



CLIMATE PROTECTION PARTNERSHIPS DIVISION

The Power of Partnerships

ENERGY STAR® and Other Voluntary Programs



2000 ANNUAL REPORT

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For additional information, please visit our Web sites at www.epa.gov/cppd and www.energystar.gov or call the toll-free ENERGY STAR Hotline at 1-888-STAR-YES (1-888-782-7937).

July 2001

Congratulations to everyone who has chosen to participate in EPA's voluntary climate protection programs. The extraordinary successes detailed on the following pages are a direct result of widespread cooperation on the part of citizens, businesses, organizations, and governments across the country.

Since taking office, President Bush and I have emphasized the need to build partnerships across traditional boundaries and encourage cooperation in our efforts to protect the environment. The results have shown that environmental achievement and economic prosperity can go hand in hand. As EPA Administrator, I am pleased to have so many dedicated partners in pursuit of this goal.

Our efforts to help control global climate change have been extremely successful. The most recent data show that, despite unprecedented economic expansion, growth of U.S. greenhouse gas emissions has started to decline. We have accomplished this together through initiatives to increase energy efficiency, develop clean energy solutions, capture and use methane gas, and cultivate a sense of environmental stewardship. In the year 2000 alone, public-private partnerships helped reduce energy consumption by 74 billion kilowatt hours. This reduction produced net savings for consumers and businesses of more than \$5 billion in energy costs and prevented 35 million metric tons of harmful carbon emissions. That is equivalent to eliminating the emissions from almost 25 million cars.

As individuals and businesses seek to improve the efficiency of their homes and offices, EPA will do everything we can to ensure that they have the information necessary to choose the cleanest and most efficient options available. The ENERGY STAR® label makes it easy for consumers and businesses to maximize their efficiency, save money, and help protect the environment. Cooperation from a wide variety of partners has helped make ENERGY STAR the leading symbol of energy efficiency around the world—and a model for partnership programs in the future.

We all have a responsibility to be good stewards of our environment. We have an obligation to leave our air cleaner, water purer, and land better protected for future generations. Together, we have the opportunity to make every day Earth Day, not only in our own homes, but in our communities across the country, and around the world. I look forward to continuing to work in partnership with you to leave a legacy of environmental progress and economic prosperity unmatched in any previous time.



Christine Todd Whitman

Administrator

U.S. Environmental Protection Agency

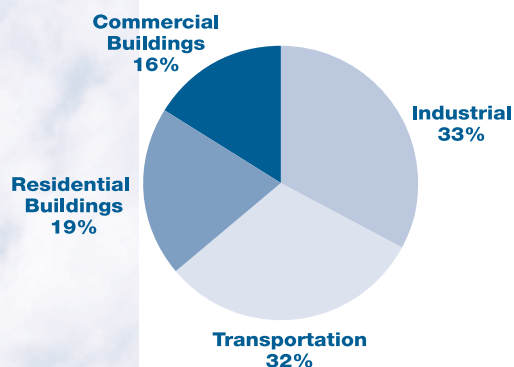
The Power of Partnerships

Awareness is growing throughout the United States that global warming is a serious problem and that serious action is required to limit emissions of greenhouse gases. Energy-related activities account for the vast majority of greenhouse gas emissions, with carbon dioxide (CO₂) from fossil fuel combustion contributing approximately 80 percent of total U.S. emissions. These emissions result from generating the energy used in our homes (19%), in commercial buildings (16%), in industry (33%), and for

transportation (32%) (see Figure 1). Other activities cause emissions of additional greenhouse gases, such as methane and perfluorocarbons (PFCs). While emitted in smaller quantities, these gases are important to address due to their greater impact per molecule in trapping heat in the Earth's atmosphere (see Table 1).

Fortunately, a number of opportunities exist for working in partnership with businesses and organizations across the country to enhance investment in attractive, yet underutilized technologies and practices that reduce greenhouse gas emissions. The Environmental Protection Agency (EPA) has developed public-private partnerships that focus on the following opportunities to take action:

FIGURE 1. U.S. CARBON DIOXIDE EMISSIONS BY SOURCE



Source: EPA 2001

Energy Efficiency. Energy efficiency means getting the same services or output (such as heating or cooling) for less energy input. Energy efficiency offers sizable cost savings across the

residential, commercial, and industrial sectors through an array of technologies and practices available today that can reduce the energy bill for many homes and buildings by 20 to 30 percent. The ENERGY STAR program works in partnership with businesses, large and small, and other organizations to capture these savings.

Clean Energy. In addition to using energy more efficiently, there are ways we can make the energy we use cleaner—effectively breaking the link between increased energy use and harmful air emissions. Combined heat and power as well as renewable sources of energy can cost-effectively play larger roles in the U.S. energy mix. EPA is working to facilitate the use of these technologies.

Methane Reductions. While a greenhouse gas, methane is also the major component of natural gas—a much sought after clean fuel. When methane emissions are reduced in a cost-effective manner, the recovered methane represents valuable fuel that can be used or sold. The natural gas, coal, and landfill gas development industries are working with EPA through partnership and outreach programs to capture and use methane wherever cost effective.

High GWP Environmental Stewardship. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) are potent greenhouse gases, and some persist in the environment for thousands of years. Given these long atmospheric lifetimes, various U.S. industries are working aggressively with EPA to avoid significant accumulation of these chemicals in the atmosphere. These voluntary programs accelerate the development and implementation of low-emitting technologies and help companies use alternative chemicals where technically feasible and cost effective.



“Cooperation from a wide variety of partners has helped make ENERGY STAR the leading symbol of energy efficiency around the world, and a model for partnership programs in the future.”

— Christine Todd Whitman

A Proven Strategy

The actions taken by partners in EPA's public-private partnerships continue to demonstrate the power of voluntary programs to cost-effectively reduce greenhouse gas emissions and prevent air pollution, while also saving businesses, organizations, and consumers billions of dollars on their energy bills.

In 2000, EPA's climate protection partnerships had their most successful year to date—rapidly expanding national participation in the popular ENERGY STAR program, as well as the methane and high GWP voluntary programs. This growth in existing programs combined with new initiatives launched in the energy supply and industry sectors will help ensure that these partnerships deliver ever greater environmental benefits in years ahead. This report presents the environmental and economic benefits from EPA's climate protection partnerships through the end of 2000. Overall achievements are summarized in the next section. Following that are descriptions of each program, covering the rationale for each, the accomplishments of 2000, and goals for the future. The final section outlines EPA's broad goals for 2001 and beyond.

TABLE 1. GLOBAL WARMING POTENTIALS (GWPS) AND ATMOSPHERIC LIFETIMES OF GREENHOUSE GASES

Greenhouse Gas	Global Warming Potential for 100 Years	Atmospheric Lifetime (years)
Carbon Dioxide	1	50-200
Methane	21	12 ± 3
Nitrous Oxide	310	120
Hydrofluorocarbons	140–11,700	1.5-264
Perfluorocarbons	6,500–9,200	3,200-50,000
Sulfur Hexafluoride	23,900	3,200

Source: IPCC 1996

Global Warming: New and Stronger Evidence

Our atmosphere today contains about 660 billion more metric tons of carbon dioxide (CO₂) than it did before industrial times. This CO₂ buildup is well documented and is the unambiguous result of clearing forests and burning fossil fuels that generate electricity, power industry, and drive transportation. In reality, even this large amount of CO₂ still represents a tiny fraction of our atmosphere. However, these trace amounts of CO₂ and other greenhouse gases, including methane and nitrous oxide, help regulate our planet's temperature.

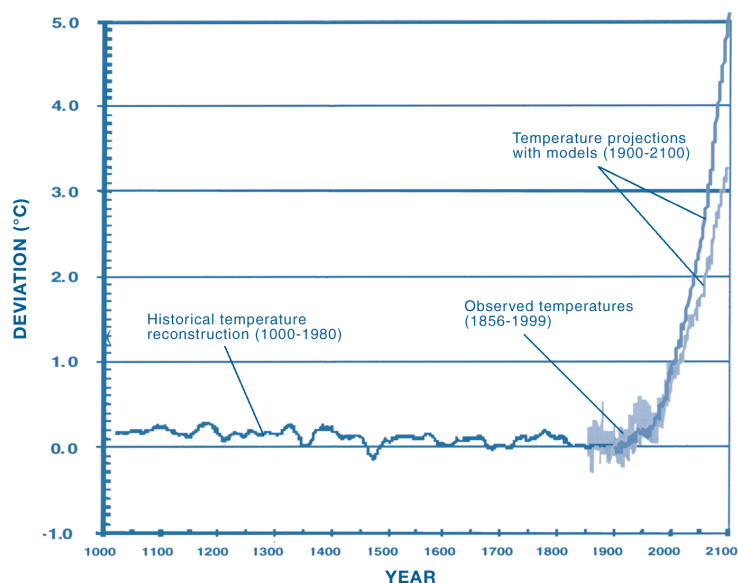
The recent Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) projects that the ongoing accumulation of greenhouse gases will result in a global temperature increase of 2.5-10°F by the end of the century. The range represents uncertainties in emissions growth over the next 100 years and the global temperature response to a given increase in atmospheric greenhouse gases. To place IPCC's estimates in context, even the low-end projection would be an unprecedented temperature change relative to the past 10,000 years (see Figure 2).

Because human activities have already changed the composition of our atmosphere—by releasing CO₂, methane, nitrous oxide, and even more potent synthetic gases such as HFCs, PFCs, and SF₆—one would expect to see signs of global warming today. Average global surface temperatures have in fact increased by 1°F over the past century, and scientists are hard pressed to explain this warming through natural fluctuations alone. The IPCC states “[t]here is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.”

Increasing average temperatures are only part of the global warming story. More extreme hot days, less extreme cold days, more intense rainfall, sea-level rise, and shrinking ice and glaciers are all strongly associated with global warming. Human health, agriculture, water resources, coastal areas, ecosystems, and wildlife are vulnerable to these changes. Exactly how the impacts of global warming will play out over time and over various regions remains uncertain. It is clear that the greater the change, the greater the chance of adverse impacts on human health and the environment. The

greenhouse gases now being added to the atmosphere will remain airborne for decades to centuries, which is why there are calls to reduce emissions now to insure against long-term, and largely irreversible, consequences.

**FIGURE 2. AVERAGE GLOBAL SURFACE TEMPERATURE
PAST VARIATIONS AND PROJECTIONS, 1000-2100**



“There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities.”

— IPCC 2001

Summary of Program Achievements

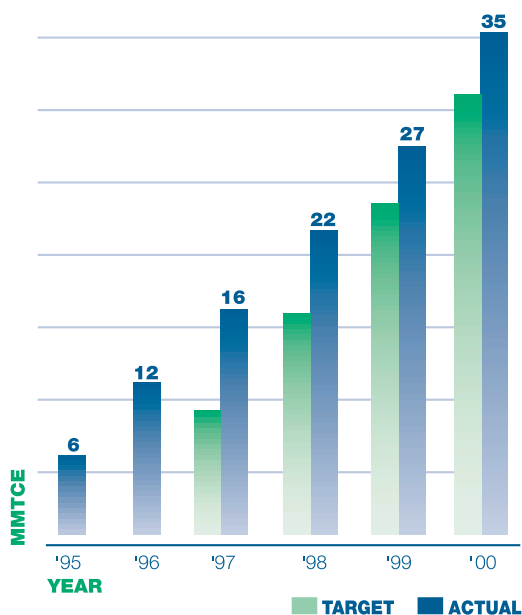
Through 2000

EPA's climate protection partnerships achieved substantial environmental and economic results in 2000, exceeding their goals for reductions in greenhouse gas emissions under the nation's Climate Change Action Plan (CCAP).¹ The major environmental and economic achievements across these programs,² based on actions that partners have taken through the end of 2000, are summarized below.

Environmental Benefits

- In 2000 alone, reductions of greenhouse gas emissions totaled 35 million metric tons of carbon equivalent³ (MMTCE)—the same as eliminating the emissions from almost 25 million cars.
- Emissions of almost 160,000 tons of nitrogen oxides (NO_x) were prevented in 2000—equivalent to the emissions from more than 100 power plants.

FIGURE 3. ACTUAL DIVISION CARBON REDUCTIONS COMPARED TO ANNUAL PERFORMANCE GOALS



Source: EPA Climate Protection Partnerships Division

- Emission reductions averaging about 33 MMTCE per year between now and 2010 were locked in, based on actions already taken by partners.

Economic Benefits

- Locked-in expenditures on energy-efficient technologies exceeding \$11 billion.
- Cumulative net energy bill savings for consumers and businesses of over \$60 billion through 2010—an average net savings of more than \$4.5 billion per year from 2000 through 2010.

¹ Each of EPA's climate protection partnerships has annual performance goals that were set through an interagency process in 1997. Goals for the years 2000, 2005, and 2020 were communicated to the Secretariat of the Framework Convention on Climate Change in the *Climate Action Report* of 1997.

² This report provides results for the climate protection partnership programs operated by the Office of Atmospheric Programs at EPA (not including the State and Local Outreach Program). It does not include emission reductions attributable to WasteWise, transportation programs, the Significant New Alternatives Program, or the landfill rule, which are the remaining EPA actions that constitute EPA's responsibilities within the nation's Climate Change Action Plan (CCAP).

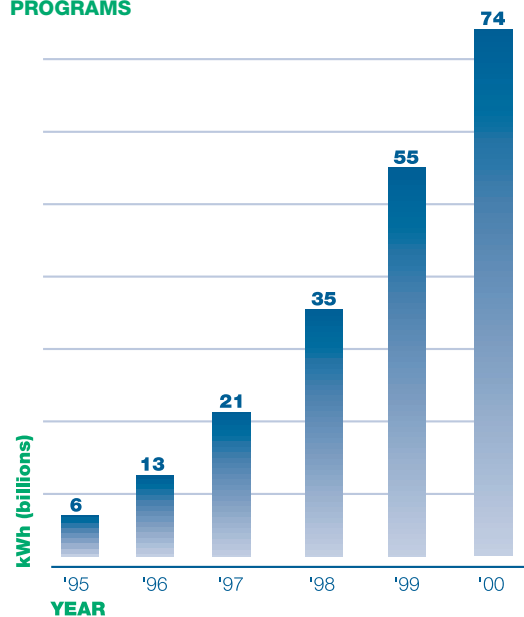
³ Reductions in annual greenhouse gas emissions for all EPA programs, including non-CO₂ gases, are expressed in "carbon equivalents," which are determined by weighting the reductions in emissions of a gas by its global warming potential for a 100-year period.

Program Effectiveness

Every federal dollar spent on these partnership programs through 2000 means:

- Reductions in greenhouse gas emissions of 1.0 metric ton of carbon equivalent (3.7 tons of CO₂).
- Savings for partners and consumers of more than \$75 on their energy bills.
- The creation of more than \$15 in private sector investment.
- The addition of over \$60 into the economy.

FIGURE 4. ANNUAL SAVINGS IN ENERGY USE AS A RESULT OF THE DIVISION'S PARTNERSHIP PROGRAMS



Source: EPA Climate Protection Partnerships Division

Key Accomplishments

- The ENERGY STAR program saved 74 billion kilowatt hours (kWh) in 2000 alone (20 percent greater energy savings than expected under the nation's CCAP⁴) and more than 10,000 megawatts (MW) of peak power.
- The ENERGY STAR label has become a national symbol for energy efficiency and is recognized by more than 40 percent of the American public.
- More than 1,600 manufacturers produced a total of 11,000 individual product models in 33 product categories that were ENERGY STAR compliant.
- Americans bought over 120 million ENERGY STAR products in 2000, contributing to the more than 600 million ENERGY STAR products bought throughout the past decade.
- Organizations representing approximately 17 percent of the U.S. building floor space have partnered with ENERGY STAR as a commitment to improve their energy performance.
- A new national energy performance rating system was used to evaluate the energy efficiency of more than 4,200 buildings, and 330 office buildings and 215 schools earned the ENERGY STAR label.
- More than 1,600 builder partners constructed over 25,000 ENERGY STAR labeled homes, locking in financial savings for homeowners of more than \$7.5 million annually.
- An international agreement was finalized allowing the European Community to implement an energy efficiency labeling program for office equipment modeled after ENERGY STAR.
- Partnership programs achieved reductions of non-carbon dioxide (CO₂) gases—methane, perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF₆)—totaling more than 17 MMTCE in 2000 alone.
- The number of landfill gas-to-energy projects grew from fewer than 100 in the early 1990s to almost 320 projects by the end of 2000.
- The Voluntary Aluminum Industrial Partnership met its aggressive goal for 2000 with emissions reduced about 45 percent relative to 1990 levels, on an emissions per unit of production basis.

⁴ Each partnership program, including ENERGY STAR, was expected to deliver specific reductions in greenhouse gas emissions. ENERGY STAR was expected to reduce energy use by 60 billion kWh and reduce CO₂ emissions by 12.8 MMTCE. The actual 2000 reductions were 74 billion kWh and 15.2 MMTCE.

Estimation of Environmental and Economic Benefits

The environmental and economic benefits from EPA's partnership programs are presented in greater detail below. EPA provides these benefits for three key program areas: ENERGY STAR, Methane Programs, and the Environmental Stewardship Programs for the high GWP gases.

The environmental and economic benefits reflect the stream of greenhouse gas emission reductions and energy bill savings that will persist through 2010 from the technology investments and product purchases made through the year 2000 due to these partnership efforts.

TABLE 2. SUMMARY OF THE CUMULATIVE BENEFITS THROUGH 2010 FROM THE ACTIONS TAKEN BY PARTNERS THROUGH 2000 (IN BILLIONS OF 2000 DOLLARS)

Program	Bill Savings	Technology Expenditures	Net Savings	GHG Reductions (MMTCE)
ENERGY STAR				
Labeled Products	\$39.6	\$1.6	\$38.0	94
Building and Industrial Improvements	\$27.6	\$7.1	\$20.6	65
Methane Programs	\$5.5	\$2.7	\$2.7	139
Environmental Stewardship Programs	—	—	—	148
TOTAL	\$72.7	\$11.4	\$61.3	447

NOTES: Technology Expenditures include O&M expenses for methane programs.
 Bill Savings and Net Savings include revenue from sales of methane and electricity.
 Totals may not equal sum of components due to independent rounding.

— : Not applicable.

The Endnotes of this Annual Report (see inside back cover) provide more detailed documentation of the estimation methodology and the assumptions used in measuring the performance of the partnership programs. A few key methodological concepts and assumptions are summarized below.

Stream of Benefits

In Table 2, the benefits are presented through 2010 for investments and program actions that have been “locked-in” through the end of 2000. The table shows the locked-in benefits from efficiency improvements that current partners have completed (or, in the case of ENERGY STAR labeled products, products that have already been purchased) plus expenditures and benefits that are due to the persistence of the market transforming activities already undertaken by the Division. In Table 2, the effect of this persistence is modeled by keeping energy savings constant between 2000 and 2010. For long-lived equipment, such as lighting fixtures, transformers, and homes, this means no additional purchases after 2000; for shorter lived items such as computers, fax machines, and audio equipment, it means replacement only to the level that would keep total energy savings at 2000 levels. Programs that have a small number of partners, such as Natural Gas STAR and Landfill Methane, are modeled using only current projects or projects for which partners have signed commitments.

Emissions Prevented

Many of the Division's programs focus on energy efficiency. For these programs, EPA estimated the expected reduction in electricity consumption in kilowatt-hours (kWh). Emissions prevented are calculated as the product of kWh of electricity saved and an annual emission factor (e.g., MMTCE prevented per kWh). Other programs focus on directly lowering greenhouse gas emissions (e.g., Natural Gas STAR, Landfill Methane Outreach, and Coalbed Methane Outreach); for these, greenhouse gas emission reductions were estimated on a project-by-project basis.

Energy Bill Savings

Energy bill savings are calculated as the product of the kWh of energy saved and the cost of electricity for the affected market segment (residential, commercial, or industrial taken from EIA's *Annual Energy Outlook 2001* and *Annual Energy Review 2000*) for each year in the analysis (1993-2010). Energy bill savings also include revenue from the sale of methane and/or the sale of electricity made from captured methane.

Expenditures on Energy-Efficient Technologies

For most of its programs, the Division's estimate of expenditures on energy-efficient technologies is based on the partners' capital cost of energy-efficient equipment, including the cost of financing. For ENERGY STAR labeled products, investment was taken as the increase in cost, if any, of purchasing ENERGY STAR products. Expenditures on this equipment include the cost of financing the equipment over the life of the equipment. In all cases equipment purchases are assumed to be financed at a 7-percent real rate of interest by the private sector and a 4-percent real rate of interest by the public sector.

Net Savings

Net savings is the difference between energy bill savings and expenditures on energy-efficient technology. It represents the increase in the amount of money that partners and ENERGY STAR product consumers have available to invest in the economy as a result of participating in the Division's programs.

ENERGY STAR Program



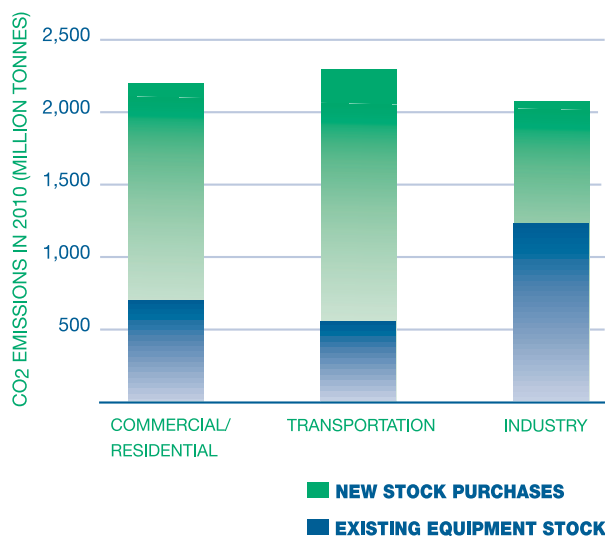
Energy Efficiency is Smart Investment

American families and businesses spend over \$600 billion each year on energy bills—more than one and a half times what is spent on K-12 education. Energy efficiency offers great potential for reducing these energy costs and reducing greenhouse gas emissions, while enhancing economic growth. More than 50 percent of projected energy use (and carbon dioxide emissions) 10 years from now will come from the use of equipment purchased between now and then (see Figure 5). Choosing the energy-efficient solution at these purchase or investment points has the potential to reduce the nation's energy bill by approximately 9 percent from business-as-usual in 2010 (EERE, 2000).

Many homeowners and businesses could use 30-percent less energy, without sacrificing services or comfort, by investing in energy efficiency. And many of these purchases or investments offer financial returns potentially worth more than double the return of other common options, such as money market funds or U.S. Treasury bonds. However, the potential of energy efficiency is not being fully realized in the market due to a variety of reasons.



FIGURE 5. MORE THAN 50% OF PROJECTED ENERGY USE 10 YEARS FROM NOW WILL COME FROM EQUIPMENT PURCHASED BETWEEN NOW AND THEN



Source: EPA Climate Protection Partnerships Division

With relatively low energy prices in the United States, many organizations have focused much less on energy efficiency improvements and more on improvements in labor productivity or capital productivity. And while many businesses and homeowners express interest in making energy efficiency investments for their own buildings and homes, they do not know which products or services to ask for, who supplies these products in their areas, and whether the real energy savings will live up to the claims.

The ENERGY STAR program enables businesses, organizations, and consumers to realize the cost savings and environmental benefits of energy efficiency investments through a straightforward market-based approach:

- Use the ENERGY STAR label to clearly identify which products, practices, new homes, and buildings are energy efficient—offering lower energy bills and environmental benefits.
- Empower decisionmakers by making them aware of the benefits of labeled products, homes, and buildings and providing energy performance assessment tools and project guidelines for efficiency improvements.
- Work with retail and service companies in the delivery chain so that they can easily offer efficient products and services.
- Partner with regional, state, and local organizations that are running energy efficiency programs so that these programs leverage the national energy efficiency specifications and public awareness of ENERGY STAR and achieve more with their resources.

Introduced by EPA in 1992 for energy-efficient computers, the ENERGY STAR label has been expanded to more than 30 product categories. Since the mid-1990s, EPA has collaborated with the U.S. Department of Energy (DOE), which now has responsibility for certain product categories. Efficient new homes and efficient commercial buildings became eligible for the label in 1995 and 1999 respectively. The potential benefits from full use of the ENERGY STAR platform over the next 10 years are tremendous:

- If everyone in the country bought only ENERGY STAR products during the next decade, the nation would slash its cumulative energy bill by more than \$100 billion and reduce greenhouse gas emissions by more than 300 MMTCE.
- If all commercial and industrial building owners implemented the ENERGY STAR strategy during the next decade, they would shrink their cumulative energy bill by \$130 billion and reduce greenhouse gas emissions by more than 350 MMTCE.

Contribution of Energy Efficiency to Electric System Reliability

The recent power outages in California, along with last summer's outages in New York City, Chicago, and New Orleans, have heightened awareness of the relationship between electric system reliability and energy efficiency. The North American Electric Reliability Council defines the reliability of electric systems in terms of two basic, functional aspects: (1) Adequacy—the ability of the electric system to supply the aggregate electrical demand and energy requirements of the customers at all times; and (2) Security—the ability of the system to withstand sudden disturbances.

By reducing demand, energy efficiency is a low-cost (2-3 cents/kWh) contributor to system adequacy because it reduces the base load as well as the peak power demand. This reduction in peak power demand can also contribute to system security by reducing the load and stress at various points in the power distribution system, thereby decreasing the likelihood of failures. One additional benefit of demand reductions is their ability to moderate electricity price spikes, reducing not only private costs for individual consumers, but also the market clearing price for delivered energy, thereby providing monetary benefits to all (Raynolds and Cowart, 2000).

A new report by the American Council for an Energy Efficient Economy, *Using Targeted Energy Efficiency Programs to Reduce Peak Electrical Demand and Address Electric System Reliability Problems*, includes recommendations for six programs whose savings would total more than 60,000 MW by 2010 if deployed nationwide—or about 40 percent of the overall increase in demand projected by the North American Electric Reliability Council. The proposed efficiency programs could also reduce peak demand for participating customers by 5-15 percent without reducing comfort or service.

The economic and environmental benefits of ENERGY STAR through the year 2000 are already substantial. More than 600 million ENERGY STAR labeled products have been purchased and billions of square feet of building space improved. The results across the ENERGY STAR program in terms of energy saved and greenhouse gases avoided in 2000 are provided in Table 3. Additional program achievements within the residential, commercial, and industrial sectors are presented in the sections beginning on page 12.

TABLE 3. ENERGY STAR PROGRAM: ANNUAL GOALS AND ACHIEVEMENTS

	2000				2001	
	Energy Saved (Billion kWh)		Emissions Prevented (MMTCE)		Energy Saved (Billion kWh)	Emissions Prevented (MMTCE)
	Goal	Achieved	Goal	Achieved	Goal	Goal
Commercial/Residential Buildings	60.3	74.0	12.8	15.2	75.3	15.1
Labeled Products¹	34.9	42.4 ²	7.3	8.8	41.0	8.2
Computers	—	3.0	—	0.6	—	—
Monitors	—	21.5	—	4.4	—	—
Printers	—	6.0	—	1.2	—	—
Copiers	—	1.1	—	0.2	—	—
Other Office Equipment	—	3.4	—	0.7	—	—
Exit Signs	—	1.8	—	0.4	—	—
Residential Lighting Fixtures	—	2.1	—	0.4	—	—
Home Electronics	—	2.0	—	0.4	—	—
Other Products	—	1.5	—	0.9	—	—
Building Improvements³	25.4	31.6	5.5	6.4	34.2	6.9
Industrial Improvements⁴	—	—	1.8	3.0	—	2.0

¹ Results for office equipment from Webber et al., 2001.

² The kWh savings imply peak demand savings of 4.5 gigawatts (GW) for labeled products and 6.8 GW for building improvements, based on conservation load factors developed by LBNL (Koomsey et al., 1990).

³ Results for building improvements from Horowitz, available October, 2001.

⁴ Results for industrial improvements from Dutrow, 2001.

— : Not applicable.

The ENERGY STAR label is being adopted in countries around the world. The year 2000 saw the signing of an international agreement allowing the European Community to implement an energy efficiency labeling program for office equipment modeled after ENERGY STAR, and in 2001 EPA expects to enter into an agreement with Natural Resources Canada allowing it to implement an energy efficiency labeling program modeled after ENERGY STAR for commercial and residential products.



ENERGY STAR IN THE RESIDENTIAL SECTOR

ENERGY STAR continues to deliver and develop new energy efficiency solutions for homeowners across the country. ENERGY STAR grew through the year 2000 by:

Building and expanding partnerships with manufacturers to add new products that can earn the ENERGY STAR label. EPA added new products such as set-top (cable) boxes and dehumidifiers to the ENERGY STAR family in 2000, bringing the total to 33 product categories, of which 25 are routinely used in the home. ENERGY STAR partners with more than 1,600 manufacturers, and the label appears on more than 11,000 product models. ENERGY STAR includes products that represent over 60 percent of energy use in the average household, so families can reduce their energy bills by up to \$400 per year by purchasing currently available products that also improve home comfort.

Building consumer awareness of the ENERGY STAR label as the national, government-backed symbol for energy efficiency. Recent surveys show that more than 40 percent of consumers nationwide recognize the ENERGY STAR label.

SET-TOP BOX



Expanding the use of the ENERGY STAR label on efficient new homes. ENERGY STAR labeled homes provide comfort, value, and savings to homeowners and increased profits for homebuilders, while protecting the environment. In 1995, the ENERGY STAR label became available for new homes that are 30 percent more energy efficient than homes built to the national model energy code. Since then, more than 1,600 builders have joined the partnership program.

They have built more than 25,000 ENERGY STAR labeled homes, at a pace that has doubled each year, and homeowners are now saving \$7.5 million annually on their utility bills. Much of this success results from promotional campaigns with key allies in three of the leading new homes markets—Phoenix/Tucson, Las Vegas, and Indianapolis—which have netted additional builders, increased awareness of ENERGY STAR, and brought ENERGY STAR to 10 percent of new housing starts in one of these markets.

2000 ENERGY STAR Award Winner: Southwest Gas Corporation

ENERGY STAR utility partner Southwest Gas Corporation (SWG) is one of the fastest growing natural gas distribution companies in the country, providing service to more than 1.3 million customers in Arizona, California, and Nevada. Southwest Gas has leveraged its high visibility and credibility to form powerful alliances with home energy rating providers and builders and to help educate prospective home buyers about the benefits of ENERGY STAR labeled homes. SWG's partnership with ENERGY STAR is having a significant impact in SWG's service territory. For example, it is estimated that over 17,000 new homes are committed to ENERGY STAR in the Phoenix area alone. The local alliances that Southwest Gas has created in Phoenix and Las Vegas have become the model for other cities to follow for delivering the benefits of ENERGY STAR labeled homes.

Developing home improvement opportunities beyond labeled products. EPA continued to explore the potential for developing energy performance specifications for parts of the home such as duct systems. The loss of warmed or cooled air through leaky ducts accounts for up to 20 percent of the home energy bill. These losses can be turned into savings when ducts are sealed to prescribed levels. EPA has partnered with several utilities to refine the duct sealing performance specification and to lay the groundwork for new consumer-oriented materials (see page 15).

Providing new consumer friendly home improvement tools. EPA launched the ENERGY STAR home improvement program, featuring an online “toolbox” to help homeowners improve the energy performance of their homes during repair, remodeling, or renovation. This toolbox includes a benchmarking tool that helps homeowners assess their home’s energy performance compared to other homes, and a Web-based audit that recommends the top five energy efficiency improvements that can be made to their home.



Working with retailers and regional, state, and local organizations to assist them in effectively highlighting and promoting ENERGY STAR labeled products in retail stores and through key state-level energy efficiency programs. EPA worked with more than 100 utilities and state energy efficiency providers that serve approximately 50 percent of the households in the United States in promoting energy efficiency with the ENERGY STAR label. More than 60 of them promoted ENERGY STAR labeled homes as part of their residential construction programs. EPA also partners with over 550 retailers in promoting ENERGY STAR labeled products in 7,000 storefronts across the country.

Regional Partners: NYSERDA's Accomplishments

The New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation created in 1975 by the New York State Legislature, joined with EPA and DOE as an ENERGY STAR partner in November 1998. NYSEDA is using the ENERGY STAR logo, name, and energy efficiency messages to promote the environmental and economic benefits of energy efficiency investments. NYSEDA's strategy, across all ENERGY STAR programs, is to create real consumer demand through public awareness and marketing, while building a sustainable mid-stream infrastructure to deliver ENERGY STAR products and services.

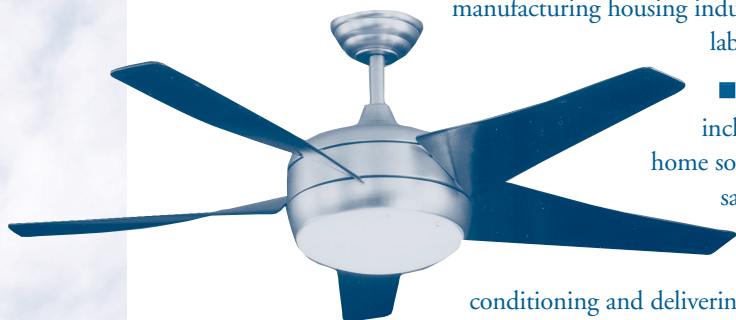
Through the New York Energy \$martSM program, NYSEDA partners with retailers, manufacturers, and remodelers/contractors to promote ENERGY STAR as a vehicle to deliver energy efficiency. This collaboration includes 592 retail partners, 52 remodeler partners, and 10 manufacturers. Governor George Pataki has taken a lead role in promoting ENERGY STAR as the best way for consumers to recognize energy-efficient products.

These efforts have been remarkably successful. Under NYSEDA's Appliance and Lighting program, New York has documented more than 350,000 ENERGY STAR product purchases attributable to their mid-stream support, marketing, and public awareness efforts.

NYSERDA estimates its efforts under the New York Energy \$martSM program have saved approximately 5.2 megawatt hours in the residential sector from program inception in 1998 to March 2001. These efforts serve as an outstanding model for other regional, state, and local organizations.

In 2001, EPA will:

- Add new products to the ENERGY STAR family. Candidate products include ventilation fans, ceiling fans, and telephony. EPA will also update the performance specifications for products in cases where technology has advanced and updates are necessary to maintain the integrity of the ENERGY STAR label.
- Continue to build consumer awareness of the ENERGY STAR label through a new public awareness campaign, with the goal of raising awareness of the label to more than 45 percent.
- Work with home builders and allies to build 25,000 ENERGY STAR labeled homes in 2001, by (1) expanding promotional campaigns to Dallas and Houston, while building on the momentum in Phoenix, Las Vegas, and Indianapolis; (2) expanding ENERGY STAR in the modular and manufacturing housing industry; and (3) increasing the use of the ENERGY STAR label by the large national builders.
- Expand the set of home improvement tools to include guidelines for improving the major systems of a home so that the homeowner can see the greatest energy cost savings. Systems will include the home envelope (steps to take to keep warmed or cooled air in the home) and the heating and cooling system (efficiently conditioning and delivering cooled or heated air to where it is wanted). EPA will work with regional partners to explore and refine these guidelines.
- Work with retail partners, utilities, and states in broad promotions of ENERGY STAR labeled products and homes, with special emphasis on ENERGY STAR labeled lighting and residential heating and cooling equipment.



“Sears is very proud to be part of the ENERGY STAR program. We are by far the largest retailer of home appliances in the nation, and we are committed to increasing consumer awareness about the benefits of using ENERGY STAR products.”

— Tina Settecase, Vice President, Sears, Roebuck & Co., Hoffman Estates, IL

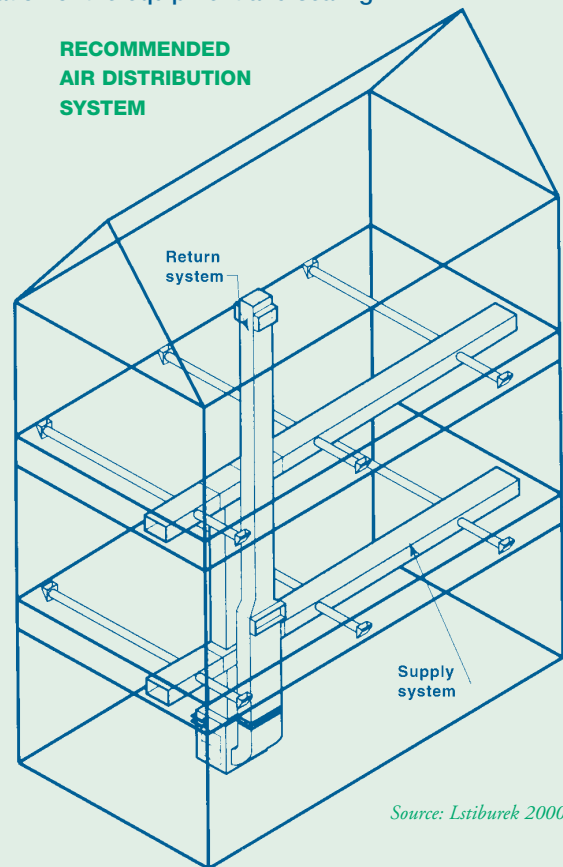
2000 ENERGY STAR Award Winner: Sears, Roebuck & Co.

Sears, Roebuck & Co. effectively promotes a wide range of ENERGY STAR labeled products from appliances, office equipment, and home electronics to HVAC equipment and window products. Last year, Sears pledged to sell more than one million ENERGY STAR qualified appliances. The company exceeded this goal by promoting ENERGY STAR in over 1,500 stores nationally. Sears' success is the result of a strong commitment to working with ENERGY STAR utility and market transformation groups across the country, offering comprehensive sales training programs for its sales staff, and directing its vendors to supply ENERGY STAR qualified products. Sears has also demonstrated an ongoing commitment to educate its consumers by airing the ENERGY STAR public service announcement on in-store displays, reaching more than 26 million viewers in the last half of 2000, and by using the ENERGY STAR logo in weekly advertising.

The ENERGY STAR Whole House Approach: Residential HVAC Sizing and Ducts

Research shows that proper sizing, installation, and maintenance of HVAC equipment are major factors in operating efficiency and cost savings. Proper sizing and installation of the equipment can result in energy savings of up to 35 percent for air conditioners and 16 percent or more for furnaces. In 2000, EPA began to promote this total HVAC system approach, including proper sizing and installation of the equipment and sealing of the ducts that deliver the warmed or cooled air to where it is needed. EPA is partnering with the Consortium for Energy Efficiency (CEE) and National Association of Technicians for Excellence (NATE) to promote CEE's Specification of Energy-Efficient Installation and Maintenance Practices for Residential HVAC Systems to contractors. The specification is a clear, accepted definition of an energy-efficient installation. EPA is also in the pilot phase of a performance specification for home duct systems, a major part of the HVAC system. Properly sealed and insulated ducts can save up to 20 percent on heating and cooling bills and benefit consumers in the following ways: (1) adding comfort by distributing air evenly throughout the home, (2) protecting against combustion back drafting, and (3) preventing outside pollutants from entering the home.

The following businesses and organizations are participating in this pilot: Sacramento Municipal Utility District; Austin Energy; Bodine-Scott Air Conditioning Company; Ongaro & Sons Inc.; Conservation Services Group; TSC, Inc.; enalasys; and Albermarle Heating and Air Inc. These pilot participants cover different climates nationally and different sealing methods. They will provide feedback on the feasibility of meeting the specification and feedback on new ENERGY STAR marketing tools for contractors and consumers.



Source: Lstiburek 2000

Federal Partners: DOE's Building America Program



The U.S. Department of Energy's (DOE) Building America Program is a set of private-public partnerships that accelerate the adoption of energy-efficient technologies and best building practices in production-built housing. This effort involves five teams from more than 50 specialist

companies working with builders across the country on a systems engineering approach to energy efficiency. These teams have demonstrated technical innovations that achieve high energy performance with no or minor additional construction cost. More than 2,000 ENERGY STAR labeled homes have been built as a result. EPA's ENERGY STAR perfectly complements DOE's effort by increasing the market awareness for energy-efficient homes and providing successful builders with a competitive advantage for their labeled homes. DOE's Building America and ENERGY STAR are working together to provide a complete solution for the building industry. And American home buyers are saving thousands of dollars in ownership costs while living in homes with better comfort, durability, and air quality.



ENERGY STAR IN THE COMMERCIAL SECTOR

ENERGY STAR continues to develop and provide innovative energy efficiency solutions to the commercial sector. ENERGY STAR grew through the year 2000 by:

Building and expanding partnerships to add new commercial products to the ENERGY STAR family. Water coolers and traffic signals were added in 2000 to the list of commercial products that can earn the ENERGY STAR label.

Expanding the innovative national building energy performance rating system that benchmarks the efficiency of a building and allows the ENERGY STAR label to be earned by high energy performing buildings. Achieving energy efficiency in the commercial market is



more difficult than simply filling a building with ENERGY STAR equipment. Significant building efficiency can result only from designing and operating major building systems in an integrated, complementary fashion. To help building owners better understand and measure the energy performance of the whole building, EPA introduced a national building energy performance rating system in 1999, which compares the energy performance of an individual building against the national stock of similar buildings. Other than building codes, which focus only on building component and system efficiency, no consistent or comparable metric existed for whole building performance. In 2000, the rating system was expanded to include both office buildings and schools (K-12). By year end,

215 schools had earned the ENERGY STAR label representing more than 15 million square feet of space, in addition to 330 office buildings. More than 4,200 buildings (office and K-12) were benchmarked.

2000 ENERGY STAR Award Winner: Verizon

Verizon, one of the world's leading providers of communications services, has dedicated an energy team of a dozen management employees to focus entirely on the wide range of energy issues affecting this Fortune 10 company. Team Energy meets quarterly with department heads across the business. As the Energy Board of Directors, they develop, implement, and sustain a world class energy program. Verizon's program features a corporate purchasing policy, a strong employee communications effort, energy audits and reviews of the most wasteful buildings, system design, data tracking, and investigation of alternative clean fuel sources, such as fuel cells. Verizon uses ENERGY STAR to benchmark its administrative facilities and then to prioritize and motivate facilities to bring their energy standards to a higher level. Verizon projects a savings of over \$20 million annually from more than 14,000 energy-reduction projects implemented in over 60 percent of its facilities in 2000.

National Building Energy Performance Rating System

The national building energy performance rating system, which was first offered for office buildings in 1999, became available for schools in 2000. To earn the ENERGY STAR label, schools must be among the top 25 percent most efficient in the country and meet important indoor environment quality targets. Almost 1,700 school buildings were benchmarked in 2000, and 215 earned labels. Through 2000, about 2,500 office buildings were benchmarked with 330 earning labels.

Schools that make energy-efficient improvements can cut costs by an estimated 25 to 30 percent on average. The first nine school districts to receive the ENERGY STAR label were announced at the Eleventh Annual Energy Efficiency Forum in June 2000:



San Diego Unified School District
Academy School District 20
Boulder Valley Public Schools
New Haven Public Schools
Kansas City Public Schools
Columbia Public Schools
McAllen Independent School District
Marion Public Schools
Milwaukee Public Schools

California
Colorado
Colorado
Connecticut
Kansas
Missouri
Texas
West Virginia
Wisconsin

“In general, we’re ahead of the curve on energy conservation. Many of our schools are the exact same layout, and while one scored 100, one scored below 75. It may turn out that the air-conditioning is running all day at that school and the lights are on all night, but now we can go back and look at the historical data and find the red flags.”

— Joe Cochran Jr., Energy/Utility Inspector, San Diego Unified School District, CA

2000 ENERGY STAR Award Winner: Arden Realty, Inc.

Arden Realty, Inc., a self-administered real estate investment trust, is the largest landlord of office properties in Southern California. Arden has earned an ENERGY STAR award for two consecutive years. The key to Arden’s success is its top-down management commitment that continually looks for ways to improve the performance of its properties through benchmarking and linking energy improvements to the financial value of its business. Arden now displays the ENERGY STAR label on 80 properties, more than doubling the number of properties that qualified for ENERGY STAR in 1999. In the forefront of adopting new approaches to accomplish its goals, Arden recently announced the installation of the largest solar array on an office property in the Western Hemisphere. Arden Realty’s commitment to improvement has saved 50 million kWh of electricity and avoided 9 MW of demand.



EPA also focused on the construction of new energy-efficient buildings. While new buildings could use up to 70-percent less energy by taking advantage of today's high-efficiency technologies, in reality the newest stock of buildings does not perform any better than the existing stock. This poor performance results from owners not knowing what the energy consumption of a well-designed new building should be and not verifying that the new building actually performs at the design intent. As of 2000, ENERGY STAR now provides energy performance targets to architects, engineers, and building owners so that they can capture the potential energy savings in new buildings.

Expanding partnerships with organizations, large and small, public and private, to provide them with effective energy efficiency investment tools.

Through 2000, EPA partnered with organizations representing approximately 17 percent of the U.S. building floor space who have committed to improving their energy performance. Among others, EPA has partnered with: (1) almost 2,900 small businesses and organizations to lower their overhead through lower energy bills; (2) more than 70 commercial real estate companies representing over 2.25 billion square feet of building space—an estimated 80 percent of the office properties market; (3) almost 250 universities and about 200 school districts, including the Los Angeles Unified School District which alone has more than 650 schools, to bring superior building performance into the classroom; and (4) about 200 local and state governments, helping them overcome key financing and budgeting barriers, which continue to be a major hurdle to energy efficiency projects in the public sector, by delivering financing training to 60 of these partners.

Also in 2000, four influential commercial real estate industry associations, including the National Association of Real Estate Investment Trust (NAREIT) and the Society of Industrial and Office Realtors (SIOR), agreed to make ENERGY STAR available to their members.

EPA continued to work with the energy services industry and assist these companies in integrating the national energy performance rating system into their service offerings. The energy services industry benchmarked almost 750 buildings, submitted more than 50 label applications, and provided professional engineer (PE) verification on over 300 labeled buildings.

EPA launched 10 pilots with utilities, states, and regional energy efficiency program managers to integrate into their activities the national energy performance rating system provided by ENERGY STAR. Examples include the following:

- California utilities agreed to provide electronic billing data for customer energy performance ratings.
- The State of Wisconsin specified ENERGY STAR as the commercial sector delivery platform for the state's public benefits program.

2000 ENERGY STAR Award Winner: Servidyne Systems, Inc.

For 25 years, Servidyne Systems, Inc., has provided building owners and managers with products and services that make building operations more efficient in terms of energy use, occupant satisfaction, and labor productivity. Servidyne pioneered energy benchmarking in the early 1980s and has adopted ENERGY STAR as a natural way to recognize clients, as well as focus attention on achieving a reduction goal. Servidyne uses benchmarking as the basis for long-term energy efficiency improvements and continues to be a leader in the industry for improving its clients' energy efficiency. In 2000, Servidyne benchmarked 94 of its clients' facilities and helped to provide services that led to the award of an ENERGY STAR label on 38 buildings.

- The Consortium for Energy Efficiency launched a national effort to foster integration of the performance rating system into member utility programs.
- NYSERDA benchmarked more than 1,000 schools to identify opportunities for energy performance improvements in districts throughout New York.
- The Building Operator Certification Program incorporated the rating system and portfolio manager into curriculum for use in training facility managers on energy-efficient operations practices.

In 2001, EPA will:

- Add new products for the commercial marketplace to the ENERGY STAR family. Candidate products include light commercial heating and cooling equipment and reach-in refrigerators and freezers.
- Develop building energy performance rating systems for four additional space types, such as convenience stores, grocery stores, hospitals, lodging, or warehouses.
- Continue to partner with state and local governments, school systems, small businesses, and the entire private sector to provide them with energy efficiency solutions. EPA will promote the new building energy performance rating system and expects to work with building owners and managers to rate 5,000 additional buildings in 2001 and qualify an additional 1,250 buildings as ENERGY STAR. EPA will also promote a new and easy-to-use power management tool for computer monitors. Although ENERGY STAR labeled monitors account for 95 percent of monitors sold, many businesses and consumers disable the power management feature due to misinformation in the marketplace.
- Continue working with energy service providers to integrate the national energy performance rating system into their service offerings.
- Continue to collaborate with utilities, states, and regional program implementers to promote the national energy performance rating system provided by ENERGY STAR, including the launch of 10 new pilots. Efforts will involve the Northwest and Midwest and an innovative partnership with the California Energy Commission to rate building energy performance in conjunction with a new state real-time pricing initiative designed to curb peak load.



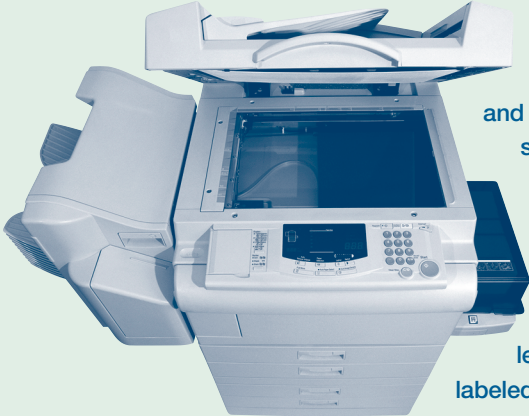
“Energy efficiency has become an important benchmark for our entire portfolio. For us the ENERGY STAR label signals to our tenants and investors that we’re capitalizing on an extraordinary opportunity to make our buildings environmentally and fiscally sound.”

— Tim Callahan, President and Chief Executive Officer, Equity Office Properties, Chicago, IL

Partnership Program Evaluation

EPA devotes considerable effort to obtaining the best possible information on which to evaluate emission reductions from voluntary programs. Below are summaries of efforts undertaken by EPA in three areas of the ENERGY STAR program.

Evaluating Office Equipment Energy Savings

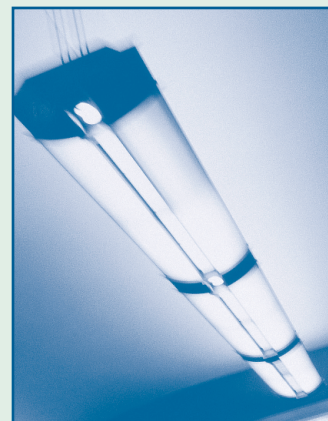


Office equipment was the first in a long line of ENERGY STAR labeled products, and this equipment is responsible for a large portion of the energy and carbon savings achieved by the program over the years. To assess the impacts of this important part of the ENERGY STAR program, EPA used market data (estimated by a leading industry analyst firm) on shipments of both ENERGY STAR and non-ENERGY STAR labeled equipment, field-measured data on the power levels for this equipment in different operating modes (e.g., active, sleep, off), as well as survey data on equipment operating patterns, lifetimes, and ownership levels. EPA combined these data with survey data on the percentage of the labeled equipment that was correctly enabled and saving energy in the field.

The reliance on market data, survey data, and state-of-the-art field measurements ensures the accuracy of the estimates. Because technology in this particular market changes so rapidly and because of the importance of this equipment to the overall results of the Climate Protection Partnerships Division, the data collection and analysis efforts are ongoing.

Evaluating the Green Lights® Program

To evaluate the climate protection benefits of EPA's Green Lights program (now part of ENERGY STAR), EPA conducted a long-term statistical analysis of the market for energy-efficient lighting products. The economic methodology used observed shipment values and shipped quantities to differentiate market effects from public programs' effects, and then employed published data sources to separate the impacts of EPA's programs from those of other energy efficiency programs. The EPA impacts are referred to as market transformation because the intent of EPA's public-private voluntary partnerships is to encourage the formation of self-sustaining markets for energy-efficient products and services, rather than temporarily increase demand through financial subsidies. Using four decades of data related to fluorescent lighting ballasts, this Green Lights program evaluation derived price elasticity and relative price response estimates associated with the quantities demanded and market shares of electronic ballasts. National energy savings and climate protection impacts associated with Green Lights market transformation efforts through the year 2000 were derived using engineering algorithms.



Measuring Results in the Industrial Sector



Reductions in carbon dioxide emissions are estimated based on ENERGY STAR partners' reports to the Voluntary Reporting of Greenhouse Gases Program managed by DOE. Partners are encouraged to report on energy reduction activities they have completed in a given year for either individual projects or for an entire organization. From these reports, only projects that are clearly identified as activities that ENERGY STAR impacted are attributed to the program. EPA and DOE work with reporting companies to ensure the reliability of the data.



ENERGY STAR IN THE INDUSTRIAL SECTOR

ENERGY STAR continues to provide energy efficiency solutions to the industrial sector. ENERGY STAR grew through the year 2000 by:

- Integrating ENERGY STAR and the Climate Wise Partnership into one program to provide the industrial sector with a more comprehensive set of industrial benchmarking and technical assistance tools.
- Welcoming new partners to the program, for a combined total of 500 companies representing 14 percent of U.S. industrial energy use.
- Continuing technical support for small and medium enterprises; more than 40 percent of the partner companies have 100 or fewer employees.
- Providing technical assistance to its partners by (1) helping U.S. companies to purchase renewable energy; (2) supporting cement industry partners in the form of an enhanced emissions tracking spreadsheet tailored to the unique needs of this industry; and (3) promoting opportunities for green power purchasing, including green power workshops in Connecticut and New Jersey.

In 2001, EPA will:

- Enhance ENERGY STAR in the industrial sector by developing energy and related productivity benchmarks of industrial plant performance for U.S. industries.
- Expand the peer-exchange networking opportunities for U.S. industry and ENERGY STAR partners by holding national networking meetings.
- Continue to partner with industrial organizations, large and small, around a joint goal of improved energy performance.

Lockheed Martin Corporation: A Model for Corporate Energy Management

Lockheed Martin Corporation—a researcher, designer, developer, manufacturer, and integrator of advanced technology systems, products, and services—recently instituted a model corporate energy program and strategy. Using ENERGY STAR principles, Lockheed Martin established a corporate energy policy, systems for measuring and benchmarking energy in each business unit, an energy management plan addressing responsibilities and resources, and systems for promoting awareness among all employees of better energy management. Lockheed Martin's corporate energy management system is geared toward continuous improvement. Senior management review is a critical factor in ensuring that the company's program succeeds. Recognized for having one of the first 100 ENERGY STAR labeled buildings, Lockheed Martin saved 3 million kWh of electrical energy and more than \$500,000 in electric and gas costs at its Orlando Missiles and Fire Control facility in 2000 alone. Energy improvements are underway and savings are being realized at the company's other manufacturing sites, thus demonstrating that improved energy performance is good for the environment and for business.

ENERGY STAR Award Winners

***Excellence in
Consumer
Education***

**Northwest Energy
Efficiency Alliance**
Portland, OR

**Pacific Gas &
Electric**
San Francisco, CA

**Participating
Electric and Gas
Utilities of the
Northeast Energy
Efficiency
Partnerships**
Lexington, MA

**Sacramento
Municipal Utility
District**
Sacramento, CA

**Wisconsin Energy
Conservation
Corporation**
Madison, WI

***Excellence in
Corporate
Commitment***

IBM Corporation
Armonk, NY

**ENERGY STAR
FOR BUSINESS*****Partners of the
Year***

Arden Realty, Inc.
Los Angeles, CA

**Hilton Hotels
Corporation**
Beverly Hills, CA

Hines
Houston, TX

**Johnson Controls,
Inc.**
Milwaukee, WI

**Kingston School
District**
Kingston, NY

**M. J. Soffe
Company, Inc.**
Fayetteville, NC

**Servidyne Systems,
Inc.**
Atlanta, GA

**Shaw's
Supermarkets, Inc.**
East Bridgewater, MA

**University of
Missouri at
Columbia**
Columbia, MO

**University of
Virginia**
Charlottesville, VA

Verizon
Albany, NY

**Virtua Health
System**
Camden, NJ

**ENERGY STAR
LABELED
PRODUCTS*****Partners of the
Year***

Alside
Cuyahoga Falls, OH

Canon USA, Inc.
Lake Success, NY

Harvey Industries
Waltham, MA

**Maytag
Corporation**
Newton, IA

**National Coatings
Corporation**
Camarillo, CA

Panasonic
Secaucus, NJ

**Sears, Roebuck &
Co.**
Hoffman Estates, IL

**Viking Windows &
Patio Doors**
Portland, OR

**Whirlpool
Corporation**
Benton Harbor, MI

***Technical
Innovation in
ENERGY STAR***

AMD
Sunnyvale, CA

Intel Corp.
Folsom, CA

**ENERGY STAR
LABELED HOMES*****Partners of the
Year***

**Atlantic Design and
Construction**
Gainesville, FL

**Barry Andrews
Homes**
Bel Air, MD

**Beazer Homes
Arizona**
Tempe, AZ

**Connecticut Light
and Power**
West Springfield, CT

**Guaranteed Watt
Saver Systems
West**
Oklahoma City, OK

**Southwest Gas
Corporation**
Las Vegas, NV

**Tierra Concrete
Homes**
Pueblo, CO

**Woods and
Associates**
Las Vegas, NV

***Excellence in
Home
Improvement***
Bob Vila

**COMBINED HEAT
AND POWER**

**The College of
New Jersey**
Ewing, NJ

Clean Energy Programs

Energy use is fundamental to economic activity—powering our homes, businesses, and transportation systems. Historically, increased economic growth has been driven primarily by energy produced from fossil fuels, with the unintended consequence of increased air pollution and an increased threat of climate change. A wide array of economically viable and environmentally preferable clean energy technologies are available today, and more will be available in the next few years. These technologies—including solar and wind power, fuel cells, and microturbines—can effectively break the link between increased energy use and harmful air emissions.

Distributed generation technologies, such as combined heat and power (CHP), offer the promise of producing electricity and heat in a fundamentally different way through a dispersed set of smaller scale generators providing power and heat at or near customer sites. CHP systems generate electricity and capture waste heat, which is then used to heat and cool buildings or provide steam in industrial processes. The use of waste heat results in total system efficiencies of 70 to 90 percent—a considerable performance gain over the 33-percent average efficiency of conventional central station electricity plants.

GEOTHERMAL ENERGY



COMBINED HEAT & POWER PARTNERSHIP

Through its Combined Heat & Power Partnership, EPA is facilitating the use of CHP technologies in selected sectors. This effort initially targets a handful of state markets, and as the program progresses, work will be expanded to other markets. EPA is focusing on small- and medium-sized CHP applications by identifying candidate industrial and commercial hosts in the select state markets. Companies receive information about the efficiency gains and improved environmental performance of CHP, as well as technical assistance.

In 2000, the CHP Partnership:

- Recognized the CHP ENERGY STAR Award winner, The College of New Jersey
- Continued to explore opportunities for regulatory flexibility in recognizing the environmental benefits of CHP applications.

2000 CHP Award Winner: The College of New Jersey

In 1999, The College of New Jersey replaced its existing 3.2 MW gas turbine with a 5.2 MW gas turbine. The upgrade increased both output and efficiency of the combined heat and power (CHP) unit while decreasing air emissions. The benefits of this one project alone are equivalent to removing the emissions from 4,000 cars. Further, the improved efficiency of the plant allows it to operate using 12 percent less fuel than modern separate heat and power installations. EPA was proud to recognize the important pollution prevention qualities of this project by awarding the 2000 ENERGY STAR CHP Award to The College of New Jersey.



In 2001, EPA will:

- Launch a national CHP partnership, working with industrial partners to convert several hundred industrial boilers to clean, efficient, gas-fired CHP.
- Launch the CHP Power Quality Initiative to work with partners' Internet data centers and telecom switching stations to meet their reliable power needs with CHP.
- Promote the recognition of CHP's benefits in environmental regulations.

Green Power Partnership

EPA has developed a program to encourage purchases of renewable energy. Modeled after EPA's successful energy efficiency programs, the Green Power Partnership is a voluntary partnership with companies, government agencies, and other organizations that purchase renewable energy. In return for technical assistance and recognition, partners commit to purchasing a percentage of their annual electricity consumption from green power.

In 2001, EPA will:

- Launch the Green Power Partnership Program, which will work with founding partners and local governments to encourage green power purchases.
- Announce 40 new corporate or local government green power purchases.
- Launch efforts with states to promote customer choice through electricity restructuring in an environmentally friendly manner.

WIND POWER

“We believe it's beneficial to continually evaluate and improve the energy efficiency of our nation's power supply. Using CHP helps companies and institutions meet their energy needs while saving money and improving their environmental performance.”

— Mark Hall, Vice President of External Affairs, Trigen Energy

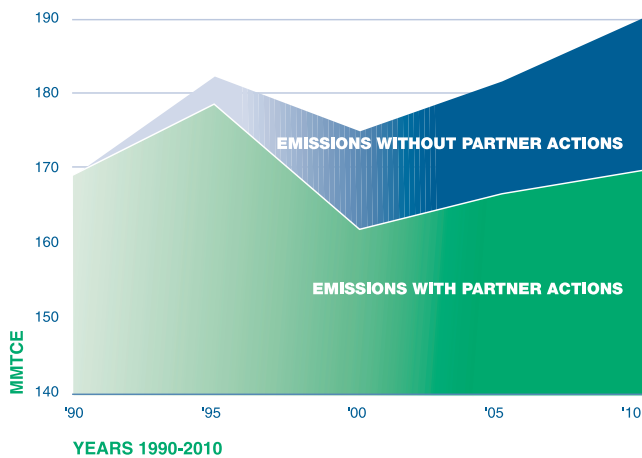
Methane Programs

Methane's contribution to total U.S. greenhouse gas emissions is second only to that of carbon dioxide. Each ton of methane emitted is 21 times more effective at trapping heat in the atmosphere than one ton of CO₂. Methane, the major component of natural gas, is also a valuable source of energy.

U.S. industries along with state and local governments collaborate with EPA in several voluntary partnerships to encourage the profitable collection and use of methane that otherwise would be released

to the atmosphere. These methane partnerships include Landfill Methane Outreach, Natural Gas STAR, and Coalbed Methane Outreach. All follow a common approach, which is to provide sound technical, economic, and regulatory information on emission-reduction technologies and practices, as well as tools to facilitate implementation of methane-reduction opportunities. Partners profit by their involvement in these programs by making their operations more efficient and their

FIGURE 6. PARTNER ACTIONS ARE PROJECTED TO RETURN METHANE EMISSIONS BELOW 1990 LEVELS BY 2010



businesses more competitive. EPA also provides information and tools to the agricultural community to encourage methane reductions.

These voluntary partnerships, in conjunction with a regulatory program to limit air emissions from the nation's largest landfills, reduced national methane emissions to well below 1990 levels in 2000, and they are projected to maintain emissions below 1990 levels through 2010.

“EPA’s technical and economic information has helped Jim Walter Resources (JWR) identify options to profitably capture our low-quality coalbed methane. Our concern at JWR is operating a business. It’s great if this also benefits the environment.”

— **Chuck Dixon, Senior Vice President, Jim Walter Resources, Alabama**

LANDFILL METHANE OUTREACH PROGRAM



Landfills are the largest source of U.S. anthropogenic methane emissions. Capture and use of landfill gas not only reduces methane emissions directly, but also reduces CO₂ emissions indirectly by displacing the use of fossil fuels. The Landfill Methane Outreach Program (LMOP) encourages landfills across the nation to capture and use their landfill gas emissions. Working with landfill owners, state energy and environmental agencies, energy suppliers, industry, and other stakeholders, LMOP lowers the barriers to landfill gas-to-energy project development.

Launched in December 1994, LMOP achieved significant reductions through 2000, reducing methane emissions from landfills by 3.2 MMTCE in 2000 alone. The number of landfill gas-to-energy projects grew from fewer than 100 in the early 1990s to almost 320 projects by the end of 2000.

LMOP focuses its outreach efforts on smaller landfills not regulated by EPA's New Source Performance Standards and Emission Guidelines. The program promotes cost-effective and environmentally beneficial methane emission reductions by encouraging the capture and use of methane that would otherwise be emitted to the atmosphere. LMOP has developed a range of tools to help landfill owners and operators overcome barriers to project development, including feasibility analyses, software for evaluating project economics, profiles of hundreds of candidate landfills across the country, a project development handbook, energy end-user analyses, and many others.

In 2000, LMOP:

- Assisted in the development of 35 new landfill gas-to-energy projects, with more than 50 additional projects under construction and expected to be online soon.
- Signed on 35 new allies, bringing the total number of LMOP allies to more than 250.
- Helped facilitate a partnership between a waste company and three Pennsylvania communities, which resulted in one of the most innovative and economically beneficial landfill gas utilization projects in the country.
- Held its fourth annual conference, which was the largest and most successful to date. One highlight of the conference was the project EXPO, a section of the exhibit hall where 10 landfill operators looking for landfill gas project development partners displayed information about their sites and distributed requests for proposals.

In 2001, EPA will:

- Initiate a competitive grant process designed to spur innovative, replicable projects at smaller landfills.
- Host its fifth annual conference in December 2001, which will include a half-day session on using landfill gas as a green power resource.
- Conduct training sessions on landfill gas utilization in Korea and Brazil.

LMOP 2000 Award Winners

Project of the Year: Green Knight Economic Development Corporation Landfill Gas Utilization Project (Pen Argyl, PA)

Known as the “Slate Belt,” Northampton County, Pennsylvania, played host to residents whose livelihoods depended on the quarry and textile industries. These industries have been on the decline for about a decade, which has forced the region into economic distress. But now, an unusual source is bringing economic development to the region—the local landfill. Grand Central Sanitary Landfill, owned by Waste Management, Inc. (WM), generates more than 8 million cubic feet of landfill gas per day. Waste Management put in a well system to flare the gas and approached the community about end-use options for the gas. Encouraged by WM’s partnership offer, the community came up with an ideal solution—create the Green Knight Economic Development Corporation (GKEDC)—an independent, nonprofit corporation that would own the gas collection facility and use the revenue from sales of the landfill gas to fund local economic development efforts. The project developed through this innovative public-private partnership not only has economic, social, and environmental benefits but also generates a source of clean, renewable energy for the community.

Partner of the Year: Buncombe County, NC

Wedge between two national parks, Buncombe County, North Carolina, attracts tourists and is home to many residents. County officials are mindful of the environment; keeping the county clean and picturesque—and fostering sustainable development—are among their priorities. When the county closed its landfill, it had to manage the gas emitted from the landfill. Rather than flare the gas, county staff teamed with a private company, Asheville Landfill Gas LLC, to build a facility, collect the gas, and turn it into an energy source for the Municipal Service District (MSD), a local wastewater treatment facility. By purchasing the landfill gas for its supplemental energy needs, MSD saves \$500,000 annually. Buncombe County plans to build a 30-acre greenhouse near the landfill and heat it with landfill gas. County officials estimate that the greenhouse has the potential to create 300 new jobs.

State Ally of the Year: State of South Carolina Energy Office

South Carolina’s Energy Office partnered with LMOP in 1998 because officials were interested in promoting landfill gas utilization throughout the state. In 1999, they developed a primer on project development requirements and opportunities, organized and created a task force of various government and community representatives, and conducted a one-day educational workshop. In addition, the Energy Office conducted a survey and determined that 30 landfills could economically develop landfill gas projects, generating a potential 81 MW of power. The tireless efforts of the Energy Office staff have created momentum in South Carolina—12 projects are under construction, and two are slated to become operational in 2001.

Energy Ally of the Year: PPL Corporation (Allentown, PA)

PPL Corporation has a long record of working with methane producers—including landfills, wastewater treatment facilities, and farms. PPL’s support for methane-capturing projects spans more than a decade and represents approximately 2 million tons of greenhouse gas emission reductions since 1991. Landfill power production facilities are an integral part of PPL’s power portfolio. PPL is currently purchasing power from Keystone Landfill, Lycoming Landfill, and Taylor/Amity Landfill, all in Pennsylvania. The company assisted Empire Landfill, also in Pennsylvania, in the development of assets in support of its pipeline quality gas production. PPL is developing partnerships with new landfills and is looking to expand existing landfill projects.

“This is an excellent opportunity for the City of Allentown to save money, improve our operations, and partner with a company that has the experience and know-how to plan and execute projects well.”

— Allentown Mayor William Heydt

NATURAL GAS STAR PROGRAM



Natural Gas STAR is a voluntary partnership between EPA and the U.S. natural gas industry designed to overcome barriers to adoption of cost-effective technologies and practices that reduce emissions of methane. Natural Gas STAR was launched in 1993 with the transmission and distribution sectors, and has since expanded twice—to the production sector in 1995 and the processing sector in 2000. The program has achieved significant reductions through 2000, reducing methane emissions from natural gas systems by 4.2 MMTCE in 2000 alone.

Natural Gas STAR has developed a range of tools designed to help corporate partners implement best management practices to reduce gas loss. These include an implementation guide, a series of “lessons learned” studies, focused workshops, partner-to-partner information exchanges, and others. Extensive partner support for and continued expansion of the program, combined with ongoing feedback from partners, demonstrates the effectiveness of these tools in promoting methane reduction activities.

In 2000, Natural Gas STAR:

- Represented 72 percent of transmission mileage, 49 percent of service connections, 40 percent of production, and 23 percent of gas processing.
- Partnered with 18 new companies, bringing the total number of partners to 88.
- Successfully expanded the program to the gas gathering and processing sector.
- Created the successful instructional video, “U.S. EPA’s Natural Gas STAR Program for Producers,” which received a 2000 Telly award.

In 2001, EPA will:

- Expand Natural Gas STAR in all sectors to represent 85 percent of gas transmission pipelines, 55 percent of distribution service connections, 55 percent of domestic gas production, and 30 percent of gas processing.
- Institute an online reporting system to enhance partner implementation.
- Increase participation among independent producers.

“As a Natural Gas STAR partner, we are recognized as an environmentally friendly company. Even regulators are aware of this voluntary partnership, which is just as valuable as the cost savings achieved by reducing methane emissions.”

— James Frederick, Environmental Specialist, Unocal Gulf Region, USA

This public service announcement and editorial promoting Gas STAR was printed pro bono on the cover wrap of the November/December 2000 edition of the Harvard Business Review.

Profitability & environmental performance.

*As these companies know...
It's a good fit.*

Production Partners

Amerada Hess, U.S. Exploration and Production
ATOFINA Petrochemicals
Belco Energy
BP
Burlington Resources
Chevron, U.S.A. Production
Devon Energy
ExxonMobil Production
Kerr-McGee
Marathon Oil
Mitchell Energy and Development
Ocean Energy
Phillips Petroleum, Americas Division
Pioneer Natural Resources USA
Shell Exploration and Production
Spirit Energy 76, A Business Unit of Unocal
Texaco Exploration and Production

The Stranded Gas Association Union Pacific Resources Group

Transmission and Distribution Partners

ANR Pipeline
Atlanta Gas Light
Atmos Energy
Baltimore Gas and Electric
Bay State Gas
Central Hudson Gas & Electric
Citizens Gas & Coke Utility
Colorado Interstate Gas
Columbia Energy Group Distribution (Columbia Gas of KY, MD, OH, PA, VA)
Columbia Gas Transmission
Columbia Gulf Transmission
Connecticut Power Delivery
Consolidated Edison of New York
Consumers Energy

El Paso Natural Gas
Enron Gas Pipeline Group
Equitable Resources
Granite State Gas Transmission
Great Lakes Gas Transmission
Iroquois Gas Transmission
Kansas Pipeline Operating Company
KeySpan Energy Delivery
KN Interstate Pipeline (Midcon)
Koch Gateway Pipeline
Louisville Gas & Electric
Michigan Consolidated Gas
New York State Electric & Gas
Niagara Mohawk Power
Northern Indiana Public Service
Northern Natural Gas
Northern Utilities
NW Natural
Orange and Rockland Utilities
Pacific Gas and Electric

PECO Energy
PSNC Energy
Public Service Electric and Gas
Questar Pipeline
Reliant Energy
Minnesco
Rochester Gas & Electric
South Carolina Electric & Gas
Southern California Gas
Southern Natural Gas
Southwest Gas
Superior Water, Light and Power
Tennessee Gas Pipeline
Transwestern Pipeline
UGI Utilities
UtiliCorp United
Washington Gas
Williams Gas Pipeline - South Central
Williams Gas Pipeline - Transco
Williston Basin Interstate Pipeline
Wisconsin Public Service



These natural gas companies are focused on being smart, efficient, and innovative, which are qualities that define business leadership.

Each has found that implementing market-based solutions to environmental challenges is consistent with objectives for continued competitiveness.

These forward-thinking companies are committed to improving the environment by voluntarily reducing emissions of methane, a major component of natural gas and an important greenhouse gas. As partners with EPA in the Natural Gas STAR Program, they are actively identifying and implementing cost-effective technologies and practices that reduce methane emissions, while improving the bottom line.

In teaming with EPA, these companies are establishing a reputation for reducing natural gas losses at a time when the demand for clean-burning natural gas is expected to rise significantly over the next 20 years. And EPA considers the voluntary actions of these companies an important part of the nation's response to concerns about global climate change.

To learn more about how these companies have become industry leaders while emphasizing environmental performance, call the program manager at 202-564-2318 or visit the program Web site at www.epa.gov/gasstar.

EPA Natural Gas STAR Program — www.epa.gov/gasstar

Endorsers of the Natural Gas STAR Program include:



Natural Gas STAR 2000 Partners of the Year

Kerr-McGee Oil and Gas Corporation



Kerr-McGee received the 2000 Natural Gas STAR Producer Partner of the Year Award. EPA honored the company for significant methane emission reductions, implementation of many partner reported opportunities (PROs), and outreach contributions both in assisting EPA with developing an Implementation Case Study and in working to secure the Domestic Petroleum Council's endorsement of the Gas STAR program. An active partner since 1996, Kerr-McGee has reported cumulative methane reductions totaling 8.5 billion cubic feet (Bcf), valued at more than \$17 million. In 1999 alone, Kerr-McGee reported emission reductions of 2.3 Bcf, of which 547 million cubic feet (Mmcf) was from new activities. While transferring the Natural Gas STAR program to its newest acquisition, Oryx Energy, Kerr-McGee identified more than 5 Bcf in prior reductions during a survey of Oryx facilities. Kerr-McGee's emphasis on maintaining open communication to ensure employee awareness and participation in data collection efforts has significantly contributed to the company's Gas STAR program success.

Columbia Transmission Segment (a NiSource Company)



Columbia Transmission Segment received the 2000 Natural Gas STAR Transmission Partner of the Year Award. EPA honored the company, which consists of Columbia Gas Transmission and Columbia Gulf Transmission, for its excellent program implementation; significant methane emission reductions, which include the inventorying and reporting of substantial reductions from previous years; and its outreach efforts. Even though Columbia Transmission Segment just became a partner in 1999, it reported more than 9.7 Bcf of methane emission reductions—valued at more than \$19.4 million—in its first annual report. In 1999 alone, Columbia Transmission Segment reported reductions of 1.5 Bcf, with 1.4 Bcf of this from new activities. The company took a team approach to implementing the Natural Gas STAR program and integrating it into everyday operations and existing programs, such as the company's Environmental Excellence Program. Members of the company's Natural Gas STAR Team visited field operations and worked closely with technicians and operators to assess current methane emission reduction practices and ways to measure these reductions.



Bay State Gas Company (a NiSource Company)



Bay State Gas Company received the 2000 Natural Gas STAR Distribution Partner of the Year Award. Bay State was honored for achieving significant methane emission reductions, introducing a number of new PROs, and contributing to the promotion of the Natural Gas STAR program through its outreach activities. Bay State Gas Company has been an active partner since 1994. In 1999, the company reported 79 Mmcf of methane emission reductions, and Bay State's cumulative reductions total more than 250 Mmcf.

“We are convinced that proactive environmental responsibility is good business. Through Natural Gas STAR our efforts to reduce our methane emissions often improve the operating efficiency of the pipelines, and that leads to financial reward.”

— Steve Wilner, Director, Environmental Health & Safety Services, NiSource, Inc.

COALBED METHANE OUTREACH PROGRAM



The Coalbed Methane Outreach Program (CMOP) reduces methane emissions from underground coal mines by collaborating with large coal companies and small businesses—primarily independent natural gas project developers and equipment supply companies—to develop environmentally beneficial and economically successful coal mine methane projects. Outreach efforts focus on providing high-quality, project-specific information. CMOP has achieved significant results through 2000.

EPA began working with the coal mining industry in 1990 when coal mines captured and used only 25 percent of the methane produced from their degasification systems. As a result of this collaboration, the percentage of methane recovery grew to more than 85 percent by 1999. To eliminate the remaining methane emitted from degasification systems, CMOP is working with industry to demonstrate the use of flare technology, which has yet to be employed at a U.S. mine.

With the program's tremendous success in reducing methane emissions from degasification systems, CMOP has expanded its focus to the methane emitted from coal mine ventilation systems. Ventilation air from coal mines typically contains methane at concentrations below one percent, yet accounts for 94 percent of the remaining methane emissions from underground coal mines—over 90 billion cubic feet of methane annually. CMOP is working with industry to demonstrate and deploy newly developed technologies that can reduce these emissions substantially over the next few years.

CMOP has developed a range of tools designed to overcome barriers to recovery and combustion of coal mine methane. These include numerous technical and economic analyses of technologies and potential projects, mine-specific project feasibility assessments, state-specific analyses of project potential, market evaluations, and guides to state, local, and federal assistance programs. CMOP has collaborated with operators of virtually every U.S. underground coal mine to apply these tools and facilitate each project. CMOP achieved a reduction of 2.1 MMTCE in 2000.

In 2000, CMOP:

- Helped reduce methane emissions at 23 project sites by providing high-quality, project-specific information to mine operators, project developers, and other stakeholders.
- Affirmed the feasibility of technology to combust ventilation air methane and identified a mine for the first demonstration of coal mine methane flaring.

In 2001, EPA will:

- Evaluate and promote the market potential of new technologies, including flares at wells producing medium-quality gas and combustion technologies appropriate for mine ventilation air.
- Facilitate flare and ventilation air demonstration projects.

Jim Walter Resources (JWR) has operated an extensive degasification program at its deep, longwall mines in Alabama for about 20 years. These operations produce gas from in-mine, gob, and vertical degasification wells. JWR is a leader in exploring innovative technologies to utilize medium- to low-quality gas.



Program Evaluation: Measuring Results in the Methane Programs

Tracking and recording the methane reductions achieved by EPA's partnership programs is a straightforward process. EPA gathers project-specific data on all the methane reduction activities implemented in coordination with the partnerships.

Natural Gas STAR

Industry partners report their reduction activities to EPA on a detailed reporting form, and EPA works with partners to verify these data.

Landfill Methane Outreach

EPA works with all stakeholders to compile up-to-date project information. The program reports reductions from only those projects that EPA directly assisted.

Coalbed Methane Outreach

EPA gathers state gas sales data for each mine to determine the total amount of coal mine methane used. Although EPA works with every project, the program reports only 40 percent of the total reductions achieved, attributing 60 percent to the impact of the Energy Policy Act of 1992.

TABLE 4. METHANE PROGRAMS: ANNUAL GOALS AND ACHIEVEMENTS

	2000 Goal	2000 Achievement	2001 Goal
LMOP			
Number of Projects	193	177	225
Annual Methane Reduction (MMTCE)	3.5	3.2	3.7
Natural Gas STAR¹			
Transmission Pipeline Miles (% in program)	85%	72%	85%
Distribution Pipeline Miles (% in program)	60%	49%	55%
Natural Gas Production (% in program)	55%	40%	55%
Gas Processing (% in program)	—	23%	30%
Annual Gas Savings (MMTCE) ²	4.2	4.2	4.4
CMOP			
Annual Methane Reduction (MMTCE)	2.0	2.1	2.0
TOTAL Methane Reduction (MMTCE)	9.7	9.5	10.1

¹ 2000 achievements are estimates. Final figures are not yet available.

² Includes both CCAP program and base reductions.

AGRICULTURE-BASED PROGRAMS

Through outreach to agriculture-based organizations and farmers, EPA and the U.S. Department of Agriculture (USDA) work together to promote practices that reduce greenhouse gas emissions at U.S. farms. The programs work with U.S. swine and dairy producers to encourage development of waste management systems that produce farm revenues and reduce water and air pollution. EPA provides technical information and tools to aid in the assessment and implementation of the projects.

In 2000, EPA and USDA:

- Assisted swine and cattle producers in developing waste management systems that improve livestock efficiency and produce farm revenues, while reducing water and air pollution. About 13 million kWh/year of renewable energy was produced from farms capturing methane to provide energy for the farm and local community.
- Increased recognition of anaerobic digestion viability at commercial swine and dairy farms.
- Brought 13 new commercial demonstration systems online across nine states through the “Charter Farm” program. These systems provided about 3 million kWh of renewable power.
- Assisted states in developing programs and policies for the broader deployment of technology.

In 2001, EPA and USDA will:

- Continue the expansion of methane-reducing technologies in the livestock sector to help ensure clean water and air.
- Collaborate with state energy programs in New York, California, Colorado, Iowa, Wisconsin, and Minnesota to facilitate the development of anaerobic digesters as renewable energy.

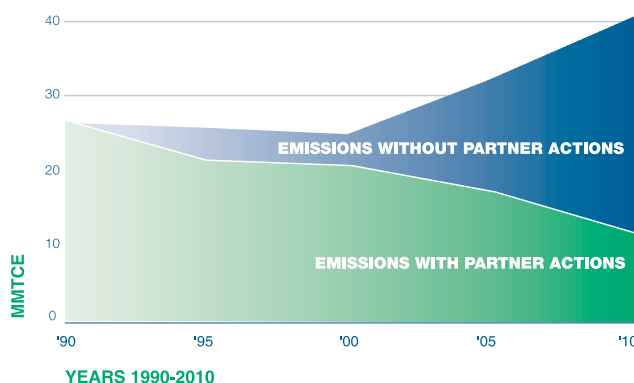
SWINE USA'S COMPLETE MIX DIGESTER IN THAYER, IOWA



High GWP Environmental Stewardship Programs

Public-private industry partnerships are substantially reducing U.S. emissions of the “high global warming potential” (GWP) gases, which are released as byproducts of industrial operations. These partnerships involve various industries that are developing cost-effective improvements in processes to reduce emissions of perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF₆)—all particularly potent greenhouse gases. When compared ton-for-ton with CO₂, they trap much more heat in the atmosphere. PFCs and SF₆ also have very long atmospheric lifetimes. Despite the potential for sizable growth in high GWP greenhouse gas emissions, these partnerships are expected to reduce emissions below 1990 levels by the year 2005.

FIGURE 7. PARTNER ACTIONS CAN MAINTAIN EMISSIONS OF HIGH GLOBAL WARMING POTENTIAL GASES AT OR BELOW 1990 LEVELS THROUGH 2010



Source: EPA Climate Protection Partnerships Division

THE VOLUNTARY ALUMINUM INDUSTRIAL PARTNERSHIP



This partnership program with the primary aluminum smelting industry is designed to reduce emissions of PFCs emitted as a byproduct of the smelting process. EPA is working with primary aluminum producers to reduce CF₄ and C₂F₆ where technically feasible and cost effective. Since the partnership was formed in 1996, it has had great success in characterizing the emissions from smelter operations and reducing overall emissions. The goal of the partnership was to reduce emissions by 30 to 60 percent from 1990 levels by 2000.

In 2000, the Voluntary Aluminum Industrial Partnership:

- Met its 2000 program goal, with emissions reduced about 45 percent relative to 1990 levels on an emissions per unit of product basis. The absolute reductions are a similar percentage but are currently affected by facility closures caused by high energy costs in the Northwest.
- Completed an emissions measurement campaign at six U.S. aluminum smelters to better characterize the relationship between operating parameters and emissions.
- Continued work with 9 of the 10 U.S. primary aluminum producers, representing 22 of the 23 U.S. smelters, to better understand the generation of PFCs in the smelting process and to quantify smelter-specific emissions.

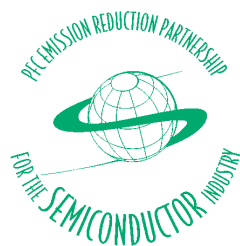
HFC-23 EMISSION REDUCTION PROGRAM

The HFC-23 partnership works to cost-effectively reduce emissions of the potent greenhouse gas, HFC-23, which is generated as a byproduct in the manufacture of HCFC-22. Through this program, EPA encourages all U.S. producers of HCFC-22 to develop and implement technically feasible, cost-effective processing practices or technologies to reduce HFC-23 emissions.

The partners have reduced emissions of HFC-23 through process optimization, reaching the total reductions that can likely be achieved through these techniques. The partnership has helped the intensity of HFC-23 emissions (the amount of HFC-23 emitted per kilogram of HCFC-22 manufactured) decline significantly. Despite an estimated 35-percent increase in production since 1990, total emissions are below 1990 levels—a reduction of 4.8 MMTCE compared to business-as-usual.

In 2000, EPA partnered with 100 percent of the U.S. HCFC-22 producers to use process optimization and abatement to reduce production byproduct emissions of HFC-23—the most potent and persistent of the HFCs.

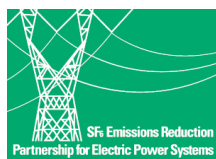
THE PFC EMISSION REDUCTION PARTNERSHIP FOR THE SEMICONDUCTOR INDUSTRY



Since 1996, the PFC Emission Reduction Partnership for the Semiconductor Industry has served as a catalyst for companies in Europe, Japan, Korea, Taiwan, and the United States to join together to set the first global target for reducing greenhouse gas emissions. Through this partnership, companies have identified and implemented process changes in the manufacture of silicon chips to reduce emissions of PFCs.

In 2000, EPA renewed the partnership with U.S. semiconductor manufacturers who agreed to reduce emissions of PFCs by 10 percent below their 1995 baseline by 2010.

SF₆ EMISSIONS REDUCTION PARTNERSHIP FOR ELECTRIC POWER SYSTEMS



The SF₆ Emissions Reduction Partnership for Electric Power Systems, initiated in 1999, provides a forum for the electric power industry to work with the U.S. government to reduce sulfur hexafluoride (SF₆) emissions to technically and economically feasible levels through identifying and encouraging adoption of best management practices. By the end of 2000, more than 60 electric utility companies had joined the partnership, representing approximately 25 percent of the companies within this industry.

In 2000, EPA expanded the electric power systems partnership to reduce SF₆ emissions to 63 partners, representing nearly 45 percent of net generating capacity. Over 80 percent of SF₆ sales are to this power sector.

SF₆ EMISSION REDUCTION PARTNERSHIP FOR THE MAGNESIUM INDUSTRY



This new partnership is identifying and encouraging adoption of best management practices for reducing emissions of sulfur hexafluoride (SF₆), a highly potent greenhouse gas. The program to reduce emissions from magnesium production already represents more than 60 percent of U.S. magnesium industry emissions.

In 2000, EPA:

- Expanded the magnesium industry partnership to reduce SF₆ emissions to 15 partners, representing 100 percent of primary magnesium production and 60 percent of domestic casting capacity. This partnership accounts for 75 percent of total domestic SF₆ emissions from the U.S. magnesium industry.
- Received reports from magnesium partners for their first annual emissions estimates using EPA-designed reporting software. In turn, EPA published the partnership's first annual report.

MOBILE AIR CONDITIONING CLIMATE PROTECTION PARTNERSHIP

As part of the effort under the Montreal Protocol for the Protection of the Ozone Layer, new vehicles worldwide have been redesigned to use HFC-134a refrigerants in air conditioning systems rather than CFC-12. The production of CFC-12 refrigerants for use in developed countries was halted in 1996 and will be phased out globally by 2006. HFC-134a was the global choice because it has no ozone depleting potential, has six times less global warming potential than CFC-12, is non-flammable, has low toxicity, and has cooling capacity and energy efficiency that can be made comparable to CFC-12 through engineering. Although HFC-134a has far less impact on the climate than the CFC-12 it replaced, it is included in the basket of greenhouse gases whose emissions need to be reduced.

The Society of Automotive Engineers (SAE), the Mobile Air Conditioning Society Worldwide (MACS), and EPA have organized a global voluntary partnership to promote improved air conditioning systems and service. The choice of measures to improve the environmental performance of vehicle air conditioning systems is complicated because (1) both refrigerant and fuel consumption must be considered over the life of the vehicle, (2) customers demand reliable and affordable equipment, and (3) new systems may require special safety systems and technician training. The partnership has three goals:

- To promote cost-effective designs and improved service procedures to minimize emissions from HFC-134a systems.
- To cooperate on development and testing of next-generation mobile air conditioning systems that satisfy customer requirements and environmental, safety, cost, and reliability concerns.
- To communicate technical progress to policy makers and the public.

In 2000, this partnership developed a brochure that provides an overview for decisionmakers and interested parties of the “state-of-the art” of mobile air conditioning technology from the viewpoint of industry, technical organizations, and government. Titled *The Importance of Motor Vehicle Air Conditioning in Climate Protection*, this brochure presents the consensus on the best methods of speeding progress toward the implementation of more energy-efficient mobile air conditioning systems. As a member of the partnership, SAE has drafted new test plans, circulated and improved existing test plans, and held an extensive investigation of testing organizations. SAE has also worked on the Internet to involve experts and stakeholders in this process.

In 2001, the High GWP Environmental Stewardship Programs will:

- Work with the aluminum industry to negotiate a new agreement to continue to explore and implement emission reduction options through 2005, as well as continue to conduct smelter measurements in the aluminum industry to complete the U.S. smelter-type data set and to validate past process-type measurements.
- Work with the U.S. semiconductor partners to achieve their 10 percent PFC emission reduction goal by 2010 from their 1995 baseline.
- Continue to build the SF₆ Emissions Reduction Partnership for Electric Power Systems (utilities) to 100 (representing 60 percent of the industry’s net generating capacity).
- Expand participation in the SF₆ Emission Reduction Partnership for the Magnesium Industry to represent greater than 80 percent of U.S. industry emissions. Facilitate global information sharing to achieve cost-effective emission reductions of 0.3 MMTCE.
- Maintain an effective partnership with HCFC-22 chemical manufacturers to reduce emissions of HFC-23.
- Expand the stewardship programs to reduce high GWP emissions from other key sources, such as the military and the ozone-depleting substance (ODS) replacement industries.

Alcoa Inc.: Aluminum Industry Leader

In addition to achieving significant PFC emission reductions in the past decade, Alcoa Inc. has been a global industry leader working to protect the climate. U.S. companies in the aluminum industry, including Alcoa, have partnered with EPA since 1995 to reduce emissions of PFCs, an inadvertent byproduct of the primary smelting process. The charter partners of the Voluntary Aluminum Industrial Partnership were Alcan Ingot, Alcoa Inc., Alumax, Century Aluminum, Columbia Falls, Goldendale, Kaiser Aluminum, Noranda Aluminum, Northwest, Southwire Co., Reynolds Metals Co., and Vanalco Inc. In 2000, these companies reduced their U.S. PFC emissions by more than 45 percent from the 1990 baseline. Alcoa has served as co-chair of the partnership and provided significant in-kind technical expertise in developing and implementing the partnership’s PFC smelter measurement campaigns. Having met its 2000 PFC emission reduction goal, Alcoa has committed to further PFC reductions by 2005. These efforts are part of an overall company plan for a 25-percent reduction in greenhouse gas emissions by 2010.

International Climate Protection Award Winners



In 1998, EPA established the Climate Protection Awards to recognize exceptional leadership, personal dedication, and technical achievements in protecting the Earth's climate. Awards are presented to companies, organizations, and individuals that have demonstrated their commitment to greenhouse gas reductions through pollution prevention, technical innovation, stewardship, recycling, and new products. The 2000 award winners are presented below.

CORPORATE & GOVERNMENTAL AWARDS

Alcan Aluminum Sebree Ingot Plant

Henderson, KY, USA

Architectural Services Department, the Government of the Hong Kong Special Administrative Region

Queensway, Hong Kong

The AT&T Employee Telework Program

Atlanta, GA, USA

Honda Motor Company

Torrance, CA, USA

ICI Klea Runcorn

Cheshire, UK

Intel Corporation

multiple locations

International Fuel Cells

South Windsor, CT, USA

Novellus Systems

San Jose, CA, USA

Oregon Energy Facility Siting Council and Oregon Office of Energy

Salem, OR, USA

Visteon Corporation

Dearborn, MI, USA

ASSOCIATION AWARDS

American Portland Cement Alliance

Washington, DC, USA

The Real Estate Roundtable

Washington, DC, USA

University of Colorado Environmental Center

Boulder, CO, USA

INDIVIDUAL AWARDS

Ms. Sherri W. Goodman

U.S. Department of Defense

Washington, DC, USA

Dr. Jerry Mahlman

U.S. National Oceanic and Atmospheric Administration

Princeton, NJ, USA

Mayor Marc H. Morial

City of New Orleans

New Orleans, LA, USA

Ms. Tia Nelson

The Nature Conservancy

Arlington, VA, USA

Mr. Nobuo Okubo

Nissan Motor Company, Japan

Tokyo, Japan

Dr. Robert T. Watson

The World Bank

Washington, DC, USA

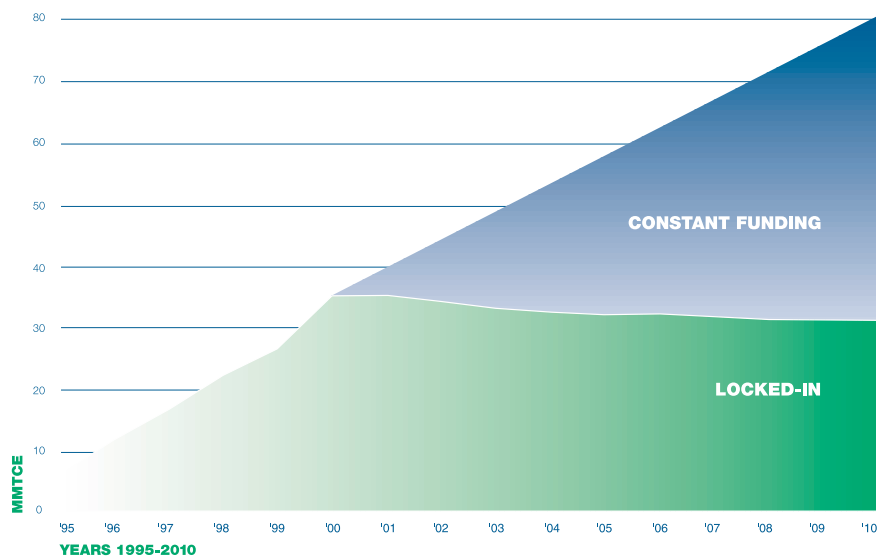
Expectations for 2001 and Beyond

Voluntary partnership programs will continue to be a powerful means for reducing emissions of greenhouse gases and air pollutants across the country, while saving businesses, organizations, and consumers money on their energy bills. In the future, EPA expects these win-win partnerships to continue reducing local and global air pollution, while delivering sizable savings.

EPA plans to:

- Add new products and services to the ENERGY STAR family.
- Build public awareness of ENERGY STAR to more than 60 percent by the end of 2005.
- Continue to educate consumers and homeowners to be aware that ENERGY STAR products can reduce their home energy bills by about 30 percent or \$400 annually through a variety of means.
- Offer energy performance rating and labeling for more building types, including retail uses, healthcare, lodging, food service and sales, and public assembly.
- Build additional partnerships with businesses and organizations, focusing particularly on small businesses, state and local governments, and school systems.
- Encourage increased penetration of cleaner, more efficient energy supply technologies.
- More than double the cost-effective reductions of the non-carbon dioxide greenhouse gases by 2010, helping to return methane emissions to 1990 levels.

FIGURE 8. ANNUAL REDUCTIONS IN GREENHOUSE GAS EMISSIONS CAN BE MORE THAN DOUBLED BY 2010



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Endnotes

1. Bill Savings. These are the total savings in energy bills, in 2000 dollars, realized by partners or purchasers of ENERGY STAR labeled products through 2010. Many of these investments, such as the building improvements associated with ENERGY STAR, have lifetimes as long as 15 years. A cut-off of 2010 was chosen as a reasonable end-point to assess benefits, even though the benefits of the Division's programs and partners' investments will often continue to be realized after that year.
2. Technology Expenditures. Technology Expenditures represent the cost to partners, in 2000 dollars, of investments in energy efficiency, including the cost of financing the investment over its life at a 7.0 percent real rate of interest (4.0 percent for public-sector investments). This includes any price premium, and the cost of financing that premium, for the purchase of ENERGY STAR labeled products. The benefits of these investments have accrued since they were made and will continue to accrue until the end of their useful lives. Investments also include future investments and purchases made as a result of market transformation that has already occurred, to the extent that they keep kWh savings constant between 1999 and 2010.

Seven percent is the standard interest rate recommended by the Office of Management and Budget in Circular No. A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs for Base-Case Analysis*. As stated in the circular, "[the 7.0 percent] rate approximates the marginal pretax rate of return on an average investment in the private sector in recent years."

3. Net Savings. Net Savings is the difference between Bill Savings and Technology Expenditures. It represents the undiscounted amount of cash in constant dollars available to partners and purchasers of ENERGY STAR labeled products to put into the economy through 2010.
4. MMTCE. Million Metric Tons of Carbon Equivalent is the amount of carbon emission equivalents avoided by investments in energy-efficient products through 2010 plus the emissions avoided by the methane programs and by the programs reducing emissions of high global warming potential gases. For energy efficiency investments and purchases, the carbon emission equivalents are based on an analysis of marginal carbon emissions from electric generation. The marginal carbon emission rate decreases over time: in 2000 it is 1.64 lbs. CO₂/kWh; in 2005 it is assumed to be 1.20 lbs. CO₂/kWh; and in 2010 it drops to 1.09 lbs. CO₂/kWh.

**For further information on the cost and benefits calculations,
call EPA's Climate Protection Partnerships Division at 202-564-9190.**



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