stewardship. We strive to:

- Conduct operations in compliance with applicable environmental laws, regulations, and Boeing policies and procedures.
- Prevent pollution by conserving energy and resources, recycling, reducing waste and pursuing other source reduction strategies.
- Continually improve our environmental management system.
- Work together with our suppliers, customers and other stakeholders on activities that promote environmental protection.

Boeing believes that climate change is a serious environmental challenge that requires credible action. Recognizing this, we are committed to reduce emissions of greenhouse gases from our facilities and products.

As the global community develops approaches to reducing greenhouse gas emissions, we acknowledge that voluntary measures alone may not be enough. Consequently, we support development of mandatory, yet flexible frameworks to address emission reductions.

Boeing recognizes that appropriate action may vary from one sector to another. A comprehensive approach

should take into account the most effective way to deal with each industry sector. Since airplanes connect the world and fly between countries, we also advocate a single global approach to addressing emissions in commercial aviation. ■

## Reducing Our Environmental Footprint

# Performance Targets

We have set aggressive environmental performance targets, including a new target for conserving water, which was adopted in April 2010. As with our other environmental performance targets, 2007 was established as the baseline year for our five-year water conservation effort.

At our major manufacturing facilities in the United States, Boeing has set the following targets for the period between 2007 and 2012:

- 25 percent reduction in greenhouse gas emissions (on a revenue-adjusted basis).
- 25 percent reduction in energy consumption (on a revenue-adjusted basis).
- 25 percent reduction in water consumption (on a revenue-adjusted basis).
- 25 percent reduction in hazardous waste generation (on a revenue-adjusted basis).
- 25 percent improvement in solid waste recycling rates (on a total or “absolute” basis).

We are currently on track to achieve each of these targets. While aggressive, they will ensure that we conserve valuable resources.

In 2009, we recycled 68 percent of the waste we generated, up from 64 percent the previous year. We reduced energy consumption by 0.3 percent, and reduced greenhouse gas



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emissions by 0.3 percent. Hazardous waste generation increased, reflecting an increase in airplane production compared to 2008, which was affected by a labor strike. Despite the increase, we outperformed our 2009 plan to minimize hazardous waste. ■

## Reducing Our Environmental Footprint

# Environmental Management

### Environment, Health and Safety Organization

Environmental initiatives inside Boeing are consolidated into one corporate organization — Environment, Health and Safety — which works with our business units to drive an integrated, enterprisewide strategy that includes our products, services, processes and facilities. This strategy also considers the impact of our suppliers and customers.

Our strategy is guided by the Environment, Health and Safety Policy Council, led by Boeing Chairman, President and Chief Executive Officer Jim McNerney. This EHS Policy Council assures that strategy and performance targets are set and monitored at the highest levels of company leadership.

The Environment, Health and Safety organization contains functions focused on occupational safety and

health, environmental and regulatory compliance. Responsibilities of the organization include:

- Establishing companywide strategies to address current and potential future environmental issues associated with Boeing products, services, facilities and technologies, and those of our suppliers and customers.
- Defining and implementing companywide environmental management systems and tools for integrating environmental capabilities into the company's core operating processes.
- Establishing standards, processes and guidelines for tracking Boeing's performance to these environmental plans and objectives.
- Assisting business partners in tracking their performance to environmental plans and objectives.

### ISO 14001 Certification

Certification to the internationally recognized ISO 14001 environmental standard has strengthened our ability

to meet our aggressive environmental targets.

By the end of 2008, all major Boeing facilities in the United States, Australia and Canada were certified to the ISO 14001 standard. Since then, the following Boeing sites have also earned ISO 14001 certification:

- Anaheim/Huntington Beach, Calif.
- Commercial Airplanes Commercial Aviation Services' facilities in Kent and SeaTac, Wash.
- CDG, a Boeing subsidiary based in Los Angeles.
- Houston.
- Macon, Ga.
- Palmdale, Calif.
- Wichita, Kan.



## Reducing Our Environmental Footprint

# Construction and Remodeling Standards



PHOTO: BOEING PHOTO

Boeing's new 787 final assembly facility, under construction in North Charleston, S.C., will meet LEED Silver rating or higher by using the latest technologies in conserving energy and water.

In 2009, we adopted the standard that all new construction and major renovation projects at Boeing-owned buildings in the United States will conform to the U.S. Green Building Council's LEED Silver rating or higher.

**LEED**, or Leadership in Energy and Environmental Design, provides a rating system based on multiple factors including energy and water efficiency of buildings and the use of sustainable resources in construction.

Boeing's recent renovation of our facilities in Kent, Wash., and Houston, Texas, were both certified as meeting the higher LEED Gold rating. By modernizing air-conditioning and heating systems, installing more efficient lighting and other actions, the Houston facility reduced annual electrical consumption by more than 2 million kilowatt-hours, enough to power about 170 American homes.

### Charleston 787 Assembly Facility

In November 2009, Boeing broke ground in North Charleston, S.C., for a second facility to assemble and deliver the new 787 Dreamliner. Construction is currently in progress.

Construction of the new final assembly and delivery facility required the clearing and grading of about 150 acres (60 hectares) of forested land. Prior to grading, Boeing worked with The Nature Conservancy to identify and relocate selected trees and plant species. In addition, the company worked with a botanist from the College of Charleston to perform plant recovery and relocation for species uncommon to the area.

Approximately 30 percent of the trees removed from the site were used to produce lumber, and about 70 percent was reclaimed and used as biomass fuel sources. Our relationship with The Nature Conservancy continues as we

work together to identify preferred plant species for our wetland development. In addition, Boeing invested \$75,000 to fund reforestation projects elsewhere in South Carolina to offset the impact of clearing the land.

The expansion of the North Charleston facility is being designed to LEED Silver rating or higher. This includes installing dual-flush toilets, restrictive flow faucets and the latest technologies in heating and cooling systems to conserve water and electricity including laminate solar panels.

Boeing is working with the Charleston Area Regional Transportation Authority to develop alternate commuting options for employees that can be implemented in 2010. Boeing teams in North Charleston also are exploring ways to design manufacturing processes to significantly minimize, or eliminate, the amount of solid waste sent to landfills. ■

## Reducing Our Environmental Footprint

# Employee Business Travel and Commuting



PHOTO: BOEING PHOTO

Using alternative transportation, Boeing employees in Everett, Wash., avoided driving approximately 84 million miles (117 million kilometers) in personal vehicles in 2009. Boeing is targeting an 18 percent increase in employee participation in commuting programs between 2008 and 2012.

As a global company, Boeing has extensive requirements for our employees to work with customers and suppliers around the world. In 2009, our employees booked more than 215,000 business trips, flying nearly 891 million miles (1.4 billion kilometers).

Like many businesses, we are making increased use of virtual conferencing, when appropriate, as a substitute for face-to-face meetings. In 2009, Boeing employees conducted more than 1.8 million virtual meetings that included an estimated 8.3 million attendees.

Boeing has made significant progress in working with its suppliers to improve the logistics of moving parts, supplies and

equipment to company facilities. This includes environmentally progressive decisions regarding the use of air and ground transportation. The company is testing delivery systems that use consolidated routes with multiple suppliers.

Individual Boeing sites have ongoing programs encouraging employees to make environmentally progressive commuting decisions, including carpools, vanpools and public transportation.

Our overall goal, for the five-year period between 2008 and 2012, is to achieve an 18 percent increase in employee participation in commuting programs,

and a 5 percent annual reduction in distances driven by employees to commute to work.

For example, at our largest facility in Everett, Wash., where we design and produce the 747, 767, 777 and 787 jetliners, programs encouraging employee-commuting options have been in place for several decades. By relying on public transportation, vanpools and other alternative commuting options, it is estimated that employees at the Everett site in 2009 avoided driving approximately 84 million miles (117 million kilometers) in personal vehicles. ■



## Reducing Our Environmental Footprint Commitment to Remediation



PHOTO: SIMI VALLEY ACORN, USED WITH PERMISSION

Collecting and treating rainwater before it leaves a former federal energy and rocket testing site in Southern California is one of the ways Boeing uses advanced technologies to clean up sites affected by past business practices.

Boeing is committed to cleaning up locations affected by past business practices. We work closely with national, state and local regulatory agencies, and strive to be transparent in communicating with community members, government regulators and other stakeholders.

Our remediation activities include cleaning up former manufacturing facilities and sites where Boeing, or companies it has acquired, shipped chemicals and other waste for treatment, storage or disposal. In some cases, waste-processing facilities that used treatment methods deemed acceptable in the past are being cleaned up to meet or exceed current environmental standards that are more stringent.

Our commitment to remediation is demonstrating progress as Boeing

completed its obligations at 12 sites in 2009.

Boeing considers the environmental effects of our cleanup programs, and we use innovative technologies where appropriate.

For example, at a former rocket testing facility at Rancho Cordova, Calif., Boeing technicians infuse extracted groundwater with concentrated food-grade vinegar. This accelerates the process of reducing chemicals from previous rocket tests in the ground water.

On our property along the Duwamish Waterway in Seattle, we have added sugar food products to groundwater to encourage naturally occurring microorganisms to degrade and eliminate solvents in the ground.

### Duwamish Waterway Cleanup

Boeing intends to restore fish habitat and shoreline along a stretch of the Duwamish, an industrial waterway in Seattle.

Boeing's operations along the Duwamish began approximately 75 years ago. To produce B-17s for World War II, Boeing expanded its Plant 2 facility and constructed factory space on pilings above the waterway.

We plan to demolish the factory, which has not been used for airplane production for more than 40 years. We will remove the pilings, restore the shoreline, create nearly 5 acres (2 hectares) of wetlands and enhance habitat for migratory fish.

Boeing will excavate more than 100,000 cubic yards (76,000 cubic meters) of sediment from the waterway, replacing it



(continued from page 20)



PHOTO: LOWER DUWAMISH WATERWAY GROUP, USED WITH PERMISSION  
Boeing intends to restore shoreline and create habitat for migratory salmon on our property along the Duwamish, an industrial waterway in Seattle.

with clean fill. The project, which will take several years to complete, will reduce the level of PCBs, metals and other chemicals in the waterway.

Boeing, the city of Seattle, the Port of Seattle and King County are working together to clean the Duwamish. Since January 2010, Boeing has reached separate agreements with Seattle, King County, the state of Washington, the U.S. National Oceanic and Atmospheric Administration, the U.S. Department of Interior, and the Suquamish and Muckleshoot Indian tribes to restore major parcels along the Duwamish. The cleanup plan was approved by the U.S. Department of Justice in early May 2010.

More than 100 years of use by multiple industries — including maritime, electrical power generating, steel forging, cement manufacturing and aerospace — resulted in the U.S. Environmental Protection Agency listing the Lower Duwamish Waterway as a Superfund site. Other factors contributing to pollution of the Duwamish include storm water coming off freeways and major roads along the waterway.

### Santa Susana Cleanup

Santa Susana Field Laboratory, located northwest of Los Angeles, is home to several endangered species and a wide assortment of plants and wildlife. The site has a rich history. A former federal

rocket engine and nuclear research facility, the site has supported virtually every major U.S. space program from the first manned Mercury flights through the Apollo moon landings and the current space shuttle fleet. Boeing obtained the site in 1996 as part of the acquisition of the aerospace and defense divisions of Rockwell International.

Research and testing activities began at the site in the early 1950s. Nuclear energy research concluded in 1988, and the last rocket engine test occurred in 2006. As a result of tests and research conducted on behalf of the federal government, portions of the site are contaminated with various chemical and low-level radioactive constituents.

Boeing remains committed to cleaning up our 2,350-acre (916.5-hectare) portion of the site for future generations. Working with the U.S. government (which owns and leases portions of the site), we have made significant progress, including removing 50,000 cubic yards (38,000 cubic meters) of contaminated soil and debris, analyzing more than 10,000 soil and groundwater samples, installing more than 400 monitoring wells on and offsite, and upgrading a ground water extraction treatment system.

In 2007, the California Legislature passed a special statute that applies solely to Santa Susana and changes the normal cleanup process that applies elsewhere in the state. In November 2009, Boeing asked a federal court to overturn the law and apply the same cleanup process to Santa Susana that applies to other sites in California. We are continuing cleanup efforts while the federal court decides the case.

One of our continuing areas of focus at Santa Susana is meeting stringent requirements for storm water quality. To meet permit limits, many of which require storm water to be cleaner than natural background levels (which, in some cases

means meeting or exceeding standards for drinking water), we have installed sophisticated filtering systems to clean storm water before it leaves the site. This involves collecting storm water runoff in holding tanks and treating it with advanced filters and chemicals before release.

Runoff from Santa Susana complied with these standards 96 percent of the time in 2009. Due to heavy rains in the fall of 2009, on several occasions storm water exceeded permit requirements for parts per billion of dissolved nitrates, ph, dioxins and metals.

In April 2010, the Los Angeles Regional Water Quality Control Board announced a proposed settlement with Boeing



PHOTO: BOEING PHOTO  
Boeing is committed to cleaning up the former Santa Susana federal energy and rocket testing field laboratory in Southern California.

regarding storm water permit violations that occurred from 2006 through 2009. Under the proposed agreement, which is subject to court approval, Boeing will pay \$300,000 to a program selected by the water board to develop a regional approach to storm water management. Boeing also will pay \$200,000 in fines.

Boeing continues to focus on technical solutions to enhance the quality of storm water, making progress on the cleanup of Santa Susana, and protecting the endangered species and wide assortment of plants and wildlife that enrich the site. ■

## Reducing Our Environmental Footprint

# Investing in Our Communities



PHOTO: HOMEBOY INDUSTRIES, USED WITH PERMISSION

Boeing's contributions to Homeboy Industries helps at-risk youths receive job training in solar panel skills.

We believe that Boeing's success is linked to the vitality and quality of life of our communities, and the environment is one of our five strategic areas for community investments. Our contributions range from time, money and resources, as well as innovative technology solutions, to address environmental challenges and strengthen communities around the world. In 2009, we made cash contributions of approximately \$7 million to support environmental activities at community-based organizations.

We consider several priorities when awarding these grants, including:

- Inspiring environmental citizenship and educating citizens to minimize their impact on the environment,

- Reducing greenhouse gas emissions, increasing recycling and encouraging energy efficiency, and
- Protecting and restoring critical natural assets and habitat.

Boeing's corporate giving program is devoting a growing portion of its contributions to meeting environmental needs. In 2007, 7 percent of Boeing's Global Corporate Citizenship contributions went to environmental programs. By 2009, that portion had increased to 20 percent.

Homeboy Industries, a Los Angeles-based industry, is one of Boeing's grant recipients. It assists at-risk and formerly gang-involved youth to become positive and contributing members of society

through job placement, training and education. Boeing provided funds to the Homeboy's Solar Panel Training and Certification Program. Individuals who complete the 10-week program often find employment quickly with the assistance of an employment counselor.

This environmental focus to our corporate giving programs extends to international efforts. As a principal partner in Engineers Without Borders — USA, Boeing is contributing our unique expertise and financial support to community projects that require sustainable engineering solutions. In one recent project, Boeing employees used their skills to help deliver clean water to a health clinic in the African nation of Malawi.



(continued from page 22)

### Employee Volunteerism

Boeing employees use their time, talent and resources to improve communities around the globe.

Many company-sponsored volunteer opportunities are environmental projects, including more than 100 Earth Day events involving Boeing employees around the globe in 2010. In addition, Boeing employees are involved in recycling projects, and cleanup projects along highways, trails and waterfronts. Boeing employees donate thousands of hours of their own time each year to support these company-sponsored volunteer efforts.



▶ [Click to launch video on the website](#)

One global example of volunteerism occurred in June 2009 when Boeing employees in Moscow, Beijing, Southern California and Denver, Colo., participated in projects supporting Plant Conservation Day. To support this event, Boeing teamed with an international nonprofit organization that works to protect endangered plant species and encourage plant diversity around the world.

In Moscow, approximately 50 employees, family and friends teamed with 150 children from local schools to assist with a rare plant donation and help to educate the children on endangered plant species and medicinal plants in the Moscow region. In Beijing, Boeing China employees joined in an activity to protect *cypripedium macranthum*, a threatened indigenous plant.

Similar activities occurred across the United States. For example, employees in Southern California planted trees at the Dubnoff Center, an educational and clinical agency for children. In Denver, employees of Jeppesen, a Boeing subsidiary, helped educate more than 1,500 students about native plant life.

### Supporting Habitat Protection and Restoration

Protecting human health and the environment in the communities where we operate remains a top priority.

In late 2009, Boeing sponsored a volunteer cleanup of the Fujimae Tidal Flats in Japan. Participants included employees from Boeing Japan, employees of Mitsubishi Heavy Industries, a major Boeing supplier, and children from the Nagoya area. Fujimae, located on the Nagoya coast, is recognized as internationally important by the Ramsar Convention on Wetlands and is Japan's biggest stopover for migratory birds. The cleanup followed



PHOTO: BOEING PHOTO

Employees and family members cleaning the shores of Darby Creek near Philadelphia, one of the many environmental efforts involving Boeing volunteers in Europe, Asia and North America.

a series of gatherings in which the students learned about the ecosystem of Fujimae.

In Spain, Boeing works with the Cobeña Botanic Gardens and Environmental School to help preserve endangered plant species near the Madrid Barajas airport. The Environmental School, built in 2009, heightens environmental awareness through a program that gives children and young adults with mental disabilities the opportunity to lead in teaching about the environment. ■

## Reducing Our Environmental Footprint

# Environmental Affiliations

Boeing is working with the following organizations to drive environmental improvements throughout our industry and across the globe.

### Algal Biomass Organization

Boeing is a member and currently chairs the board of directors of the [Algal Biomass Organization](#), which promotes research and the commercialization of algae-based biofuels.



### Aircraft Fleet Recycling Association

Boeing is a founding member of the [Aircraft Fleet Recycling Association](#), a working group of companies that has safely recycled more than 7,000 commercial and military aircraft.



### Air Transport Action Group

Boeing is on the board of the Air Transport Action Group, a coalition of companies throughout the globe in the air transport industry. [ATAG](#) advocates the environmentally responsible development of aviation infrastructure, including en route capabilities, airport capacity and ground access in order to meet customers' demand in a timely way.



### Carbon Disclosure Project

Boeing has participated in the [Carbon Disclosure Project](#), an independent nonprofit organization that has become the standard for carbon disclosure methodology and process since 2006. Boeing was named the best performing industrial company and also named to the 2009 Global Carbon Disclosure Leadership Index.



### EarthCorps

EarthCorps is a nonprofit organization founded in 1993 with a mission to build global community through local environmental service. The organization provides one-year intensive programs for young adults to learn best practices in conservation techniques and develop skills in leading volunteers. Boeing has awarded [EarthCorps](#) grants to support their Great Cities — Great Parks and Greener Cities Stewardship projects.



### Engineers Without Borders – USA

[Engineers Without Borders – USA](#) focuses on developing engineering solutions to global dilemmas of clean water, sanitation and renewable energy. Boeing has awarded the non-profit grants to help build its infrastructure, for fundraising and chapter support, and for targeted projects in Africa, India and China.



### The Nature Conservancy

Boeing is a member of The Nature Conservancy's International Leadership Council, one of the world's leading corporate forums on conservation. Boeing supports [The Nature Conservancy](#) through grants for use in planning the protection of natural environments and conserving land and water resources and large corridors of open spaces for wildlife.



### Pew Center on Global Climate Change Business Environmental Leadership Council

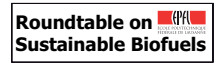
Boeing participates in the [Pew Center on Global Climate Change Business Environmental Council](#). This group of major companies exhibits environmental leadership, invests in environmentally progressive products and supports domestic and global measures to achieve cost-effective reductions in emissions.





**Roundtable on Sustainable Biofuels**

Boeing is a member of the [Roundtable on Sustainable Biofuels](#), an international initiative coordinated by the Energy Center at the Ecole Polytechnique Fédérale de Lausanne in Switzerland. The Roundtable brings together farmers, companies, nongovernmental organizations, experts, governments, and intergovernmental agencies concerned with ensuring the sustainability of biofuels production and processing.



**Sustainable Aviation Fuel Users Group**

Boeing is affiliated with the Sustainable Aviation Fuel Users Group, a group of 14 major airlines from around the world. [SAFUG](#) is focused on accelerating the development and commercialization of sustainable aviation fuels produced from algae, camelina, halophytes, jatropha and other nonfood cellulose.



**The Trust for Public Lands**

The [Trust for Public Lands](#) is a national, nonprofit, land conservation organization that conserves land for people to enjoy as parks, community gardens, historic sites, rural lands and other natural places, ensuring livable communities for generations to come. Boeing has supported the organization through grants for Greenprint.org, an interactive Web site containing Web-based mapping tools and data analysis.



**U.S. Green Building Council**

Boeing is a member of the [U.S. Green Building Council](#), a nonprofit organization dedicated to sustainable building practices, which develops and administers the Leadership in Energy and Environmental Design building standards.



**U.S. Department of Energy/EPA ENERGY STAR**

Since 1997, Boeing has been an industrial partner in the joint U.S. Department of Energy and EPA [ENERGY STAR](#) program for energy management and conservation efforts. Boeing buildings in Houston and Long Beach, Calif. have received the ENERGY STAR designation for energy-efficient operations.



**U.S. Environmental Protection Agency Climate Leaders**

Boeing joined the industry-government partnership, [Climate Leaders](#), in 2008, committing to reduce the company's environmental impact by completing a companywide greenhouse gas emissions inventory, establishing reduction targets and reporting progress to the EPA on an annual basis.



**Wildlife Habitat Council**

Boeing is a member of the [Wildlife Habitat Council](#), a nonprofit organization dedicated to increasing the quality and amount of wildlife habitat on corporate, private and public lands. The Council devotes its resources to building partnerships with corporations and conservation groups to create solutions that balance the demands of economic growth with the requirements of a healthy, biodiverse and sustainable environment.



**World Business Council for Sustainable Development**

Boeing serves on the board of the [World Business Council for Sustainable Development](#), a 200-company coalition focused on sustainable development through business leadership. Member companies explore sustainable development; share knowledge, experiences and best practices; and advocate business positions on these issues.



**World Environment Center**

We are a member of the [World Environment Center](#), a global nonprofit organization that helps companies around the world implement environmentally sustainable business strategies and operations.



## Measuring Our Progress



PHOTO: BOEING PHOTO

Employees William Cazzell and Rick Rivas Jr. measure energy consumption at Boeing's facility in Houston.

Since 2002, on a revenue-adjusted basis, Boeing has reduced CO<sub>2</sub> emissions by 31 percent, energy consumption by 32 percent, water consumption by 43 percent and hazardous waste generation by 38 percent.

The following data reflects environmental performance at major Boeing manufacturing sites in the United States. Additional sites, including office locations, may be included in the reported values as well. When that occurs, it is noted in the footnotes.

Boeing considers the following to be its major U.S. manufacturing sites:

- **Alabama:** Huntsville
- **Arizona:** Mesa
- **California:** Anaheim, El Segundo, Huntington Beach and Boeing

Defense, Space & Security's Long Beach operations

- **Kansas:** Wichita
- **Missouri:** St. Charles and St. Louis
- **Oregon:** Portland
- **Pennsylvania:** Philadelphia
- **Texas:** San Antonio and Houston
- **Washington:** Auburn, Developmental Center, Everett, Frederickson, Kent Space Center, North Boeing Field/Plant 2 and Renton

Currently, Boeing does not report emissions, energy and water consumption, hazardous waste generation and recycling rates at our recently acquired operations in North Charleston, S.C. Except as noted, the following does not include data from Boeing subsidiaries or joint ventures.

This year, Boeing is enhancing public reporting by disclosing emissions of nitrogen oxides, sulfur oxides and volatile organic compounds for U.S. manufacturing operations that submit annual air emission inventory reports to the relevant regulatory authorities.

The graphs on the following pages show data in round numbers for the purpose of creating visual depictions of the data over time. However, performance-improvement percentages stated throughout this Environment Report are calculated using actual values. Consequently, the improvement percentages cited throughout this report more closely indicate actual performance.

(continued from page 26)

<b>Summary of Environmental Performance (2007-2009)</b>				
	<b>2007</b>	<b>2008*</b>	<b>2009</b>	<b>% Improvement Absolute ('07-'09)</b>
<b>Revenue</b> (U.S. dollars in millions)	\$66,387	\$60,909	\$68,281	
<b>U.S. Employment</b> (Year End)	159,313	162,191	157,073	
<b>Energy consumption</b> (MMBtus or Millions of British Thermal Units)	12,951,825	12,679,255	12,642,153	2.4%
<b>CO<sub>2</sub> emissions</b> (Metric Tons)	1,331,663	1,295,187	1,291,286	3.0%
<b>Water consumption</b> (Thousands of U.S. gallons)	1,788,759	1,770,002	1,672,285	6.5%
<b>Hazardous waste</b> (Tons generated)	8,956	7,647	8,105	9.5%
<b>Recycling rates</b> (As a percentage of total non-hazardous solid waste generated)	58%	64%	68%	
<b>Environmental fines**</b> (U.S. dollars in millions)		\$0.024	\$0.028	

\* 2008 revenues and manufacturing production was affected by a 58-day Machinist strike in Washington, Oregon and Kansas.

\*\* Environmental fines do not include a proposed settlement for storm water permit violations at Santa Susana, Calif., between 2006-2009.

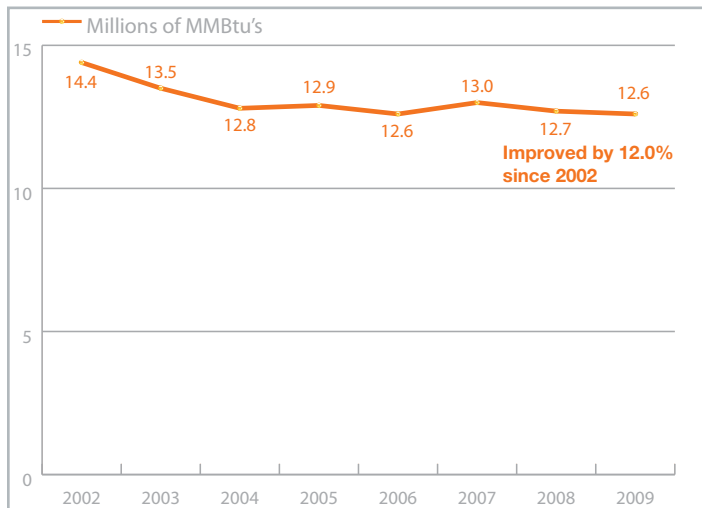


## Measuring Our Progress

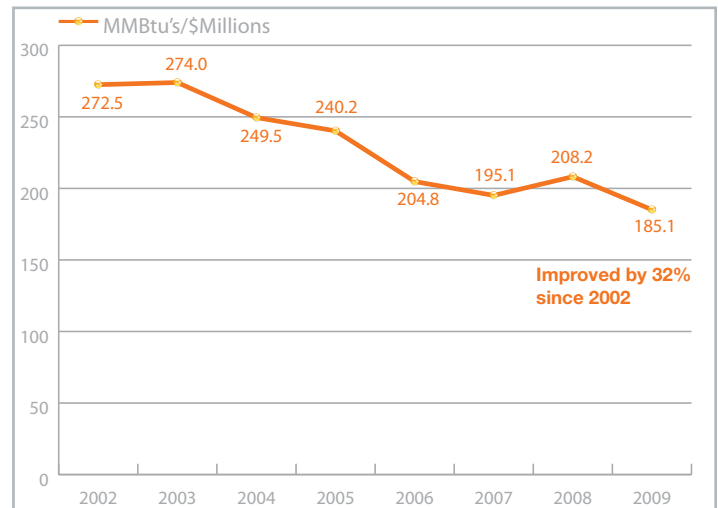
# Energy Conservation

Boeing reduced absolute energy consumption by 0.3 percent in 2009, and has reduced energy consumption on a revenue adjusted basis by 32 percent since 2002.

**Energy Use at Major U.S. Sites – Absolute**



**Energy Use at Major U.S. Sites – Revenue Adjusted**



- In addition to data from Boeing's 20 major sites, also includes data from Bellevue, Wash., Chicago, Boeing Commercial Airplanes' operations in Long Beach, Calif., Seal Beach, Calif., and West Hills, Calif.
- Energy use is calculated from consumption of electricity, natural gas and fuel oil. (Our facility in Philadelphia is the only major U.S. site that uses fuel oil for energy.) Consumption of other fuels is not represented.
- Five additional sites were included in data collection beginning in 2008. Energy consumption totals for previous years were adjusted to reflect this change in reporting practices.
- 2008 data reflects reduced production demand due to the IAM work stoppage in Washington, Oregon, and Kansas.
- Data in the chart is normalized for divestitures by excluding Boeing Commercial Airplanes operations in Wichita (now Spirit AeroSystem) from 2002 to 2005. Boeing Defense, Space & Security's Wichita operations are included in this data.

## Measuring Our Progress

# Air Emissions

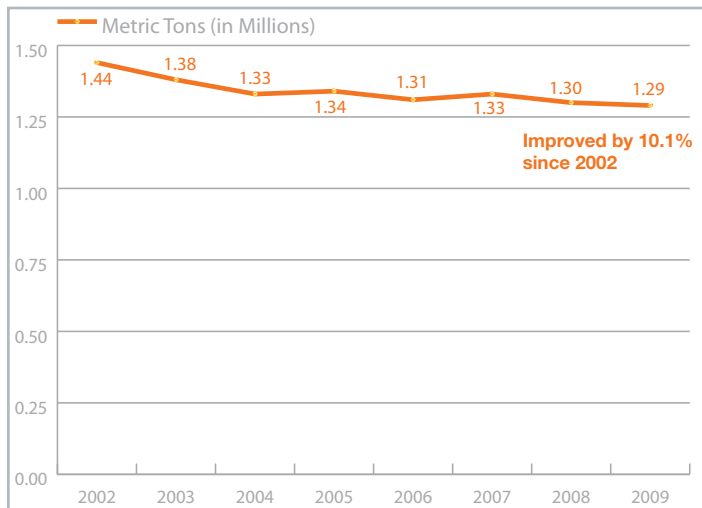
Boeing's industrial operations, like those at most other manufacturing industries, release regulated air emissions. These include CO<sub>2</sub>, nitrogen oxide, sulfur oxide and other gases. For many of its major U.S. manufacturing sites, Boeing tracks and, as required, reports certain emissions to the U.S. Environmental Protection Agency and state and local regulatory authorities.

## CO<sub>2</sub> Emissions

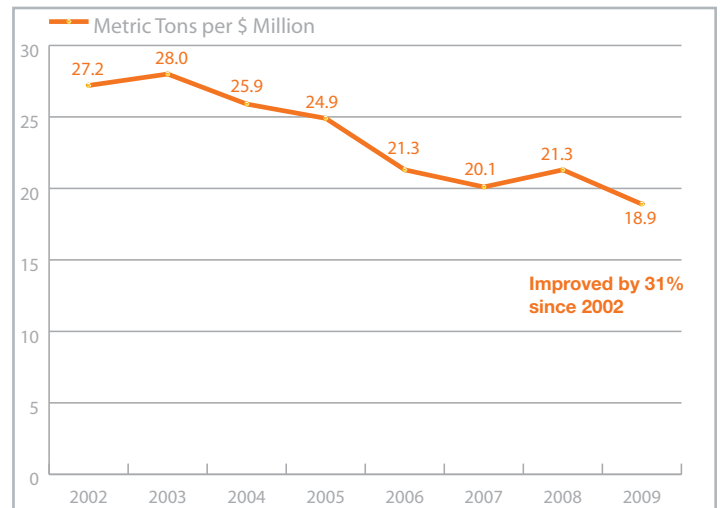
Reductions in CO<sub>2</sub> emissions are primarily the result of energy conservation. Since 2002, Boeing has reduced CO<sub>2</sub> emissions by 31 percent on a revenue-adjusted basis, and by 10.1 percent on an absolute basis.

To calculate CO<sub>2</sub> emissions at our major U.S. locations, Boeing uses measurements of electricity consumption, natural gas use and fuel oil.

**CO<sub>2</sub> Emissions at Major U.S. Sites – Absolute**



**CO<sub>2</sub> Emissions at Major U.S. Sites – Revenue Adjusted**



- In addition to data from Boeing's 20 major sites, also includes data from Bellevue, Wash., Chicago, Boeing Commercial Airplanes' operations in Long Beach, Calif., Seal Beach, Calif., and West Hills, Calif.
- 1 metric ton = approximately 1.1 tons or 2,204.62 pounds.
- CO<sub>2</sub> emissions are calculated based on consumption of electricity, natural gas and fuel oil. (Our facility in Philadelphia is the only major U.S. site that uses fuel oil for heating.) Consumption of other fuels is not represented.
- Similar to Boeing's 2009 Environment Report, emissions from purchased electricity is calculated using regional eGRID electricity CO<sub>2</sub> factors. Different from our 2009 Environment Report, emissions from natural gas and fuel oil are calculated using the emission factors provided in US EPA GHG Mandatory Reporting Rule. Historical totals are adjusted to reflect use of US EPA GHG Mandatory Reporting Rule emission factors.
- 2008 data reflects reduced production demand due to the IAM work stoppage in Washington, Oregon, and Kansas.
- Data in the chart is normalized for divestitures by excluding Boeing Commercial Airplanes operations in Wichita (now Spirit AeroSystem) from 2002 to 2005. Boeing Defense, Space & Security's Wichita operations are included in this data.

*(continued from page 29)*

## NOx and SOx Emissions

In addition to CO<sub>2</sub>, Boeing works to limit other emissions. Two of these emissions, nitrogen oxides (NOx) and sulfur oxides (SOx), occur in industrial operations by using equipment such as boilers, heaters, furnaces and back-up electrical generators that operate on natural gas and fuel oil.

Boeing has begun reporting NOx and SOx Emissions starting with this year's Environment Report. This report does not include calculations of NOx and SOx Emissions associated with operating aircraft, ground vehicles and other mobile equipment. A major factor contributing to the reduction of SOx emissions between 2007 and 2008 was the lower use of fuel oil in Philadelphia.

### NOx and SOx Emissions Table

NOx and SOx Emissions – Major U.S. Sites			
	2007	2008	Percent Improvement
<b>NOx Emissions</b>	368 tons	306 tons	16.8%
<b>SOx Emissions</b>	89 tons	46 tons	48.3%

- Data based on Boeing's U.S. manufacturing operations that submit annual air emission inventory reports to the relevant regulatory authorities. Not all of our major manufacturing operations are subject to annual air emission inventory reporting requirements.
- 1 ton = approximately 0.91 metric tons or 907.18 kilograms.
- 2008 data reflects both improved operational performance and reduced production due to the IAM work stoppage in Washington, Oregon and Kansas.
- Dates for reporting NOx and SOx emissions vary by government agency, and consolidated 2009 data was not available in time to be included in this report. Boeing will provide consolidated 2009 data in its next environment report.

## VOC Emissions

Volatile organic compounds (VOC) are chemicals that when exposed to sunlight in the atmosphere react with oxygen to form ground-level ozone. They are generated by a variety of industrial processes, including cleaning with solvents, painting and vapors from petroleum-based fuels.

VOC Emissions – Major U.S. Sites		
2007	2008	Percent Improvement
1067 tons	976 tons	8.5%

Boeing has begun reporting VOC emissions starting with this year's environment report.

- Data based on Boeing's U.S. manufacturing operations that submit annual air emission inventory reports to the relevant regulatory authorities. Not all of our major manufacturing operations are subject to annual air emission inventory reporting requirements.
- 1 ton = approximately 0.91 metric tons or 907.18 kilograms.
- 2008 data reflects both improved operational performance and reduce production due to the IAM work stoppage in Washington, Oregon and Kansas.
- Dates for reporting VOC emissions vary by government agency, and consolidated 2009 data was not available in time to be included in this report. Boeing will provide consolidated 2009 data in its next environment report.

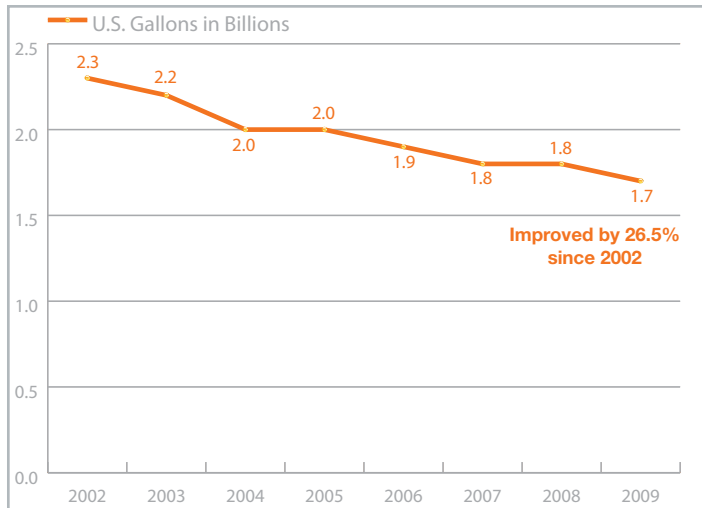


## Measuring Our Progress

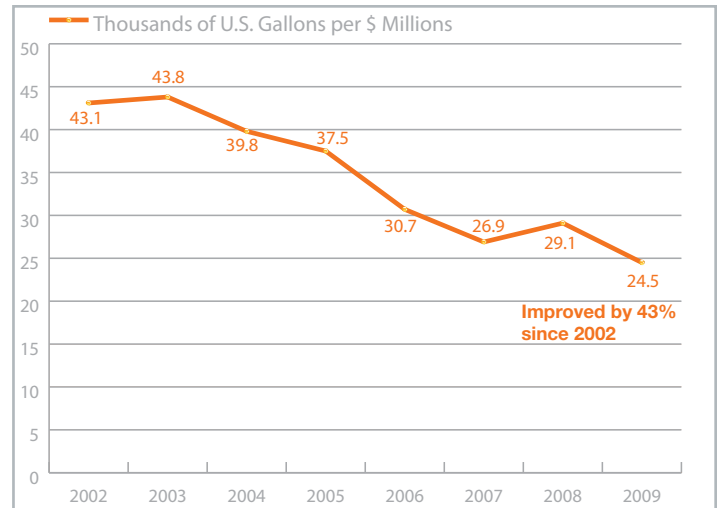
# Water Conservation

Boeing reduced absolute water consumption at our major U.S. sites by 6 percent in 2009, and has reduced water consumption at these sites on a revenue-adjusted basis by 43 percent since 2002.

### Water Use at Major U.S. Sites – Absolute



### Water Use at Major U.S. Sites – Revenue Adjusted



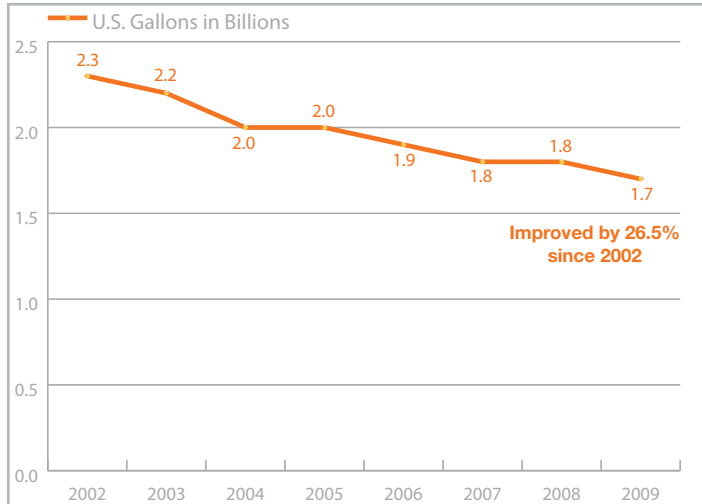
- In addition to data from Boeing's 20 major sites, also includes data from Chicago, Boeing Commercial Airplanes' operations in Long Beach, Calif., and West Hills, Calif.
- 1 U.S. gallon = approximately 3.79 liters.
- To align with reporting practices for energy, emissions, hazardous waste and recycling, Boeing has begun reporting water use at major U.S. sites. Previously, Boeing reported on water use at all of its U.S. locations, which is a higher level of consumption.
- Data in the chart is normalized for divestitures by excluding Boeing Commercial Airplanes operations in Wichita (now Spirit AeroSystems) from 2002 to 2005. Boeing Defense, Space & Security's Wichita operations are included in this data.
- 2008 data reflects reduced production demand due to the IAM work stoppage in Washington, Oregon and Kansas.

## Measuring Our Progress

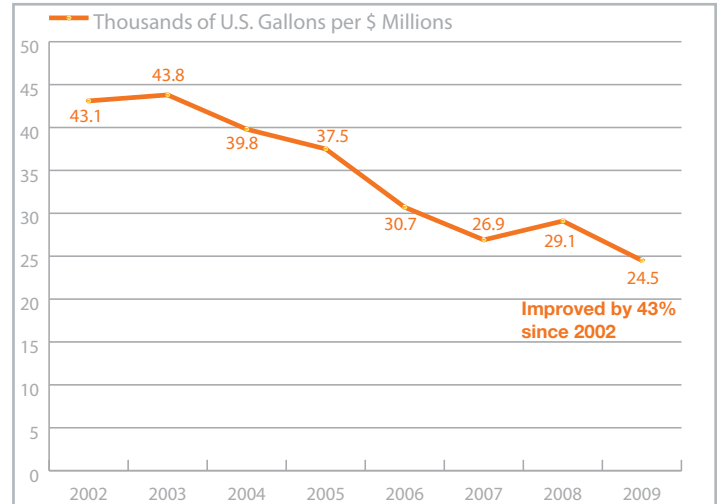
# Hazardous Waste

Boeing has reduced hazardous waste on a revenue-adjusted basis by 38 percent since 2002. On an absolute basis, Boeing increased hazardous waste generation at our major U.S. manufacturing operations in 2009, reflecting an increase in airplane production compared to 2008, which was affected by a labor strike. Despite the absolute increase, Boeing outperformed its 2009 plan to minimize hazardous waste.

### Hazardous Waste at Major U.S. Sites – Absolute



### Hazardous Waste at Major U.S. Sites – Revenue Adjusted



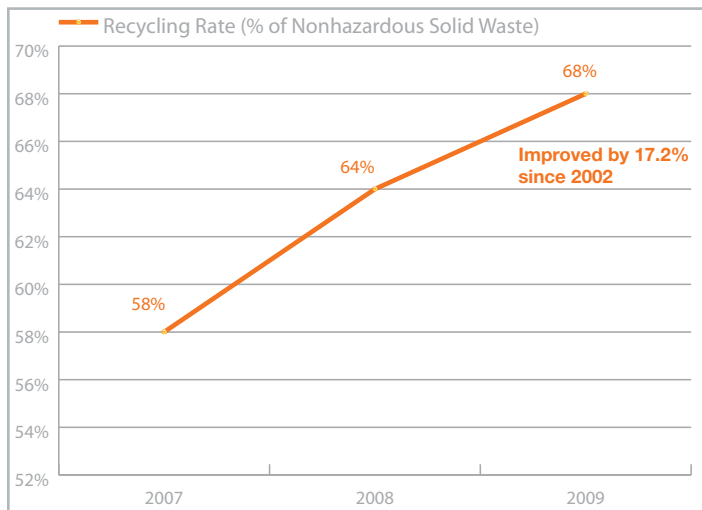
- In addition to data from Boeing's 20 major sites, also includes data from El Paso, Texas, Heath, Ohio, Macon, Ga., Salt Lake City and Sylmar, Calif.
- 1 ton = approximately 0.91 metric tons or 907.18 kilograms.
- 2007 and 2008 data has been restated to reflect the fact that, for internal purposes only, one Boeing site previously misclassified certain waste as remediation waste rather than hazardous waste.
- 2008 data reflect both improved operation performance and reduced production demand due to the IAM work stoppage in Washington, Oregon, and Kansas.
- Operational hazardous waste does not include wastes derived from remediation and construction activity.
- Total normalized for divestitures by excluding Boeing Commercial Airplanes Wichita (now Spirit AeroSystem) from 2002 to 2005.

## Measuring Our Progress

# Solid Waste and Recycling

In 2009, Boeing recycled 68 percent of the waste we generated at our major U.S. manufacturing operations, up from 64 percent the previous year. Our recycling efforts include non-hazardous waste streams such as metals, wood, paper, cardboard, plastics and organic materials.

### Recycling Rates at Major U.S. Sites – Absolute



- In addition to data from Boeing's 20 major sites, also includes data from Bellevue, Wash., Boeing Commercial Airplanes operations in Long Beach, Calif., Seal Beach, Calif., and West Hills, Calif.
- Recycling rate is calculated by dividing the amount of nonhazardous solid waste recycled by the total amount of nonhazardous solid waste generated.



## Measuring Our Progress

## Toxic Release Inventory/National Pollutant Release Inventory

Starting with this report, Boeing is including Canada's National Pollutant Release Inventory (NPRI) for 2007 and 2008. The NPRI is similar to the U.S. TRI report.

Boeing has reduced toxic releases by 66 percent since 2002, while overall transfers of chemicals to offsite facilities have increased 24 percent during the same period. This increase largely is the result of shipments of chemical tank line waste for disposal. Boeing's chemical tank lines are used for treatment of metal during the production of aerospace parts.

### United States Toxic Release Inventory (TRI) and Canada NPRI (Millions of Pounds)

	2002	2003	2004	2005	2006	2007	2008
	(U.S. only)	(U.S. only)	(U.S. only)	(U.S. only)	(U.S. only)	(U.S. & Canada)	(U.S. & Canada)
<b>Releases</b>							
Total release (millions of pounds)	1.27	1.06	0.88	0.47	0.25	0.25	0.21
Wichita	0.66	0.59	0.55	0.27			
Total release less BCA Wichita	0.61	0.47	0.33	0.20	0.25	0.25	0.21
Percentage change	0	-23%	-46%	-67%	-59%	-58%	-66%
Normalized to revenue (pounds/million \$ rev.)	12	9	6	4	4	4	3
Percentage change from normalized	0	-18%	-45%	-67%	-65%	-67%	-70%
<b>Transfers</b>							
Total (millions of lbs)	8.17	6.78	6.80	4.75	3.27	24.07	2.57
Wichita	6.09	5.09	5.01	3.06			
Total transfers less BCA Wichita	2.08	1.69	1.79	1.69	3.27	24.07	2.57
Percentage change		-19%	-14%	-19%	58%	1058%	24%
Normalized to revenue (pounds/million \$ rev)	39	34	35	32	53	363	42
Percentage change from normalized		-13%	-12%	-20%	35%	820%	7%
<b>Total release and transfers (millions of lbs) (less BCA Wichita)</b>							
	2.69	2.16	2.11	1.90	3.52	24.32	2.78
Percentage change		-20%	21%	-30%	31%	804%	3%
Normalized to revenue (pounds/millions \$ rev)	51	44	41	35	57	366	46
Percentage change from normalized		-14%	-19%	-31%	12%	618%	-11%
Revenue (millions U.S. \$)	52,720	49,311	51,400	53,621	61,530	66,387	60,900

- Normalized for major divestitures by excluding Boeing Commercial Airplanes Wichita from 2002 to 2005.
- 2005, 2006, and 2007 CR data resubmitted by Wichita in September 2009.
- 2007 increase in offsite transfer was a result of a Boeing Integrated Defense Systems Wichita transfer of old tooling and scrap metal to recycler.
- 2008 data reflects reduced production demand due to the IAM work stoppage in Washington, Oregon and Kansas.
- 2007 and 2008 include Canada NPRI data; prior years do not.
- 2009 data will be submitted to the U.S. and Canadian governments after the publication of this report. Boeing will provide 2009 data in its next environment report.

## Measuring Our Progress

# Australian Operations

Boeing's largest presence outside the United States is in Australia. Last October, Boeing filed a report with the [Australian Department of Climate Change](#) detailing energy use and greenhouse gas emissions during the 2008-2009 Australian fiscal year. The report calculated emissions based on electricity and fuel consumption at Australian sites for which Boeing had

the obligation to report greenhouse gas emissions and energy usage.

When publishing the information required by the National Greenhouse and Energy Reporting Act 2007, the Australian government released data only for companies emitting more than 125,000 metric tons of equivalent carbon dioxide (CO<sub>2</sub>-e). For the 2008-2009

fiscal year, Boeing's CO<sub>2</sub>-e emissions in Australia were calculated at 98,000 metric tons, a level which did not reach the current threshold to be included in the government's report. Boeing will continue reporting emissions to the Australian government on an annual basis as required. ■

## Measuring Our Progress

## Environmental Awards and Recognition

Boeing received environmental awards and recognition from a number of local, national and international organizations in 2009. These included:

- Boeing named the best performing industrial company in the 2009 Carbon Disclosure Project and named to the 2009 Carbon Disclosure Leadership Index, which ranks corporations for transparency around reporting climate-change risks and actions to improve environmental performance.
- Jane's Air Traffic Control Global Award in the Industry category for the development of the innovative Air Traffic Management concept of Tailored Arrivals, which reduce fuel burn, emissions and noise.
- Utah Green Business achievement award.
- Southern California Edison award for excellence in energy efficiency.
- The California Manufacturers and Technology Association recognized Boeing for efforts to encourage environmental employee involvement.
- U.S. Department of Energy/EPA ENERGY STAR designation for Boeing's buildings in Houston and Long Beach, Calif.
- Clean Texas Program recognition for Boeing's facility in El Paso.
- Green Business of the Year award from the city of Kent, Wash.
- Clean Air Award from the city of Wichita, Kan.
- Air Pollution Control Achievement Awards from the city of Huntsville, Ala.
- Phoenix Clean Air Campaign Award.
- Local water quality awards presented by water treatment districts in multiple locations including El Paso, Texas; Everett, Wash.; Portland, Ore.; Renton, Wash., Seattle, Wash.; St. Charles and St. Louis, Mo.; and Wichita, Kan. ■