

# REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015



**ENERGY STAR:** The simple choice for energy efficiency







## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

### FORWARD

The industrial sector is a vital part of the United States economy. Sales of manufacturing goods are valued at just over \$5.8 trillion, contribute over 12 percent to the U.S. GDP, and provide more than 11.08 million jobs paying an average of \$54,400 annually.<sup>1</sup> This sector also contributes more than a quarter of the nation's annual greenhouse gas (GHG) emissions. Through ENERGY STAR®, U.S. Environmental Protection Agency (EPA) enables the industrial sector to reduce GHG emissions and improve energy efficiency by removing barriers to energy management.

The EPA expanded the ENERGY STAR program to address industrial energy efficiency in 2000. Since then, the program has helped manufacturers strengthen their energy management practices and has engaged entire manufacturing sectors in focused energy efficiency efforts. The results demonstrate that energy efficiency is a cost-effective strategy for reducing GHG emissions in the manufacturing sector. This report discusses the origin of the ENERGY STAR program, its expansion into the industrial sector, the strategies used promote industrial energy efficiency and results.





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## CONTENTS

<b>FORWARD</b>	2
<b>ORIGINS OF ENERGY STAR</b>	4
A Move Beyond Lighting	5
Debut of Energy Performance Benchmarking	6
Expansion into the Industrial Sector	6
<b>ENERGY STAR FOR INDUSTRY</b>	6
The Industrial Sector Focus	7
Energy Performance Indicators	8
Energy Guides	9
Guidelines for Energy Management	10
Recognition of Performance	11
Results	12
Future Direction	14
<b>APPENDIX</b>	
ENERGY STAR Industrial Sector Focuses	15
Industrial Energy Management Tools & Resources	16
References	17







## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

### ORIGINS OF ENERGY STAR

The early 1990's began a new focus on environmental protection oriented towards preventing pollution before it could occur. The U.S. Environmental Protection Agency (EPA) launched new initiatives using voluntary, market-based strategies to prevent pollution. Among these were the Green Lights and ENERGY STAR programs, which were designed to reduce greenhouse gas (GHG) emissions from fossil fuel use by promoting energy efficiency.

In 1991 EPA launched Green Lights to build the market for more efficient lighting. At the time, lighting was estimated to account for 20 to 25 percent of the electricity sold in the U.S.<sup>2</sup> New energy-efficient lighting technology was available but not yet widely adopted.

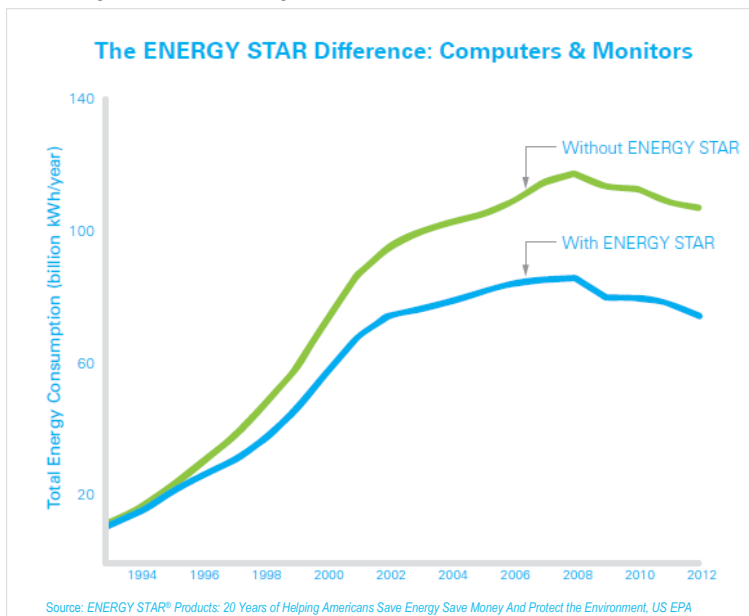
Through Green Lights, EPA asked businesses, governments, and other organizations to make a voluntary commitment to upgrade their facilities' lighting where it could be done profitably. Businesses and other organizations responded, and at Green Lights' peak in 1995, over a thousand organizations had committed to installing energy-efficient lighting.

Green Lights proved to be a successful framework for driving action. A year later, EPA launched ENERGY STAR to help businesses and consumers make informed selections of personal computers (PC), based on energy performance. Growth projections for PC use in businesses and households were enormous, with corresponding increases in electricity use and

associated carbon dioxide emissions. Although technologies existed to make PCs more energy-efficient, they were not being used.<sup>3</sup>

EPA faced a challenge in motivating and mobilizing the U.S. marketplace to offer energy-efficient PCs. Working with computer manufacturers, EPA helped build the business case for producing and purchasing an energy-efficient product, identified an energy performance specification for the PC, designed the recognizable ENERGY STAR label, and informed the market of the availability of an environmentally friendly product.

The market responded again as businesses and consumers made the decision to purchase energy-efficient products.



EPA introduces **Green Lights**, a partnership program designed to promote efficient lighting systems.



EPA pilots the **ENERGY STAR Buildings** program with 23 building owners to showcase an ENERGY STAR approach.

1991

1992

1993

1994

EPA introduces the first **ENERGY STAR labeled products** for personal computers and monitors.





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Since this early beginning, EPA has leveraged the ENERGY STAR program and transformed it into a national symbol of energy efficiency. The ENERGY STAR logo is now recognized by nearly 90 percent of the U.S. public.<sup>4</sup> EPA continues to apply the ENERGY STAR to more than 70 product categories that meet strict energy performance specifications and continues to add new product categories.<sup>5</sup>

### A MOVE BEYOND LIGHTING

The momentum established by Green Lights enabled EPA to move beyond lighting to capture substantial additional savings by improving the energy efficiency of a whole building. Through its work with Green Lights participants, EPA learned that real savings lay not just in technologies but in the interaction of the various building systems and the effectiveness of energy management.

In 1993 EPA conducted a study to investigate best practices and strategies for promoting whole-building energy performance. Through the study, EPA identified several areas where ENERGY STAR could make a difference. These included the need for an energy performance benchmarking system to ensure objective measurement and a partnership program to help organizations build stronger energy management programs.<sup>6</sup> Two years later, EPA launched ENERGY STAR Buildings, as a logical step to encourage Green Lights partners to focus on the continuous improvement of their facilities' energy performance beyond lighting upgrades.

This step marked an evolution in the design of energy efficiency programs by moving from a *technology-oriented* approach to a *systems* approach focused on the whole facility. It also heralded a new era of strategically managing energy by adopting an organizational-wide energy management approach.

### DEBUT OF ENERGY PERFORMANCE BENCHMARKING

EPA needed an objective measure by which all buildings could be evaluated. It was obvious that saving energy was good, but there was no way to objectively compare—or benchmark—the performance of one building to another. EPA turned to an existing inventory of commercial building energy use available from the Department of Energy to develop comparative metrics for evaluating performance.

In 1999 EPA released the first ENERGY STAR score for office buildings.<sup>7</sup> To recognize and motivate top performance, EPA extended the ENERGY STAR label to office buildings that scored in the top 25% nationally on the ENERGY STAR scale. To make it easy for users to benchmark their facilities, an on-line energy data management tool called Portfolio Manager was released in 2000.<sup>8</sup>

The release of these new tools would mark a fundamental shift in how the market came to define energy-efficient buildings. Until this time, no system had existed. Now, EPA enabled organizations to gauge the performance of their buildings easily and at low cost, prioritize investment opportunities, learn from the best performing, and verify the savings of their actions.



EPA launches **ENERGY STAR Buildings** to promote whole building energy efficiency.



EPA establishes the **ENERGY STAR Partner of the Year Award** for excellence in energy management.

1995

1997

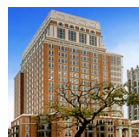
1998

1999

Green Lights merges with **ENERGY STAR** to help businesses improve their energy performance organization-wide.



First **ENERGY STAR** rating for office buildings is released.



First **ENERGY STAR** label is awarded to a commercial office buildings.





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The ENERGY STAR scores have since been expanded to nearly twenty commercial and institutional building types, with more in development.

### EXPANSION INTO THE INDUSTRIAL SECTOR

Both Green Lights and ENERGY STAR had engaged companies from the industrial sectors in energy efficiency of their buildings. Many of these partners requested EPA to offer more ENERGY STAR tools and resources to address the energy use of their manufacturing plants. At the same time, another EPA voluntary program, Climate Wise, was working with industrial companies to reduce GHG emissions by focusing on energy efficiency.

Given the growth in consumer awareness of ENERGY STAR, industry interest in an ENERGY STAR program, and the importance of energy efficiency for GHG management, EPA merged Climate Wise and ENERGY STAR to offer expanded resources for the industrial sector.<sup>9</sup>

#### First ENERGY STAR certified building:

Ridgehaven Green Building,  
San Diego, CA  
1999



### ENERGY STAR FOR INDUSTRY

EPA expanded ENERGY STAR in the industrial sector in 2000.<sup>10</sup> Having operated voluntary partnership programs for nearly ten years, EPA identified three key areas where the new industrial program could work to reduce barriers to energy efficiency:

- Increase access to information on industrial energy efficiency upgrades and strategies;
- Provide energy performance measurement tools that rate a plant's energy efficiency; and,
- Offer tools and resources that support strong corporate energy management systems and programs.

Early on, EPA understood that industrial energy management must move beyond occasional energy audits and projects if significant energy savings were to be captured. EPA observed among its partners that greater improvements in energy efficiency occurred when companies applied a *strategic* and *programmatic* approach based on continuous improvement of energy performance.

The objective for the new industrial program would be to promote strategic energy management and to work with manufacturers to build strong corporate-wide programs. To shine a spotlight on organizations that were succeeding at creating strong corporate-wide energy management programs that achieved significant energy savings, EPA extended the ENERGY STAR Partner of the Year Award to industrial partners. Today, the award is highly coveted by industrial partners.

ENERGY STAR®  
**PortfolioManager®**

Portfolio Manager,  
an on-line energy  
tracking tool for  
buildings, goes live.



EPA expands  
ENERGY STAR to  
promote industrial  
energy-efficiency.

2000

2001

First National Awareness  
Survey reveals that 40% of  
Americans recognize the  
ENERGY STAR.



EPA kicks off first ENERGY  
STAR Industrial Focus with  
the Motor Vehicle  
manufacturing sector.





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### THE INDUSTRIAL SECTOR FOCUS

As energy performance scores for commercial buildings were making in-roads in the market, EPA set out to explore benchmarking of industrial plants. EPA consulted partner companies from specific industrial sectors to gauge the need for such tools. Support for new tools was positive, especially among the motor vehicle sector.

Motor vehicle manufacturing has long been an icon of American industry, making the sector attractive for this new initiative. Many automobile manufacturers were already involved with ENERGY STAR and had expressed an interest in partnering to advance energy management. These factors led EPA to select this sector as the first to engage in a new initiative.

EPA called this new industrial collaboration an Industrial Focus, based on the concept of “focusing” on energy efficiency within a unique manufacturing sector.

While EPA had a vision for *what* an Industrial Focus would entail, early conversations with motor vehicle sector energy managers helped shape *how* EPA would implement the new initiative. ENERGY STAR kicked off its first Industrial Focus with the motor vehicle sector in the fall of 2001.<sup>11</sup> Since then the sector has helped set the pace for other industries to follow. The collaborative spirit of motor vehicle energy managers helped establish the culture of networking and sharing of best

practices that is now associated with ENERGY STAR in the industrial sector. The successful partnership with the sector also contributed to the ENERGY STAR program’s expansion into over 25 other sectors since the first Focus meeting in 2001.

Today Industrial Focuses are a cornerstone of the ENERGY STAR industrial partnership. Through its “Focuses,” EPA identifies and brings together energy managers from the major companies within a given industrial sector to work collaboratively on a defined set of activities. Within many sectors, the Focus has brought the energy managers from the industry together for the first time. And it has created a collegial group of professionals who learn together.

For many companies, the Focuses have helped them build energy management programs. Through peer interactions, participants

are able to benchmark their company’s energy management activities and identify areas for improvement. By refining their programs and corporate energy performance, companies rely on the Focuses to help them reduce energy-related GHG emissions while saving money and improving competitiveness. For EPA, the Focuses provide a forum for discussions on the development of important energy management tools for a sector, such as an energy guide and benchmarking tool known as a Plant Energy Performance Indicator.

#### INDUSTRIAL SECTOR FOCUS KEY ELEMENTS

- ✓ Energy manager network
- ✓ Plant Energy Performance Indicator
- ✓ Sector Energy Guide
- ✓ Energy program guidance
- ✓ ENERGY STAR certification



Wet Corn Milling  
(Corn Refining)  
Industrial Sector  
Focus launches.



Petroleum Refining  
Industrial Sector  
Focus starts.



ENERGY STAR Guidelines  
for Energy Management is  
released to promote strategic  
energy management.

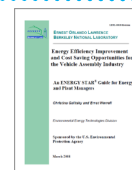
2002

Cement manufacturing  
Industrial Sector Focus  
begins.



2003

First Industrial Sector Energy  
Guide is published for Auto-  
mobile Assembly plants.







## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

### PLANT ENERGY PERFORMANCE INDICATORS

Benchmarking energy performance is a critical best practice for driving energy efficiency. Industrial energy managers generally understand the concept of benchmarking; however, access to industry-wide energy performance benchmarks are usually unavailable. Consequently, most energy managers do not know if their most efficient plants are actually efficient when compared to the entire industry and whether better performance could be expected of a plant.

EPA developed ENERGY STAR Plant Energy Performance Indicators (EPIs) with the goal to overcoming this barrier to better energy management by enabling comparison of energy performance between similar facilities within a manufacturing sector.

The first challenge in creating energy performance benchmarks is having a good dataset. EPA overcame this issue by securing a way to access industrial energy and production data collected by the US Census Bureau through the Annual Survey of Manufacturers and the Manufacturers Energy Consumption Survey (MECS) which cover all plants in the United States.<sup>12</sup>

To ensure fair comparisons between plants within a sector, the ENERGY STAR approach to benchmarking draws on statistical methods to define the most important drivers for energy use within an industry and to normalize for a meaningful comparison. Working closely with energy managers from the sectors helps EPA to identify these key drivers and provides industry the opportunity to review the draft EPIs.<sup>13</sup>

EPA began work on the first ENERGY STAR EPI in 2001 with the motor vehicle sector, which selected automobile assembly plants for benchmarking. Benchmarking wet corn mills followed in 2002 and cement plants in 2003. In 2005 EPA finalized and released for industry use the first industrial EPI for auto assembly plants.<sup>14</sup>

ENERGY STAR EPIs rate plant energy performance on a scale of 1 to 100. A score of a 50 is considered average performance, while a score of 75 is the benchmark for an ENERGY STAR plant. Determining a plant's energy performance enables companies to set strong goals for improvement and gauge change. EPIs also provide the basis for industrial plants to earn EPA's ENERGY STAR certification which requires that plant must score a 75 or higher (within the top quartile) and meet the technical requirements of the EPI.

EPA has since published eleven additional EPIs and has more in development (See Appendix for list of EPIs). Additionally, EPA worked with Solomons Associates, a private company with a long standing benchmarking system for petroleum refineries, to recognize the results of the Solomon-EII® system in determining top quartile of energy performance for US refineries.<sup>15</sup>

Today ENERGY STAR EPIs play an important role in many companies' energy management programs. They provide an objective metric for driving and rewarding plant energy performance.



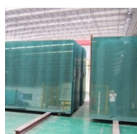
Pharmaceutical  
manufacturing  
Industrial Sector  
Focus begins.



EPA publishes *Teaming Up to Save Energy* guidebook to share best practices on forming energy teams.

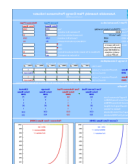
2004

Glass making  
Industrial Sector  
Focus launches.



2005

First Plant Energy  
Performance Indicator  
(EPIs) is released for  
Automobile assembly  
plants.







# REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

## INDUSTRIAL ENERGY GUIDES

A key objective of each ENERGY STAR Industrial Focus is to transfer best practices between companies and encourage investment in energy-efficient technologies within a sector. At the same time a barrier to improved energy efficiency is the lack of information on how to improve. EPA determined it would be helpful to develop sector-specific “energy guides” that would document proven energy efficiency measures and strategies that can be cost-effectively adopted by a focus industry.

To ensure the guides would be relevant to an industry, EPA designed a development process that involves a sector’s energy managers while employing a technical group with an international perspective on industrial energy management to research and draft the guides.

Energy Guides summarize trends in energy use and energy intensity in the industry and discuss available energy efficiency opportunities. The guides focus on commercially available technologies in the United States and abroad.

The first three Energy Guides were released in 2003 and have been followed by fourteen additional guides. Several guides have also been updated to stay current. These guides have been widely used among industry, academia, governments, and other organizations. Today they are among the most downloaded documents from the ENERGY STAR Buildings & Plants web site. The guides have been cited in numerous articles and papers and are widely considered “required reading” for many industrial energy managers.

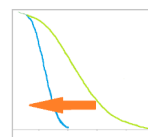
Sector	Release Year
Baking	2012
Brewing	2003
Cement manufacturing	2006, 2013
Corn Refining & Wet Corn Milling	2003
Dairy Processing	2011
Fruit & Vegetable Processing	2008
Glass manufacturing	2008
Iron & Steel manufacturing	2010
Metal Casting	2015
Motor Vehicle manufacturing	2003, 2008
Petroleum Refining	2005
Petrochemical manufacturing	2008
Pharmaceutical manufacturing	2008
Pulp and Paper manufacturing	2009
Ready mix concrete manufacturing	2011
Small & Medium manufacturing enterprises	2010
Textile manufacturing	2010



First industrial plants receive **ENERGY STAR** certification.



**Petrochemical** Industrial Sector Focus begins.



Updating the Automobile Assembly EPI baseline shows sector-wide improvements.

2006

2007

**Food processing** Industrial Sector Focus starts with **frozen potato processors**.



**Pulp and Paper making** Industrial Sector Focus launches.



*Energy Strategy for the Road Ahead* published to provide a vision for advanced strategic energy management.





# REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

## GUIDELINES FOR ENERGY MANAGEMENT

Through the Green Lights program, EPA observed that organizations with structured energy programs supported by senior management were more likely to implement lighting and other efficiency upgrades than other companies. Additionally, these organizations had a greater likelihood of finding energy savings tied to better operating and maintenance practices, and saved more energy.

EPA also observed that most organizations did not have formal energy programs and “energy management” was largely viewed as implementing energy projects. Consequently, many organizations were missing large opportunities to improve their energy performance and maintain that improvement.<sup>16</sup>

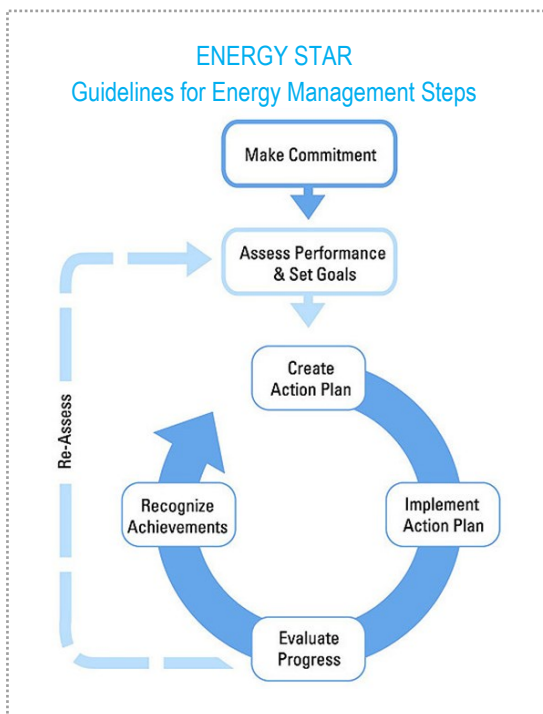
EPA took the first steps toward addressing this issue by focusing on whole-facility improvement and by providing benchmarking tools to support developing energy management programs. These steps gave EPA a clearer understanding of the best practices and successful energy management strategies that organizations with leading energy programs were employing.

By observing specific programmatic traits and practices, EPA developed the ENERGY STAR Guidelines for Energy Management (Guidelines) as a road map for developing and operating a basic energy management program.

The Guidelines were published on the ENERGY STAR web site in 2003 and have become the foundation of the thousands of

commercial and industrial programs.<sup>17</sup> Recently they informed the design of the International Standard Organization’s Energy Management Standard (ISO 50001) and the concept of “strategic energy management” now being explored by some utility programs.<sup>18</sup>

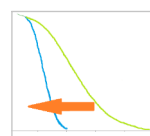
EPA has built on the foundation of the Guidelines, by developing numerous tools and resources that support action under each step of the Guidelines. Many of these tools have drawn from the best practices of ENERGY STAR industrial partners.



**Steel making**  
Industrial Sector  
Focus launches.



**Metal casting**  
Industrial Sector  
Focus starts.



Updating the Wet Corn  
Milling EPI baseline reveals  
sector efficiency gains.

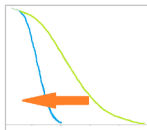
2008

2009

Food Processing Sector  
Focus adds **Cookie &  
Cracker Baking** and **Juice**  
production.



Updating the Cement  
Making EPI baseline  
shows improvement in  
sector efficiency.



**Printing** Industrial  
Sector Focus  
begins.





## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

### RECOGNITION OF PERFORMANCE

Recognizing and celebrating success in energy efficiency is important for raising awareness of the value of energy management. It is also an effective energy management tool that creates motivation for good performance and validates effective programs. In the Industrial sector, ENERGY STAR recognition began with the Partner of the Year award and has expanded as the program has grown.

#### Partner of the Year Award

To distinguish world-class corporate energy management programs, EPA created the ENERGY STAR Partner of the Year Award for Excellence in Energy Management. Awarded annually, it is the highest level of recognition awarded by EPA's ENERGY STAR program. Partners must demonstrate they have:



- ✓ A well-established corporate energy management program aligned with the Guidelines for Energy Management;
- ✓ Organization-wide energy savings;
- ✓ Active participation in ENERGY STAR and communication of its benefits.

The award is pursued by industrial companies as it denotes the energy program as one of the best in the U.S. For companies that achieve the award, EPA challenges them to do more the next year. Those that continue to demonstrate growth and partnership are awarded the Sustained Excellence designation.

#### Plant Certification

ENERGY STAR Plant Energy Performance Indicators (EPI) provide an objective rating of a manufacturing facility's energy performance and are the basis for EPA to award ENERGY STAR certification. To be eligible for certification, the facility must verify a score of 75 or higher using its sector's EPI and be in good standing with federal Clean Air Act regulations.



ENERGY STAR plant certification is awarded annually and distinguishes a plant as being among the most efficient in the U.S. EPA awarded the first industrial plant certifications in 2006. The extension of ENERGY STAR certification to industrial facilities was a major milestone for both the program and the field of energy management.

#### Challenge for Industry Achiever

EPA issued the ENERGY STAR Challenge for Industry (the Challenge) in 2010 to inspire industrial plants and sectors without an EPI to set goals and improve their performance by 10% or more. Recognition is offered to plants that achieve this goal within five years or less from a baseline registered with EPA. Since its launch, the Challenge for Industry has seen participation grow quickly with many companies and industry associations challenging their plants to take action.



EPA challenges industry to reduce energy intensity by 10% or more.



Dairy Processing Industrial Sector Focus launches.



Baking Industrial Sector Focus begins.

2010

2011

2012

Ready-mix concrete Industrial Sector Focus launches.



Motor Vehicle Industrial Sector Focus expands to cover engine and transmission plants.







## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

### RESULTS

The goal of EPA's ENERGY STAR industrial partnership is to reduce GHG emissions by offering manufacturers tools and resources that improve energy efficiency. In the years since 2000, EPA through ENERGY STAR has partnered with over 750 industrial companies that operate thousands of plants across the U.S., launched over 20 industrial focuses, and developed a vast suite of energy management resources. These efforts have yielded significant benefits for both the environment and the companies participating in the program's initiatives.

EPA has been able to gauge the success of the program by measuring impacts. In 2013, EPA estimates its work with the industrial sector through ENERGY STAR resulted in electrical savings of more than 33,000 GWh and fuel savings of 274 trillion British thermal units (BTU).<sup>19</sup>

#### Plant Certification

Industrial plants earning ENERGY STAR certification are the most efficient in their sector and save more energy than average performing plants. Eligibility for certification is determined using an ENERGY STAR Plant Energy Performance Indicator (EPI) that is plant professionally verified. As of 2015, certification is available for 12 plant types. The first plants were certified in 2006 and results through July 2015 are presented in the following table. In 2014, 70 certified plants saved 91 trillion BTUs in energy, equivalent to over 8.2 billion metric tons of GHG emissions, and saved over \$700 million.

#### ENERGY STAR Plant Certification (As of July 2015)

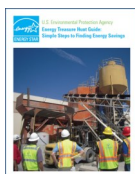
Number of plant-types eligible for certification	12
Total number of plants earning certification	141
Total number of certifications awarded	460
Annual energy saved (Trillion BTU source)	544
Households powered by energy savings	3,023,000
GHG Savings (Million Metric Tons CO <sub>2</sub> e)	36

#### Challenge for Industry

Plants that achieve the ENERGY STAR Challenge for Industry reduce their energy intensity by 10% or more within five years or less. Savings are professionally verified. The Challenge was launched in 2010 and a median reduction of 20% within two years has been observed nearly five years later. Results as of July 2015 are presented in the following table.

#### ENERGY STAR Challenge for Industry (As of July 2015)

Total number of plants taking the Challenge	1107
Total plants achieving the Challenge	341
Annual energy saved (Trillion BTU source)	60
Number of homes powered by energy savings	338,000
Average energy intensity reduction	20%
GHG Savings (Million Metric Tons CO <sub>2</sub> e)	12



EPA publishes the *Energy Treasure Hunt* guide to help companies find savings by engaging employees.



Ammonia / Nitrogenous Fertilizer Industrial Sector Focus launches.

2013

2014

2015

Aluminum Casting Industrial Sector Focus starts.



EPA publishes first *Industrial Insights* to share unique information on ENERGY STAR Industrial Focus sectors.





## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

### Continuous Improvement

Developing a plant Energy Performance Indicator (EPI) requires calculating a sector-wide energy performance baseline for a specific period in time. When an EPI is updated, a new baseline is calculated, providing EPA with the opportunity to observe how the distribution of energy performance has changed over time. Ideally, a sector's baseline will go down, thereby encouraging even better performance from the industry as individual leaders innovate and excel.

As of July 2015, EPA had updated baselines for three EPIs: automobile assembly, cement manufacturing, and wet corn milling. The shifts in the baselines of each industry reveal that all of these sectors have their improved energy performance from their original baseline. Discussions with industry energy managers participating in the ENERGY STAR Industrial Focuses also allows EPA to gain insights into what is contributing to a sector's improved energy performance.

### Automobile Assembly Plants

Within the motor vehicle sector, EPA observed that automobile assembly plants reduced fossil fuel use by 12 percent between 2000 and 2005. Further, the gap between top performing plants and others closed while the performance of the industry as a whole improved. The sector's improvement in energy efficiency helps to avoid 700,000 metric tons of carbon emissions annually.<sup>20</sup>

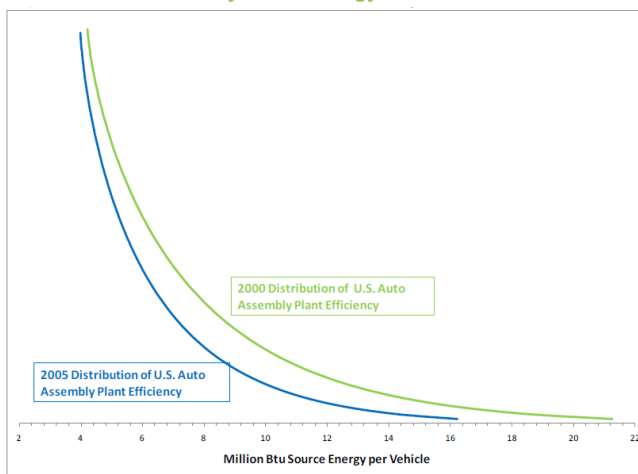
### Cement Plants

The cement industry reduced its energy intensity by 13 percent between 1997 and 2008. The energy performance of the industry's least efficient plants improved by the largest amount. Total annual energy savings are 60.5 trillion Btu (source), avoiding 1.5 million metric tons of energy-related carbon emissions.<sup>21</sup>

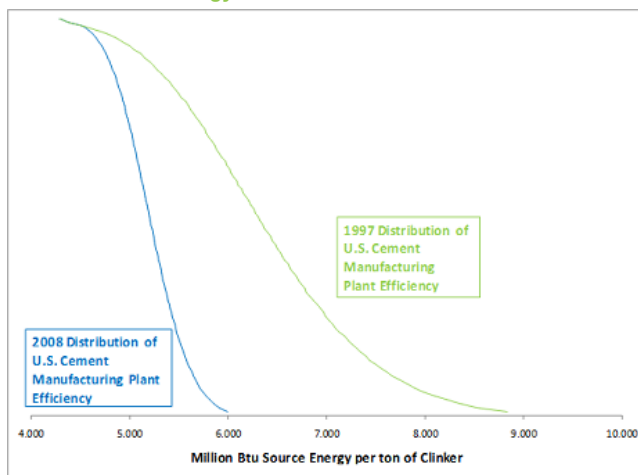
### Wet Corn Mills

Wet corn mills reduced annual energy use by 6.7 trillion Btu (source) between 1997 and 2009. A 4.3% reduction in overall energy use was achieved by the industry resulting in an annual reduction of 47 million metric tons of energy-related carbon emissions from improved energy efficiency.<sup>22</sup>

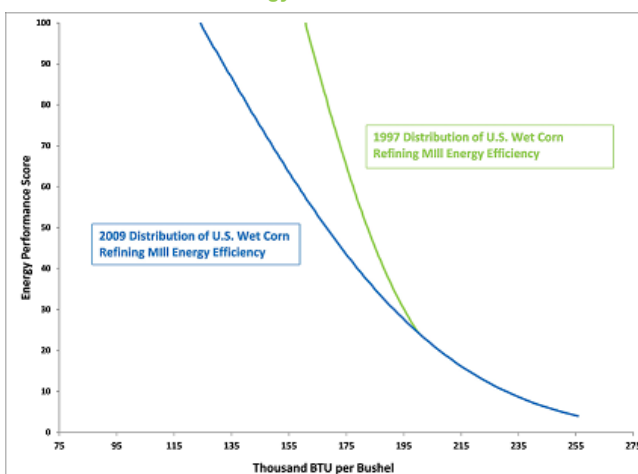
### Automobile Assembly Plant Energy Performance



### Cement Plant Energy Performance



### Wet Corn Mill Plant Energy Performance



Source: Duke University



## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

### FUTURE DIRECTIONS

Fifteen years since the expansion of ENERGY STAR to the industrial sector and nearly 25 years since the inception of Green Lights, the ENERGY STAR principles for achieving energy efficiency and greenhouse gas emissions reductions remain unchanged. ENERGY STAR is still rooted in the power of collaborative partnerships, the importance of high-level organizational commitment, the value of a good plan, a consistent and objective way to measure real-world consumption and savings on a continuous basis, and recognition awarded for achievement. These core values will continue to be of great importance as even greater emphasis is placed on reducing GHG emissions tied to energy use.

As the 2000—2015 time period concludes, EPA, through ENERGY STAR, is poised to lead the industrial sector to greater energy achievements. The ENERGY STAR industrial partnership will continue to grow as new sectors are added to the Industrial Focuses. EPA anticipates that many of these sectors will be suppliers to existing focus industries which will continue the strong network of industries linked by market segments. New tools designed to encourage greater improvements in energy efficiency in the workplace will be developed and new collaborations with other entities promoting industrial energy efficiency will be explored. Organizations will continue to use ENERGY STAR as a platform for their energy efficiency efforts and as a result will be better positioned to address future climate risks, policies, reporting requirements and regulations. EPA looks forward to the next decade of collaboration with the industrial sector on energy performance as we work to help make industry become more sustainable.





REDUCING GREENHOUSE GAS EMISSIONS BY  
ADVANCING INDUSTRIAL ENERGY EFFICIENCY  
2000—2015

Industrial Sector Focus	Launch Year	Energy Performance Indicator
<b>Ammonia / Nitrogenous Fertilizer</b>	2015	In progress
<b>Cement Manufacturing</b>	2002	2 <sup>nd</sup> Version Released
<b>Concrete Manufacturing</b>	2010	Draft
<b>Corn Refining</b> (Wet Corn Mills)	2002	2 <sup>nd</sup> Version Released
<b>Dairy</b> Fluid Dairies Ice Cream Cheese	2010	Draft Draft
<b>Food Processing</b> Frozen Fried Potato Products Cookies & Crackers Juice Tomato Products Bread & Rolls	2006 2008 2008 2008 2012	Released Released Released Draft Draft
<b>Glass Manufacturing</b> Flat glass Container glass Fiberglass	2004	Released Released Draft
<b>Iron &amp; Steel Mills</b> Integrated Mills Mini Mills	2008	Draft
<b>Metal Casting</b> Iron Investment Steel Casting Carbon/Alloy Casting Aluminum	2009 2009 2009 2014	Draft Draft Draft In progress
<b>Motor Vehicle Manufacturing</b> Assembly Plants Engine Plants Transmission Plants	2001 2011 2011	2 <sup>nd</sup> Version Released Draft Draft
<b>Petrochemical Manufacturing</b>	2007	Draft
<b>Petroleum Refining</b>	2003	Private system recognized by EPA
<b>Pharmaceuticals</b>	2004	Released
<b>Printing</b>	2009	Draft
<b>Pulp &amp; Paper</b> Integrated Mills Pulp Mills	2006	Released Released



## INDUSTRIAL ENERGY MANAGEMENT TOOLS & RESOURCES

### Energy Management Program Development

**Guidelines for Energy Management** – Guidance for developing a company energy management system.

**Energy Program Assessment Matrix** – Tool to evaluate a company's energy program.

**Facility Energy Management Assessment Matrix** – Tool to evaluate a site's energy management practices.

**Energy Management Assessment Matrix for Small Companies** – Simplified version of the matrices.

**Teaming Up To Save Energy** – Guidance on how to build an energy team.

**Benchmarking To Save Energy** – Guidance on how to benchmark a site's energy performance.

**Energy Strategy for the Road Ahead** – Guidance on developing an advance energy strategy and related strategic energy management program.

**Energy Treasure Hunt Guide** – Guidance for finding low and no cost savings opportunities.

### Technical Resources & Tools

**Energy Guides** – Technical guides for finding energy savings in specific sectors' plants.

**Small and Medium Sized Manufacturers' Guide** – Energy management guidance for small to mid-sized manufacturers.

**Plant Energy Performance Indicators** – Sector-specific plant energy performance benchmarking tools.

**Energy Tracking Tool** – Energy tracking & goal setting tool for manufacturing sites and companies.

**Industrial Service & Product Providers** – Case studies of successful energy projects through the assistance of industrial service and product providers.

**Partner Profiles** – Case studies on successful energy management strategies and projects.

**Quick Converter** – Tool for converting most common fuels and units to source mmBTUs.

**Industrial Insights** – Summary information and data on selected industrial sectors' energy use, performance, and greenhouse gas emissions.

### Networking & Training

**Annual Partner & Focus Meeting** – Yearly meeting for energy managers from partner companies and industrial focuses.

**Partner Web Conference Series** – Information sharing by leading companies on energy management.

**Brown bags** – Quarterly partner web conferences with presentations on hot topics in energy management.

**On-line trainings** – Training on selected ENERGY STAR tools & resources offered through remote learning platforms

### Communication Resources

**Bring Your Green to Work** – Resources for promoting energy efficiency to employees.

**Plant Poster Series** – Customizable posters to raise awareness on energy management.

**Communication Tool Kit** – Ready-to-use resources for promoting energy efficiency.

### Recognition

**ENERGY STAR Partner of the Year** – Annual award for outstanding energy achievements and commitment to energy management.

**ENERGY STAR Plant Certification** – Awarded to qualifying plants for superior energy performance nationally.

**ENERGY STAR Challenge for Industry** – Recognizes sites that achieve a 10% reduction in energy intensity within 5 years. The Challenge for Industry is open to any manufacturing plant



## REDUCING GREENHOUSE GAS EMISSIONS BY ADVANCING INDUSTRIAL ENERGY EFFICIENCY 2000—2015

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