

Boeing's Energy Management Program Leverages EPA Energy Star Resources to Improve

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ABSTRACT

This article will describe the energy management system improvements made at the Boeing Company through its participation the Energy Star industrial partnership program. All improvements were based on the Energy Star guidelines: making a commitment; assessing performance and setting goals; creating an action plan; implementing the action plan; evaluating progress; reassessing; and recognizing achievements. Key among these were: formalizing a corporate energy policy; establishment of corporate energy and environmental goals; requiring each major site to develop improvement plans and projects to achieve those goals; creating a targeted energy conservation project investment fund to support the implementation of those projects; expanding energy bill payment and data collection service across all facilities; establishing a corporate-wide conservation scorecard system for monitoring progress; and improving internal recognition and communication processes. The success of Boeing's efforts was borne out by their achievement of the 2011 Energy Star partner of the year award for energy management.

BODY

You may have recently seen the Boeing Company's "That's why we're here" television ad campaign often shown during Sunday morning's "Meet the Press." This ad opens with a Boeing employee's stating, "We know why we're here—to chart a greener path in the air and in our factories." Another employee states, "To find cleaner, more efficient ways to power flight." A third employee, "And harness our technology for new energy solutions." The narrator then states, "Around the globe, the people of Boeing are working together to build a better tomorrow." A fourth employee ends with, "That's why we're here."¹

Why does a corporation as large as Boeing need to put ads on TV about its products and its environmental efforts? My view from inside the company is that we, the people of Boeing, with corporate leadership's approval and encouragement, want to show that we understand the impacts our products have on people and on the environment, and that our company is making every effort to improve the safety, comfort and environmental impact of our products, processes and facilities.

Boeing Corporate President and CEO, Jim McNerney, stated in our 2011 environmental report, "...Because of the tremendous benefits aerospace brings to the world, our industry—and our company—is growing. Boeing has a clear life-cycle strategy to address its impact on the environment:

- As a technology leader, we will continue to pioneer environmentally progressive products and services and bring them to market.
- As a leader in aerospace, we are bringing the industry together to become more aligned on environmental improvement opportunities.
- As a responsible corporate citizen and neighbor, we are reducing energy use, greenhouse gas emissions, pollution and waste at our facilities."²

A key effort in Boeing's strategy involved renewing our industrial partnership with EPA Energy Star to develop and improve our corporate energy management program and our environmental footprint.

Allow me to introduce the Boeing Company and explain where energy management fits in. Boeing is the world's largest, most diversified aerospace company. We design, assemble and support commercial jetliners, defense systems, satellites and launch vehicles. We serve customers in more than 90 countries. We had a total revenue in 2010 of \$64.3 billion. Boeing owns and operates 84.7 million square feet of buildings enterprise-wide, supporting 157,000 employees across the U.S. and in 70 other countries. Boeing is organized around two primary businesses, commercial airplanes and defense systems, supported by nine corporate functions, one of which includes the shared services group.³ This organization's function is similar to behind-the-scenes support of a major theatrical production. An efficient and productive infrastructure allows the on-stage performers to play their roles without having to be concerned about what is happening "off stage." We allow our busi-

ness partners to run their businesses without having to worry about the Boeing infrastructure. That means we have an enormous impact on the companys' success in two very important ways:

- First, by providing foundational services to our business partners, we allow them to focus their efforts and energy on what they do best—deliver Boeing's products and services.
- And second, because we touch almost every product, service and location, we have a unique opportunity to influence and model innovation and efficiency, generating cost savings to the company.

Boeing's corporate energy management team, the utilities services/energy management group, consists of eight individuals with varying responsibilities. The group, led by Keith Warner in the corporate energy manager position, coordinates all aspects of the energy management and conservation programs from strategy to implementation and interfacing with Boeing leadership at all levels. The remaining core members are responsible for managing energy supply purchases on open markets, demand side management, utility bill paying services and data management, energy and water conservation efforts, and solid waste and recycling efforts.

Each site has designated focals for energy conservation, water conservation and recycling. The utilities council is made up of these site focals who are the day-to-day people "in the trenches," pushing energy projects through, estimating and reporting energy consumption plans and budgets, and reporting progress on established initiative tracking. This council meets monthly to review the current status of conservation scoring and to share best practices and updates of what is occurring at each site. Due to its higher cost impact, energy remains the main focus for these meetings.

Energy focals have responsibility for leading site energy teams and developing site energy management plans. Using knowledge of their site operations, production rates, historical weather data (and crystal balls), they must develop site consumption plans consisting of monthly energy consumption for one-year and five-year annual plan estimates. The 12-month plan is tracked and scored throughout the year. The five-year plan establishes the long-term purchase plans for energy to hedge against anticipated future cost increases. In addition, site focals attend monthly utilities council web conferences, review and approve replication opportunities, score their sites' Energy Star matrix, perform assess-

ments and implement site improvement plans, and pursue Energy Star label, Energy Star challenge for industry, LEED rating, or other high-performance building certifications.

In 2005, Boeing was looking for ways to improve our already mature energy management program. We wanted to increase awareness of our existing energy conservation efforts and advocate improvements to all sites and business units. Ever increasing energy costs, with the spike in rates seen at that time for natural gas and electricity, greatly aided our efforts. Those heightened the role energy plays in our products by affecting the bottom line. Of all the guidance programs for making improvements we investigated, the Energy Star industrial partnership program stood out as the best fit for benefiting Boeing. All of the major U.S. corporations that were continuously portrayed as leaders in energy and the environment were participating in the Energy Star program. This program offered in-depth and well-studied best practices for building corporate energy management programs and provided a regular forum for multiple partners to share what has and hasn't worked in their own experiences.

Prior to renewing our Energy Star partnership, Boeing had already developed a robust corporate energy management program, which included some good practices, but we were not seeing opportunities for continued improvement. Boeing had a central energy management team in place; we had developed an energy focus group including representatives from each of our major sites that met monthly through teleconferences and at an annual face-to-face conference to share common issues and best practices; we had begun utilizing a corporate managed bill paying and data management service; and we had implemented several site energy improvement projects tied mostly to utility incentives. Our corporate energy policy needed more teeth and promotion. We lacked cohesive corporate energy or environmental goals. Leadership had limited visibility of energy consumption or its potential impacts. And, there was inconsistency between sites in funding availability to implement projects to reduce consumption. All of our future outlooks anticipated rising energy consumption due to production increases, and even faster rising energy costs. Energy Star offered us a venue to see how other corporations were addressing and overcoming many of the same issues we faced.

Boeing Energy Star Partnership History

1997—Joined the 1997 energy star partnership as it developed out of the EPA green lights program.

- 1998—Boeing was named 1999 Energy Star buildings and green lights partner of the year
- 1998-2005—Corporate changes included mergers, acquisitions, and divestitures, plus inception of SSG
- 2005—Reengaged with Energy Star to build up our energy management program
- 2007—Renewed Energy Star partnership with signature of shared services president, Mary Armstrong
- 2009—Reaffirmed Energy Star partnership at top corporate level with signature of president and CEO, Jim McNerney
- 2010—Won 2011 Energy Star partner of the year—leader in energy management

If you are not familiar with the Energy Star industrial partnership, it is a voluntary partnership between government and private industries established in 1992 to help address climate change through focus on the energy efficiency of products, homes, buildings, industrial plants and organizations. The Energy Star logo has developed into a national symbol for energy efficiency.

Energy Star works with us at Boeing—as it has with over 3000 partner companies—to develop a stronger energy management program with emphasis on corporate energy management practices by offering: an instructive partnership program; energy management guidance; energy program resources, benchmarking and tracking tools, recognition opportunities for achievements; and sector-specific tools and resources. The successes of many of the industrial partners in addressing current energy issues further enticed us to investigate how our participation might help the Boeing company.

Putting the pieces together with Energy Star:

- Aligns to corporate energy and environmental goals
- Provides a proven, shared, sustainable, strategic approach
- Promotes networking and support
- Establishes best practices for energy management
- Provides energy awareness programs and resources



Figure 1. Energy Star Logo

- Encourages benchmarking
- Provides national recognition for program successes

Shared services energy management is strongly aligned with the corporate environmental organization. Boeing environment, health and safety (EHS) provides corporate strategic direction and oversight to help drive continual environmental performance improvements and foster a safe and healthy workplace at Boeing. Our comprehensive approach to improving our environmental performance throughout the product life cycle is contributing to steady, measurable progress. In addition, we are exploring alternative energy sources and applying aerospace technologies to increase energy efficiency, security and reliability.

Energy Conservation is actively promoted through the Boeing conservation initiative, a joint effort of shared services and EHS. The conservation initiative strategy is to embed conservation culture in all our service delivery processes. The initiative also promotes water conservation, renewable energy, sustainable site and building design, solid waste and recycling, fleet management, and alternative commuting across all business partners. Energy Star offered proven guidance for developing an even stronger energy management program.

About the same time we joined Energy Star, Boeing changed the role of its Environmental organization and elevated it to report directly to the board of directors. In 2007, shared services energy management, working in combination with EHS to form the conservation initiative, developed five-year corporate targets for 25% reductions in: energy consumption, greenhouse gases, water consumption, hazardous waste, and 25% improvement in solid waste recycling.

Using Energy Star strategic guidance materials, our energy management leaders laid out our plans for improvement to SSG leadership, Boeing business leadership at commercial airplane and defense systems, and to the corporate board of directors:

- Relating energy efficiency and environmental stewardship
- Providing a longer, broader view of strategic energy decisions and investments
- Improving how the company manages, procures and uses energy
- Preparing contingent strategies for emergent future scenarios
- Challenging leaders to take action

We have worked with our manufacturing business partners and continue to engage them on best practice replication efforts for reduc-

ing energy and water consumption, and on expanding recycling efforts. Some of the programs we promote and leverage internally include:

- Replicating of best practices
- Using common utility bill paying and metrics processes
- Providing utility system benchmarking
- Increasing online visibility of site energy consumption
- Encouraging employee awareness and engagement
- Insuring off-shift and weekend equipment shutdown
- Leveraging energy efficiency with lean manufacturing.

We have strongly promoted and actively participated in Energy Star networking opportunities:

- Monthly partner web conferences
- Supply chain working groups
- Annual industrial partner meetings

Energy Star tools, such as the program assessment matrix, helped Boeing identify areas of our energy management program that needed improvement and provided many resources to aid in achieving those improvements. We began developing improvements to our energy management system as we:

- Strengthened and formalized our corporate energy and environmental policy
- Expanded benchmarking and analysis of energy use with the expansion of bill payment services to all sites
- Established corporate energy and environmental goals
- Established the targeted energy conservation project fund
- Tracked performance to targets
- Provided on-demand visibility of each site's energy consumption

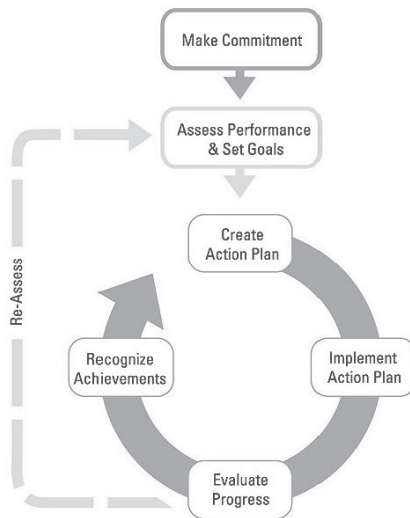


Figure 2. Energy Star Guidelines⁴

- Implemented standard monthly energy use/cost reviews
- Highlighted energy awareness through communications

Since 2007, Boeing has invested over \$30 million in energy and conservation projects, reducing energy consumption more than 300,000 MMBtu. These savings translate directly to Boeing's bottom line as more than \$8.4 Million in annual savings.

At each site level, we have incorporated use of the Energy Star facility assessment matrix to establish current scores and to develop site energy management improvement plans intended to improve those scores.

Boeing has extensively promoted the Energy Star change the world pledge program and led all industrial partners in pledges for the program year 2010-2011 with pledges of the equivalent to over 45 million pounds of avoided greenhouse gases. Other Energy Star promotional tools we leveraged include: bring your green to work; the Energy Star challenge; and the battle of the buildings. In addition to these promotions, Boeing currently has five office buildings that have achieved the Energy Star label, having incorporated improvements making them 25% more efficient than average office buildings. We are tracking five more buildings that should all qualify for the Energy Star label. Two separate Boeing sites in Long Beach, California, achieved the Energy Star challenge by improving energy efficiency 10% or more within three years.

High performance buildings currently certified and in work:

Energy Star label buildings⁵:

1. Chicago, IL, corporate HQ (May 2010)
2. Houston, TX, bldg. 91-014 tower II (Feb. 2011)
3. Houston, TX, bldg. 91-051 Bay Area Blvd. (Nov. 2008, Jan. 2011)
4. Long Beach, CA, bldg. 800 (Oct. 2009)
5. Long Beach, CA, bldg. 801 (Nov. 2011)
6. Bellevue, WA, bldg. 33-01, -07, -08, -11, -14 (in work)
7. St. Louis, MO, bldg. 270 (in work)
8. Everett, WA, bldg. 45-80 (in work)
9. Philadelphia, PA, bldg. 86-310 (in work)

LEED Certified Buildings:

1. Kent, OH, bldg. 18-26
2. Houston, TX, bldg. 91-051
3. El Segundo, CA, bldg. S-30/31
4. Portland, OR, bldg. 85-001 expansion (in work)
5. Philadelphia, PA, H47 factory mod 86-310 (in work)



Figure 3. Boeing Energy Star Sites

6. Charleston, SC, new 787 manufacturing facility (in work)
7. Chicago, IL, corporate HQ (in work)
8. Washington, DC, new office bldg. (in work)

Boeing is making good progress in the areas of conservation, recycling, and reducing hazardous waste. The result is a steadily shrinking environmental footprint. At the time of our partnership recommitment in 2007, our outlook for energy consumption was for increases of nearly 3% by the end of 2012. By the end of 2010, the efforts established as a result of our Energy Star partnership commitments and refinement of our internal energy management processes have resulted instead in an overall reduction in our energy consumption by 2.4%.

Since 2002, on a revenue-adjusted basis at our major U.S. operations, Boeing has:

- Reduced greenhouse gas emissions by 28%
- Reduced energy consumption by 30%
- Reduced hazardous waste generation by 44%
- Reduced water consumption by 41%

Since 2007, on a revenue-adjusted basis at our major U.S. operations, Boeing has:

- Reduced energy consumption by 2.4%
- Reduced greenhouse gas emissions by 3%
- Reduced hazardous waste generation by 20%

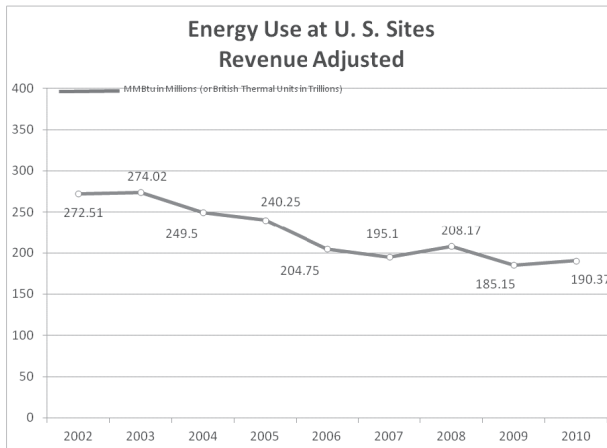


Figure 4. Boeing Energy Use 2002-2010⁶

- Reduced water consumption by 8%
- Diverted 26% more solid waste from landfills.

Recognition such as the Energy Star partner of the year is an important opportunity to share success with all our employees as well as with our customers, who are increasingly aware of how we manage our environmental footprint. Key accomplishments that helped us achieve the partner of the year include:

- Achieved a 5.1% energy intensity reduction and an absolute energy reduction of 1.1% equivalent to over 133,000 MMBtu (enough energy to power 3,400 homes)
- Invested \$6.6 million in energy efficiency improvements through an investment fund that requires sites to dedicate 3-5% of their annual utilities budgets for energy and environmental projects
- Built a strong energy management strategy and culture that reduces the environmental footprint of Boeing operations by conserving resources and removing waste
- Achieved the Energy Star challenge for industry at two of our sites and earned the Energy Star label for five of our office buildings, including corporate headquarters
- Conveyed the value of energy efficiency and productivity improvements to employees, customers, and communities through

innovative outreach and Energy Star awareness campaigns

To say that we at Boeing are proud of achieving the Energy Star partner of the year is an understatement. Our pride begins with those who are working to make improvements at the site level, extends to those working to improve our enterprise programs and processes, and finally to our leadership at all levels, as evidenced in this statement by Jim McNerney:

This achievement is a testament to the innovation and creativity of the entire Boeing team, which simultaneously cut our energy usage, reduced our facilities' environmental footprint and drove improvements in our business performance. We are proud of our teams' efforts. This is a great honor for Boeing—one that will motivate us to keep improving our energy efficiency and reducing our environmental footprint even further.

—W. J. McNerney

Thank you Energy Star! We couldn't have done it without you... and that's why we're here!

References

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Alan Griffin has led Boeing corporate energy conservation efforts for six years. His 26 years with Boeing have included positions ranging from facilities mechanical engineer to construction project manager and energy management engineer. Energy conservation has been an important aspect of his work throughout these assignments. Alan has been a member of the Association of Energy Engineers since 1987 and is a charter member of the AEE Huntsville Chapter, formed in 2010. Alan graduated from the Georgia Institute of Technology with a bachelor's degree in mechanical engineering in 1979 and is a registered professional engineer, certified energy manager, certified energy auditor, green building engineer, LEED-accredited professional, and project management professional. He resides in Decatur, Alabama. You can contact him by email at: alan.k.griffin@boeing.com