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ENERGY STAR® and Other Voluntary Programs

2001 Annual Report

PARTNERSHIPS CHANGING THE WORLD

ENERGY STAR® AND OTHER VOLUNTARY PROGRAMS

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About the Cover: The cover photo is from EPA's new national campaign to encourage Americans to help protect the environment by changing to energy-efficient products and practices today. The message is an easy one. Look to ENERGY STAR to make a change. By using ENERGY STAR to increase energy efficiency at home and at work, each of us can make an enormous difference, now and for the future.

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).

August 2002

Congratulations to all the partners of EPA's climate protection programs. Together, we have demonstrated that voluntary programs can be an extremely effective tool to ensure a cleaner environment and greater energy security for all Americans.

Our partners' efforts have made this past year the most successful to date for protecting the environment. In 2001 alone, reductions of greenhouse gases totaled 38 million metric tons of carbon equivalent—the same as eliminating the emissions from 25 million cars. As we initiate new programs and as our current programs expand with new partners, the environmental benefits will only increase.

We have accomplished these reductions in greenhouse gases through initiatives that increase energy efficiency, develop clean energy solutions, capture and use methane gas, and minimize emissions of other non-carbon dioxide gases. Since 1992, ENERGY STAR® has been a leader in this area. ENERGY STAR educates businesses and consumers about energy-efficient solutions that do not sacrifice performance, comfort, or convenience. Last year alone, with the help of ENERGY STAR, Americans saved $6 billion on their energy bills, while preventing the pollution associated with that of about 12 million cars.

In 2001, we launched the Combined Heat and Power Partnership and the Green Power Partnership, which promote cleaner technologies in order to reduce the environmental impact of electricity generation. Commitments by partners in our methane programs have reduced national emissions to well below 1990 levels and are expected to maintain emissions below 1990 levels through 2010. New initiatives, such as Climate Leaders—a program that encourages companies to develop long-term comprehensive climate change strategies—are continuing the successful tradition of EPA voluntary programs.

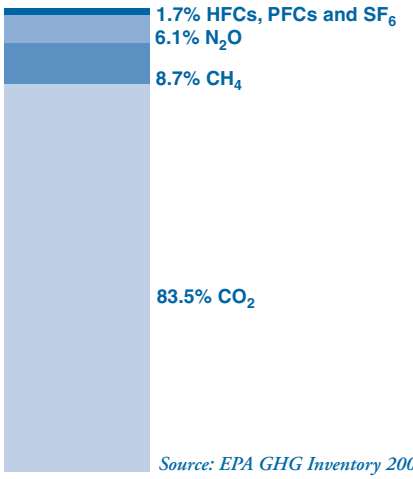
Partners in our climate protection programs are showing that voluntary stewardship is alive and well among U.S. businesses, and they are setting an example for all. By continuing to work together and staying firmly focused on our goals, I am confident that we will make America's environment healthier and cleaner for this and future generations.

Christine Todd Whitman
Administrator
U.S. Environmental Protection Agency

Partnerships Changing the World

Each of us has a responsibility to protect our environment. We have the power, too. Whether purchasing an Energy Star product or switching to renewable energy, businesses, organizations, and consumers can play an important role in reducing greenhouse gas emissions and protecting our environment for future generations.

FIGURE 1.
U.S. greenhouse gas emissions by gas



Source: EPA GHG Inventory 2002

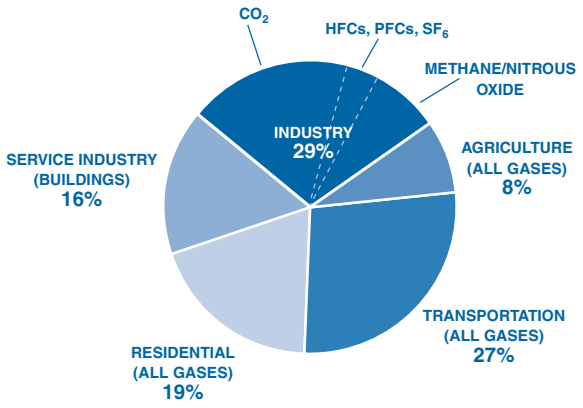
Greenhouse gases are accumulating in the Earth's atmosphere as a result of human activities and trapping heat in the atmosphere that would otherwise escape (see discussion on page 4). Carbon dioxide (CO_2) from fossil fuel combustion—the major source of energy in our homes, in commercial buildings, in industry, and for transportation—is the largest source of greenhouse gas emissions in the United States. Other activities, such as industrial processes, cause emissions of additional greenhouse gases—for example, methane (CH_4), nitrous oxide (N_2O), and perfluorocarbons (PFCs) (see Figure 1).

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 and, in the case of PFCs and sulfur hexafluoride (SF_6), their long atmospheric lifetimes (see Table 1). When viewed in terms of economic sectors, emissions from industry account for 29 percent of U.S. greenhouse gas emissions, followed by transportation (27%), residential (19%), service industry (buildings) (16%), and agriculture (8%) (see Figure 2).

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:

Corporate Commitments. Many companies are voluntarily evaluating their impact on the environment and then acting to change for the better. Businesses that participate in Climate Leaders, a new effort formally launched in early 2002, will work with EPA to inventory their greenhouse gas emissions, set an aggressive long-term reduction goal, and report their annual progress toward this goal.

FIGURE 2.
U.S. greenhouse gas emissions by sector



Source: EPA GHG Inventory 2002

Energy Efficiency. Energy efficiency means obtaining the same services or output (such as heating or cooling) for less energy input. Energy efficiency offers significant cost savings across the residential, commercial, and industrial sectors through an array of technologies and practices available right now that can reduce the energy bill for many homes and businesses by 20 to 30 percent. The Energy Star program works in partnership with businesses, large and small, and other organizations, such as schools and city governments, to capture these savings.

Clean Energy. In addition to using energy more efficiently, there are ways to 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 play larger roles cost-effectively in the U.S. energy mix. EPA is collaborating with its partners to expand the use of these technologies.

Methane Programs. Although it is a potent 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 (SF_6) 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.

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

Partnerships Can Change the World

EPA's partners continued to demonstrate the power of voluntary programs in 2001, making it the most successful year to date for protecting the climate through this approach. EPA's ENERGY STAR, methane, and environmental stewardship programs all delivered significant environmental and economic results while exceeding their goals for reductions in greenhouse gas emissions.[1] EPA also launched two new programs in 2001—the Combined Heat and Power (CHP) Partnership and the Green Power Partnership—to encourage conversion to more efficient energy supply technologies and increased reliance on renewable energy.

This annual report presents the environmental and economic benefits from EPA's climate protection partnerships through the end of 2001. A summary of these achievements is provided in the next section. Following that are descriptions of each program, covering the rationale for each, the accomplishments of 2001, and goals for the future. The final section outlines EPA's broad goals for 2002 and beyond.

[1] Each of EPA's climate protection partnerships is designed to achieve greenhouse gas reduction goals for 2000 and beyond, which were set through an interagency process in 2001. Accomplishments for the year 2000 and goals for the year 2010 were communicated to the Secretariat of the Framework Convention on Climate Change in the *U.S. Climate Action Report 2002*.

"Together, we have demonstrated that voluntary programs can be an extremely effective tool to ensure a cleaner environment and greater energy security for all Americans."

— Christine Todd Whitman

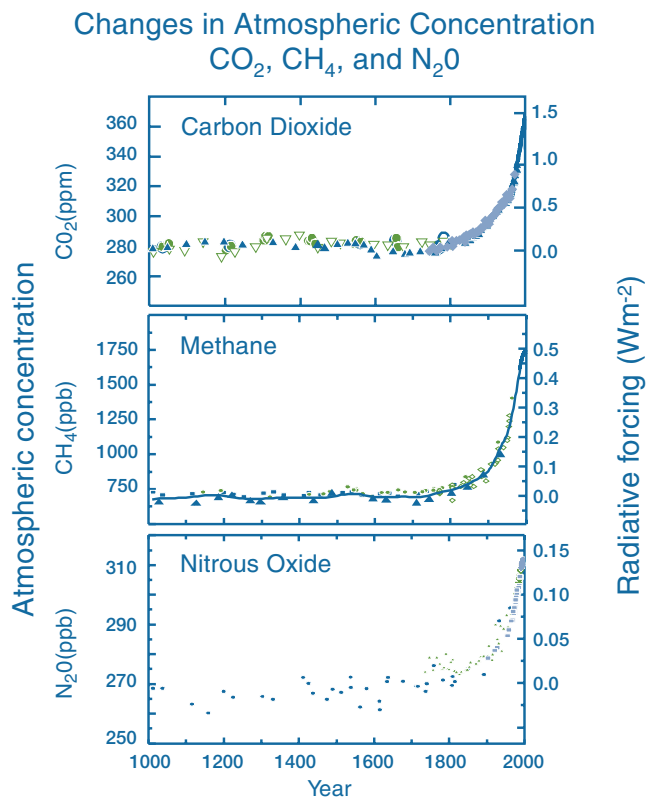
Global Warming: Summary of the Science

Over 12 billion metric tons of carbon dioxide (CO_2) accumulate in our atmosphere every year due to fossil fuel burning and deforestation. This ongoing buildup of CO_2 and other greenhouse gases is trapping heat in the atmosphere that would otherwise escape to outer space. Atmospheric concentrations of CO_2 are now 30 percent above their 18th-century levels. Methane (CH_4), the second most important global warming gas of concern, is now 150 percent more abundant in our atmosphere. Nitrous oxide (N_2O) concentrations have increased 17 percent. And more recently, emissions of HFCs, PFCs, and SF_6—all very strong heat-trapping gases—have begun contributing to this human-induced gas buildup in the atmosphere.

In 2001, both the Intergovernmental Panel on Climate Change (IPCC) and the U.S. National Academy of Sciences reached essentially the same conclusions about the current and likely future climatic effects of the increasing atmospheric concentrations of these gases. The National Academy stated, "The IPCC's conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations accurately reflects the current thinking of the scientific community on this issue."

The warming is expected to continue, but by how much depends on many factors. The IPCC projects that globally averaged surface temperatures will increase by 2.5–10°F by 2100, compared to 1990. The range primarily reflects different assumptions about the future growth of greenhouse gas emissions and the sensitivity of our climate to the heat-trapping effect of these gases. The National Academy therefore asserts that "national policy decisions made now and in the longer term future will influence the extent of any damage suffered by vulnerable human populations and ecosystems laterin this century."

FIGURE 3.
Global atmospheric concentrations of three well-mixed greenhouse gases



Source: IPCC Third Assessment Report 2001

The exact impacts of further climate change remain difficult to project, especially as one moves from larger to smaller geographic scales. However, some regions and sectors of the economy have been identified as being particularly vulnerable. The National Academy, for example, highlights that "some models project an increased tendency toward drought over semi-arid regions, such as the U.S. Great Plains," and that "hydrological impacts could be significant over the western United States, where much of the water supply is dependent on the amount of snow pack and the timing of the spring runoff."

Another key uncertainty that remains is whether or not we can arrive at a "safe" level of atmospheric greenhouse gas concentrations. Neither the IPCC nor the National Academy can answer this question definitively at this time, as it requires not only scientific and economic analysis, but also value judgements regarding acceptable risks for diverse populations and ecosystems. According to the National Academy, however, "risk increases with increases in both the rate and magnitude of climate change."

Summary of Program Achievements Through 2001

The major environmental and economic achievements across EPA's climate protection partnerships,[2] based on actions that business partners and consumers have taken through the end of 2001, are summarized below.

Environmental Benefits

- Greenhouse gas emissions were reduced by 38 million metric tons of carbon equivalent[3] (MMTCE) in 2001 alone—the same as eliminating the emissions from more than 25 million cars.
- Nitrogen oxides (NO_x) were reduced by 140,000 tons in 2001 alone.[4]
- Reductions in greenhouse gas emissions of more than 33 MMTCE per year are locked in between now and 2012.

Economic Benefits

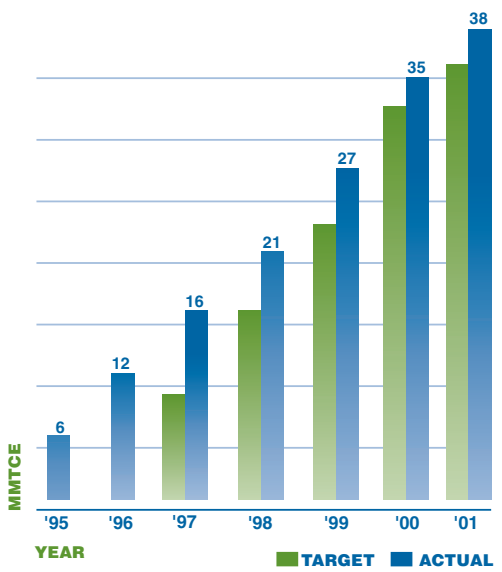
- Consumers and businesses have locked in investments in energy-efficient technologies exceeding $13 billion.
- Net of their investments in energy-efficient technologies, consumers and businesses are saving about $70 billion cumulatively through 2012 and more than $6 billion in 2001 alone.

Program Effectiveness

Every federal dollar spent on these partnership programs through 2001 means:

- Reductions in greenhouse gas emissions of 1.0 metric ton of carbon equivalent (3.7 tons of CO_2).
- 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.
CPPD carbon reductions compared to program goals



Source: EPA Climate Protection Partnerships Division

[2] This report provides results for the voluntary programs operated by the Climate Protection Partnerships Division (CPPD) at EPA. It does not include emission reductions attributable to WasteWise, the State and Local Outreach Program, transportation programs, the Significant New Alternatives Program, or the landfill rule, which are the remaining actions in EPA's comprehensive climate program. EPA estimates the reduction in greenhouse gas emissions across the entire set of climate programs to be about 65 MMTCE in 2001.

[3] Reductions in annual greenhouse gas emissions for all EPA programs, including non-CO_2 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.

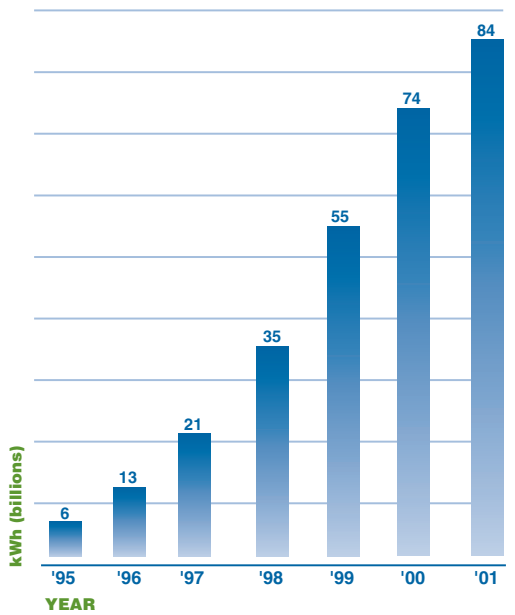
[4] Based on data from the Emissions & Generation Resource Integrated Database (E-GRID) Version 2.0, released September 2001.

Key Accomplishments

Energy Efficiency

- The ENERGY STAR program saved a significant amount of energy in 2001—more than 80 billion kilowatt hours (kWh) and 10,000 megawatts (MW) of peak power, the amount of energy required to power more than 10 million homes.
- The ENERGY STAR label has become the national symbol for energy efficiency, recognized by more than 40 percent of the American public. It is being used by more than 1,200 manufacturers across a total of 13,000 individual product models in over 35 product categories. Americans bought 150 million ENERGY STAR labeled products in 2001, contributing to the more than 750 million ENERGY STAR products bought throughout the past decade.
- More than 1,600 builder partners constructed over 57,000 ENERGY STAR labeled homes, locking in financial savings for homeowners of more than $15 million annually.
- The national energy performance rating system was used to evaluate more than 10,000 buildings; 11 percent of office building space and 8 percent of schools have been benchmarked with 435 office buildings and 285 schools earning the ENERGY STAR label. In 2001, EPA added energy performance rating capabilities for grocery stores and hospitals.
- EPA added a home benchmarking tool to its online "toolbox," which allows homeowners to evaluate their home's efficiency. EPA also introduced ENERGY STAR Home Sealing, a package that helps homeowners improve the energy performance of their homes during remodeling and renovation.
- An international agreement was finalized allowing Canada to implement an energy efficiency labeling program for a variety of consumer and business products, modeled after ENERGY STAR. Canada joins the European Community, Japan, Taiwan, Australia, and New Zealand in adopting ENERGY STAR to identify efficient products.

FIGURE 5.
Annual savings in energy use as a result of CPPD's partnership programs



Source: EPA Climate Protection Partnerships Division

Clean Energy

- In July, EPA launched the Green Power Partnership with more than 20 companies, government agencies, and other organizations making the commitment to buy green power.
- EPA launched the Combined Heat and Power Partnership in October with 18 founding partners representing a variety of industrial sectors.

Methane and High-GWP Environmental Stewardship

- Partnership programs achieved reductions of non-carbon dioxide (CO_2) gases—methane, perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF_6)—totaling more than 18 MMTCE in 2001 alone.
- Partner actions are projected to maintain methane emissions below 1990 levels through 2010.
- The number of landfill gas-to-energy projects grew to almost 325 by the end of 2001.
- EPA renewed its partnership with the semiconductor industry, which has established a new goal to reduce PFC emissions 10 percent below their 1995 levels by 2010.

Estimation of Environmental and Economic Benefits

The environmental and economic benefits from EPA's partnership programs are presented in 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 2012 from the technology investments and product purchases made through the year 2001 due to these partnership efforts.

TABLE 2.
Summary of the cumulative benefits through 2012 from the actions taken by partners through 2001 (in billions of 2001 dollars)

Program	NPV of Bill Savings	NPV of Technology Expenditures	NPV of Net Savings	GHG Reductions (MMTCE)
ENERGY STAR	$75.9	$10.7	$65.2	241
Labeled Products	$42.0	$2.9	$39.1	104
Building and Industrial Improvements	$33.9	$7.7	$26.1	137
Methane Programs	$5.5	$2.5	$3.0	161
Environmental Stewardship Programs	——	——	——	117
TOTAL	$81.4	$13.1	$68.2	518

NPV: Net Present Value

NOTES: Technology Expenditures include O&M expenses for methane programs.
Bill Savings and Net Savings include revenue from sales of methane and electricity.
ENERGY STAR labeled homes are included in the Labeled Products totals.
Totals may not equal sum of components due to independent rounding.

—— : Not applicable.

The Endnotes of this Annual Report (see page 48) provide 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 on the following page.

Stream of Benefits

In Table 2, the benefits are presented through 2012 for investments and program actions that have been "locked-in" through the end of 2001. 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 2001 and 2012. This assumes that when someone purchases an ENERGY STAR labeled product, he/she is likely to replace it with another ENERGY STAR product. For products with a short lifetime, such as computers, fax machines, and audio equipment, it means replacement purchases keep total energy savings at 2001 levels; for products with long lifetimes, such as lighting fixtures, transformers, and homes, it means that no additional purchases are made after 2001. Programs with 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.

GHG Emission Reductions

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 the 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.

Net Present Value of 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 the Energy Information Administration (EIA) *Annual Energy Outlook 2002* and *Annual Energy Review 2000* for each year in the analysis (1993-2012). Energy bill savings also include revenue from the sale of methane and/or the sale of electricity made from captured methane. The net present value (NPV) of these savings was calculated using a 4-percent discount rate and a 2001 perspective.

Net Present Value of 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' cost of energy-efficient equipment, including the cost of financing. For ENERGY STAR labeled products, investment was taken as the incremental 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 4-percent real rate of interest. The NPV of these expenditures was calculated using a 4-percent discount rate and a 2001 perspective.

Net Present Value of the Net Savings

The NPV of the Net Savings is the difference between the NPV of energy bill savings and the NPV of expenditures on energy-efficient technology. It represents the net value to partners and ENERGY STAR product consumers of participating in the Division's programs.

Climate Leaders Program

Climate Leaders is EPA's newest industry-government partnership. It encourages companies to develop long-term comprehensive climate change strategies. Many corporations are already making great strides in reducing their greenhouse gas emissions through participation in EPA programs such as Energy Star. Climate Leaders gives these companies, and others, the opportunity to take their climate commitment one step farther.

Partners set a corporate-wide greenhouse gas reduction goal and inventory their emissions to measure progress. By reporting inventory data to EPA, partners create a lasting record of their accomplishments through an EPA-approved greenhouse gas inventory protocol. Partners also identify themselves as corporate environmental leaders and strategically position themselves through better greenhouse gas emissions management as climate policy continues to unfold.

The groundwork for this new initiative was completed in 2001, with a formal launch in early 2002. More information about the climate leaders that are working with EPA in this program can be found on the Web at www.epa.gov/climateleaders.

"It is Alcoa's policy to operate worldwide in a safe, responsible manner which respects the environment and the communities where we operate. Alcoa believes climate change is an issue of vital importance and has committed to reducing our direct greenhouse gas emissions. We believe our participation in Climate Leaders will help us and the nation in addressing this issue."

— William J. O'Rourke, Vice President Environment, Health, & Safety and Audit Alcoa Inc.

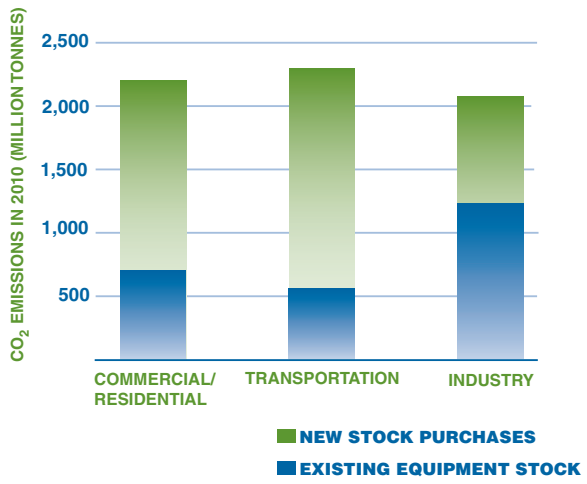
ENERGY STAR PROGRAM

Energy Efficiency is Smart Investment

Energy efficiency is well recognized for providing many benefits. These include:

- **Cost savings.** American families and businesses spend $600 billion each year on energy bills—almost one and a half times what is spent on K-12 education. Energy efficiency offers great potential for reducing these energy costs. Many homeowners and businesses could use 30 percent less energy, without sacrificing services or comfort, by investing in energy efficiency. Many of these purchases or investments offer financial returns worth more than double the return of other common options, such as money market funds or U.S. Treasury bonds.
- **Greenhouse gas reductions.** More than 50 percent of the projected national energy use and CO_2 emissions 10 years from now will come from the use of equipment purchased between now and then (see Figure 6). Promoting more efficient options could reduce greenhouse gas emissions substantially as equipment is naturally retired and replaced.
- **Energy reliability.** By reducing demand, energy efficiency is a low-cost (2-3 cents/kWh) contributor to system adequacy—the ability of the electric system to supply the aggregate energy demand at all times—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—the ability of the system to withstand sudden disturbances—by reducing the load and stress at various points in the power distribution system, thereby decreasing the likelihood of failures.
- **Energy security.** Between 1973 and 2000, U.S. dependence on foreign oil rose from about 35 percent to more than 52 percent of U.S. consumption. During the same period, the import share of natural gas rose from less than 5 percent to more than 15 percent and continues to rise. Energy efficiency and the use of renewable energy are environmentally sound ways to reduce foreign oil and gas imports and to moderate the effects of energy price spikes.

FIGURE 6.
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

The potential of energy efficiency is not, however, being fully realized nationwide for a variety of reasons. With relatively low energy prices in the United States, many organizations have focused much less on energy efficiency improvements and much more on improvements in labor or capital productivity. 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 them in their areas, and whether the real energy savings will live up to the claims.

The lack of answers to these important questions shows a large information gap for energy efficiency. The ENERGY STAR program seeks to fill this gap and 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 by 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 energy-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 thus achieve more with their resources.

Introduced by EPA in 1992 for energy-efficient computers, the ENERGY STAR label has been expanded to more than 35 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 became eligible for the label in 1995. Efficient buildings became eligible for the label in 1999 when EPA unveiled a new standardized approach for measuring the efficiency (or energy performance) of an entire building.

California Consumers Kept Lights on During Electricity Crisis

A new report by the DOE Lawrence Berkeley National Laboratory (LBNL) concludes that it is California consumers—not the mild weather or the cooling economy—who should get credit for avoiding blackouts and keeping the lights on in summer 2001 by embracing energy efficiency and conservation and reducing their peak demand by up to 5,500 megawatts (MW).

"Many observers predicted that California would face widespread rolling blackouts in the summer of 2001," states author Charles Goldman. "In April 2001, the North American Electric Reliability Council predicted that the state would have about 150 hours of rolling blackouts. Others predicted that the cost of these blackouts would range from $2 billion to $20 billion. But the blackouts never happened last summer. Our research addresses the question of what role customer load reduction played."

A central conclusion of the LBNL study is that consumers' actions to reduce their electricity consumption were the driving force behind the load reductions (reduced demand for electricity) observed in summer 2001. An important lesson to take from this, according to the report, is that a pre-existing energy efficiency services infrastructure can help the state's policymakers respond quickly to short-term power shortage emergencies. California was able to undertake massive energy efficiency projects quickly because the underlying services were already there, due in part to the fact that the state's policymakers and regulators have historically supported and funded energy efficiency programs.

Source: Goldman et al., 2002

The potential benefits from full adoption of ENERGY STAR over the next 10 years are tremendous:

- If everyone in the country bought only ENERGY STAR labeled products during the next decade, the nation would cut 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.

TABLE 3.
ENERGY STAR Program: annual goals and achievements

	2001				2002	
	Energy Saved (Billion kWh)		Emissions Prevented (MMTCE)		Energy Saved (Billion kWh)	Emissions Prevented (MMTCE)
	Goal	Achieved	Goal	Achieved	Goal	Goal
PROGRAM TOTAL for ENERGY STAR	75	84.3	18.2	19.7	85	20.3
Commercial/Residential Buildings Total	75	84.3	15.1	16.6	—	17.0
Labeled Products Subtotal[1]		45.8[2]	8.2	9.2	—	9.5
Computers	—	4.2	—	0.8	—	—
Monitors	—	18.6	—	3.6	—	—
Printers	—	5.4	—	1.0	—	—
Copiers	—	0.9	—	0.4	—	—
Other Office Equipment	—	5.6	—	1.1	—	—
Exit Signs	—	2.4	—	0.5	—	—
Lighting	—	3.3	—	0.6	—	—
Home Electronics	—	2.9	—	0.6	—	—
Other Products	—	2.3	—	0.6	—	—
Building Improvements Subtotal[3]		38.6	6.9	7.4	—	7.5
Industrial Improvements Total[4]	—	—	3.1	3.1	—	3.3

[1] Results for office equipment from Webber et al., 2002.
[2] The kWh savings imply peak demand savings of more than 10 gigawatts (GW), based on conservation load factors developed by LBNL (Koomey et al., 1990).
[3] Results for building improvements from Horowitz, 2001.
[4] Results for industrial improvements from Dutrow, 2002.

Totals may not equal sum of components due to independent rounding.

— : Not applicable.

The economic and environmental benefits of ENERGY STAR through the year 2001 are already substantial. More than 750 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 gas emissions avoided in 2001 are provided in Table 3. Additional program achievements within the residential, commercial, and industrial sectors are presented in the sections beginning on page 13.

The ENERGY STAR label is being adopted in countries around the world. The year 2001 saw the signing of an international agreement with Natural Resources Canada allowing it to implement an energy efficiency labeling program modeled after ENERGY STAR for commercial and residential products. This complements existing ENERGY STAR agreements with the European Community, Japan, Taiwan, Australia, and New Zealand.

ENERGY STAR in the Residential Sector

ENERGY STAR continues to grow as a powerful platform for delivering energy efficiency to homeowners across the country. Major highlights of 2001 include:

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, dehumidifiers, ventilation fans, ceiling fans, and telephony products to the ENERGY STAR family in 2001, bringing the total to 38 product categories, of which 33 are routinely used in the home. EPA also updated the specifications for geothermal heat pumps. More than 1,200 manufacturers are now partners in the ENERGY STAR program, using the label on more than 13,000 product models.

Dehumidifier

Building consumer awareness of the ENERGY STAR label as the national, government-backed symbol for energy efficiency. Recent surveys, including a 2001 household survey sponsored by the Consortium for Energy Efficiency, show that more than 40 percent of consumers nationwide recognize the ENERGY STAR label. In addition, a majority of consumers report that the label influenced their purchasing decisions, and more than 70 percent would recommend ENERGY STAR to a friend. In November 2001, EPA launched a new national campaign to help increase this awareness. The campaign encourages Americans to help protect the environment by changing today to energy-efficient products and practices. The message is an easy one: Look to ENERGY STAR to make a change. By using ENERGY STAR to increase energy efficiency at home and at work, each of us can make an enormous difference now and for the future.

Expanding the use of the ENERGY STAR label on efficient new homes. Homes that earn the ENERGY STAR label 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. In 2001, EPA exceeded its goal with the construction of close to 27,000 ENERGY STAR labeled new homes. This brings the total of new homes that have earned the ENERGY STAR label to 57,000. ENERGY STAR has achieved market penetration of up to 20 percent in key target areas such as Phoenix and Las Vegas.

Developing home improvement opportunities beyond labeled products. In 2001, EPA expanded its work in residential efficiency improvements. EPA is offering a new set of recommendations for whole-house improvement called *Home Performance with ENERGY STAR*. This new approach was launched with the New York State Energy and Research Development Authority (NYSERDA) and the Wisconsin Energy Conservation Corporation (WECC). It uses performance-based building science techniques to maximize quality, consistency, and effectiveness of energy efficiency improvements in existing homes.

Residential Air Conditioner

Programmable Thermostat

Additional home improvement initiatives include ENERGY STAR Home Sealing, an expansion of the original labeled insulation program to encompass the entire home "envelope." Many homeowners do not realize that the loss of warmed or cooled air through holes and cracks can equal as much airflow as leaving a window open all winter (see illustration on page 17). With partner utility National Grid in New England, ENERGY STAR launched Home Sealing in late 2001 as a new service to improve comfort and reduce energy bills.

2001 ENERGY STAR Award Winner

Sears, Roebuck & Co.

Hoffman Estates, Illinois

For the third consecutive year, Sears has distinguished itself as a champion in promoting energy efficiency to the American public. Sears continues to offer the widest array of ENERGY STAR qualified appliances under one roof, including leading brands and its own Kenmore brand. In 2000, Sears pledged to sell more than one million ENERGY STAR labeled appliances and did so, repeating this achievement in 2001. In addition, Sears sold more than 1.5 million ENERGY STAR labeled home electronics products and more than 30,000 labeled heating and cooling units. Also in 2001, Sears created "the Sears Experience" for all of its 863 mall-based appliance showrooms that showcased unique ENERGY STAR product placement and consumer education materials. Sears introduced two of the most efficient appliances in their categories—the Kenmore Elite refrigerator and the HE3t clothes washer. Both products exceed the efficiency requirements of ENERGY STAR. Contributing significantly to its success, Sears has demonstrated a strong commitment to working with regional ENERGY STAR programs across the country, offered comprehensive sales training programs for its staff, and directed its vendors to supply ENERGY STAR qualified products.

Highlighting and promoting ENERGY STAR labeled products in retail stores and through key state-level energy efficiency programs. In 2001, EPA worked with more than 160 utilities and state or regional energy efficiency providers that serve nearly 60 percent of the households in the United States in promoting energy efficiency with ENERGY STAR. More than 50 of them encouraged ENERGY STAR labeled homes as part of their residential construction programs. EPA also partners with over 450 retailers in promoting ENERGY STAR labeled products in more than 15,000 storefronts across the country.

In 2002, EPA will:

- 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. EPA expects to update specifications for televisions/VCRs, residential air conditioning/heat pumps, and residential light fixtures. EPA will also add new products and services to the ENERGY STAR family.
- Continue to build consumer awareness of the ENERGY STAR label through the new integrated public awareness campaign, as well as product-focused national campaigns for heating and cooling equipment and lighting products, with the goal of raising awareness of the label to more than 45 percent.

"Panasonic is very pleased to take industry leadership in the ENERGY STAR program. Today we offer about 450 ENERGY STAR qualifying Panasonic models in 15 different categories. Panasonic continues to devote significant resources to the development of more innovative energy-efficient products and to help educate customers about the value of conserving energy and buying ENERGY STAR."

— Don Iwatani, Chairman and CEO
Matsushita Electric Corporation of America

2001 ENERGY STAR Award Winner

Panasonic

Secaucus, New Jersey

Panasonic is a true leader in offering energy-efficient products. Panasonic and its affiliated Quasar and Technics brands currently offer an exemplary 446 ENERGY STAR qualified product models spread over 15 product categories. Last year alone marked the introduction of 164 newly qualifying models, expanding Panasonic's participation to all product categories. Panasonic's diverse product line includes home electronics, office equipment, home appliances, heating and cooling equipment, and lighting. Panasonic's commitment to ENERGY STAR also extends into sales and marketing, consumer education, specification development, product labeling, internal training, and public outreach. Panasonic actively engages other manufacturers and retailers in ENERGY STAR efforts. In 2001 Panasonic launched an Internet-based sweepstakes, which included a quiz designed to educate consumers on the benefits of ENERGY STAR and which was experienced by more than 30,000 entrants.

- Expand Home Performance with ENERGY STAR pilot programs in New York State and Wisconsin to Austin, Texas and Kansas City, Missouri.
- Expand home improvement programs to promote in-home services such as ENERGY STAR Home Sealing, duct sealing, and proper installation and maintenance of heating and cooling equipment. One key component will involve increasing the number of trained contractors to perform these services. ENERGY STAR will continue to work closely with the Building Performance Institute and the North American Technical Excellence Association to expand the number of qualified technicians who understand energy efficiency and the advantages of ENERGY STAR.

- Work with home builders and allies to build, test, and label 36,000 new homes as ENERGY STAR in 2002, by expanding the outreach partnership to 9 metropolitan areas and building upon EPA's manufactured housing alliance.
- 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, residential heating and cooling equipment, and consumer education.

2001 ENERGY STAR Award Winner

D.R. Wastchak, L.L.C.

Tempe, Arizona

With over 15,000 homes certified as ENERGY STAR to date, D.R. Wastchak, L.L.C. has labeled more homes than any other ratings provider and fueled much of the growth in ENERGY STAR housing in Phoenix. In 2001, D.R. Wastchak verified and labeled over 3,600 homes, representing nearly 15 percent of all ENERGY STAR homes labeled nationwide. The company also added 12 new builders to the ENERGY STAR program last year. D.R. Wastchak has been a key champion in ENERGY STAR marketing and advertising efforts in Phoenix, and was a primary coordinator of the successful 2001 Phoenix Showcase of ENERGY STAR labeled homes, which highlighted ENERGY STAR builder partners in the Phoenix market. These efforts serve as an exemplary model for other active ENERGY STAR markets across the country.

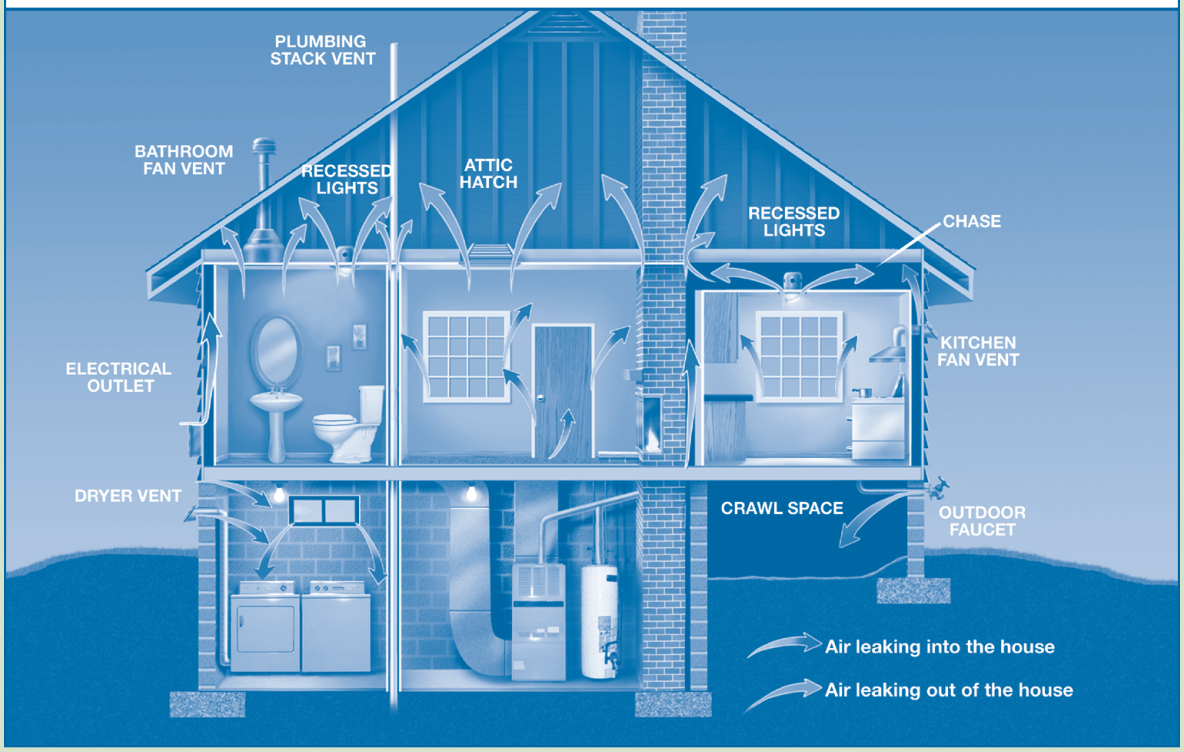
Home Performance with ENERGY STAR

Home Performance with ENERGY STAR promotes the whole-house approach to improving the overall energy efficiency of existing homes. By systematically addressing the energy use in the home—from the insulation and air leakage to the HVAC system to appliances and lighting—contractors implementing Home Performance with ENERGY STAR may be able to reduce the total energy use of a home by up to 40 percent. To achieve these significant reductions, the program emphasizes diagnostic testing, the application of building science principles, and the quality installation of improvement measures. While not all homes will be able to cost-effectively reach this level of savings, by taking a comprehensive look at an individual home, contractors can identify and implement the best solutions for that home.

To develop a cadre of residential contractors who have the knowledge and skills to provide diagnostic services and properly install energy efficiency measures, ENERGY STAR is partnering with national training and certifying organizations. EPA is continuing its partnership with the Consortium for Energy Efficiency (CEE) and the National Association of Technicians for Excellence (NATE) to promote best practices for residential HVAC systems. Further, EPA has begun a partnership with the Building Performance Institute (BPI) to develop and promote the certification of whole-house energy improvement contractors and the use of best practices in all aspects of improving existing homes.

Two states have stepped forward to implement this ambitious program. In 2001, the New York State Energy Research and Development Authority (NYSERDA) and the Wisconsin Energy Conservation Corporation (WECC) on behalf of the State of Wisconsin launched Home Performance with ENERGY STAR. NYSERDA combined an intensive marketing campaign and the services of BPI to provide contractor certification as it successfully rolled the program out across the state. NYSERDA's marketing has uncovered a large consumer demand for comprehensive energy-saving services, which in turn provides a strong incentive for contractors to seek out rigorous training and certification. WECC also began with a marketing campaign and then focused on contractor training and mentoring to establish initial capacity in the market.

Potential air leaks in a home



The Department of Housing and Urban Development and ENERGY STAR

Each year, U.S. Department of Housing and Urban Development (HUD) programs assist 5 million renters and owners—almost 5 percent of all households in the nation. HUD spends some $4 billion annually on energy, through utility allowances to renters, housing assistance payments to private building owners, and operating grants to public housing authorities. Improving energy efficiency in the public housing stock could provide significant savings to building residents, property owners, and the federal government.

Recognizing this potential savings and responding to the President's National Energy Policy, HUD recently adopted an Energy Action Plan. Prepared by HUD's multi-office Energy Task Force, the Action Plan identifies 21 separate measures that HUD could implement to improve the overall energy efficiency of HUD-financed housing. ENERGY STAR is one of several key initiatives that HUD will embrace over the coming year.

Under this Action Plan, HUD and ENERGY STAR will coordinate resources to help achieve HUD's mission to provide affordable housing to the disadvantaged, as well as EPA's mission to protect the environment. Specifically, the Action Plan calls for housing authorities to purchase ENERGY STAR labeled products and equipment, most likely through bulk purchasing orders coordinated by HUD or ENERGY STAR, to help reduce energy costs. Under HUD's HOPE VI Program for single-family housing, all new housing must be built to ENERGY STAR labeled home specifications. ENERGY STAR is collaborating with HUD to ensure that such purchasing and construction are cost effective for property owners. HUD's network of public housing authorities, FHA lenders and homeowners, and property managers provides an excellent distribution channel for information on energy efficiency and ENERGY STAR. ENERGY STAR is developing information packets for homeowners, renters, and housing managers detailing the advantages of ENERGY STAR.

"Jeffco Public Schools is pleased to partner with ENERGY STAR on this important effort. As a partner, we operate more efficiently and cost-effectively and have been able to carry these savings directly to our bottom line. We're also proud of the positive effects these efforts have on the environment."

— Jane Hammond, Superintendent
Jefferson County Public Schools

2001 ENERGY STAR Award Winner

Jefferson County Public Schools

Golden, Colorado

Jefferson County Public Schools is the largest school district in Colorado with more than 87,000 students and 135 school buildings. Its commitment to conserving natural resources starts with the Board of Education's resolution that outlines the District's energy management plan. The District has established an energy management team with a goal of achieving 20 percent or greater cost avoidance on an annual basis, and includes comparing schools to ENERGY STAR specifications to find greater improvements. Understanding how important measurement is to sound energy management, the District benchmarked more than 80 percent of its school buildings, earning the ENERGY STAR label for 41 schools. Now it is turning its attention to upgrading those buildings that have the most energy-saving opportunities. Jefferson County has saved energy while improving the indoor environment for students. An active participant in EPA's *Indoor Air Quality Tools for Schools*, the District has received an Excellence Award for indoor air quality. Its annual energy savings are approximately $2.8 million, which equates to hiring an additional 80 people or purchasing 70,000 text books.

ENERGY STAR in the Commercial Sector

EPA continued to have tremendous success in promoting energy efficiency in the commercial sector in 2001. Highlights for the year include:

Building and expanding partnerships to add new commercial products to the ENERGY STAR family. Light commercial HVAC and reach-in refrigerators and freezers were added in 2001 to the list of commercial products that can earn the ENERGY STAR label.

Promoting the innovative rating of building energy performance and the labeling of high 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. EPA first developed this online rating for office buildings. Schools (K-12) were added in 2000. Use of the national energy performance rating system more than doubled in 2001, with over 10,000 buildings evaluated through the year. Eleven percent of the office market and 8 percent of the schools market have benchmarked with 435 office buildings and 285 schools earning the ENERGY STAR label.

Expanding the national building energy performance rating system to new building types. EPA added the capability to rate the energy performance of supermarkets and hospitals in 2001. The national building energy performance rating system now has the capability to rate building types representing about 40 percent of carbon emissions from the commercial building stock.

"Food Lion is proud to have taken a leadership role in EPA's ENERGY STAR program. The wise management of our energy resources has resulted in savings to the bottom line that we pass along to our customers, helping us maintain our low-price leader status in the market. In addition, the responsible approach to energy management has helped Food Lion take a leadership role in the grocery industry's pollution prevention efforts."

— Bill McCanless, President and CEO
Food Lion LLC

National Building Energy Performance Rating System

The national building energy performance rating system became available for supermarkets and hospitals in 2001. To earn the ENERGY STAR label, these buildings must be among the top 25 percent most efficient in the country and meet important indoor environment quality targets.

Since the rating system was introduced for supermarkets in the summer of 2001, extending the system beyond office buildings and schools, more than 1,300 stores have benchmarked with three earning the ENERGY STAR. Benchmarking became available in late fall of 2001 for hospitals, and over 70 hospitals have benchmarked since that time. Three hospitals have earned the ENERGY STAR label.

The following hospitals and supermarkets were the first to receive an ENERGY STAR label in 2001:

Hospitals

Naval Medical Center San Diego
California

Memorial Hospital of Carbondale
Illinois

St. Joseph's Medical Center
New York

Supermarkets

Food Lion
North Carolina

Shaw's
Massachusetts

Pathmark
New York

2001 ENERGY STAR Award Winner

Food Lion, LLC

Salisbury, North Carolina

Food Lion, LLC, the U.S. division of Brussels-based Delhaize Group, operates more than 1,200 stores in 11 Southeastern and Mid-Atlantic states. Food Lion has integrated energy management into its corporate business objectives. The company benchmarks all of the stores in its portfolio, evaluates the worst performing stores on a monthly basis, and provides quarterly energy bonuses to maintenance staff to encourage improvements. A key partner in developing the EPA benchmark for supermarkets, Food Lion has used the energy ratings to justify recommissioning services. Food Lion knows that no matter how efficiently the store is designed, it will not be top performing if there are wasteful energy practices. It uses newsletters and other opportunities to communicate good practices to store managers and operations personnel. Food Lion extends its communication to customers by placing the ENERGY STAR logo on its grocery bags and providing links to ENERGY STAR on its Web site. In 2001, even with a 6-percent increase in store square footage, Food Lion reduced energy consumption by 1.3 percent—equivalent to over $50 million in sales and the pollution associated with approximately 14,000 cars.

Expanding partnerships with organizations, large and small, public and private, to provide them with effective energy efficiency investment tools. Over the past 10 years, EPA has partnered with companies and organizations representing approximately 17 percent of the U.S. building floor space who have committed to improving their energy performance.

Among others, EPA has collaborated with (1) commercial real estate companies representing over 3.4 billion square feet of building space; (2) universities and schools including large school districts such as San Diego Unified, Chicago, and Fairfax County as well as smaller districts like Academy School District #20 in Colorado and Sachem Central School District in New York; and (3) over 5,000 small businesses and organizations to help them lower their overhead through lower energy bills.

Also in 2001, EPA partnered with telecommunications companies such as Verizon and BellSouth, in coordination with the U.S. Telecom Association, to begin development of an energy performance rating for energy-intensive central offices that house high-tech equipment. In addition, major real estate investment managers and pension funds, such as Lend Lease and TIAA, committed to using ENERGY STAR tools to help improve energy management throughout their real estate portfolios.

EPA continued to work with the energy services industry to assist these companies in integrating the national building energy performance rating system into their customer services. These service and product providers rated almost 750 buildings, submitted about 75 applications for the ENERGY STAR label, and provided professional engineer (PE) verification on over 150 labeled buildings.

"With an annual energy bill of nearly $500 million, Verizon knows that saving energy means saving money. ENERGY STAR is helping us learn where and how our energy investments can reap the greatest savings, which is good for our bottom line and good for the environment."

— Ivan Seidenberg
President and Chief Executive Officer
Verizon Communications Inc.

2001 ENERGY STAR Award Winner

Verizon Comunications Inc.

New York, New York

A Fortune 10 company, Verizon Communications Inc. is not only a recognized leader in its approaches to energy management, but the company also uses its leadership position to establish energy performance requirements of its product vendors. In 2001, Verizon reduced the environmental impact of its operations, while saving an estimated $41 million in energy consumption costs, and communicated this improved environmental and financial performance to its employees, shareholders, and consumers. As part of a comprehensive strategic energy management plan, Verizon benchmarked 145 facilities, initiated a series of building-wide improvements, created a corporate-wide employee volunteer effort of 250 "energy champions," and adopted energy-efficient purchasing policies for new equipment. In addition, Verizon educated its 256,000 employees on the importance of energy performance and their role in controlling energy use and costs. Demonstrating exceptional leadership, Verizon spearheaded an initiative with the United States Telecom Association and the North American Communications Environmental Excellence Initiative to develop an energy performance benchmark for telecom central offices and lead fellow telecom organizations to partner with ENERGY STAR in this effort.

EPA partnered with about 20 utilities, states, and regional energy efficiency program managers to integrate ENERGY STAR into their activities to reduce energy use in the commercial sector. Specific efforts include work with the State of California to promote building energy performance rating to businesses and organizations throughout the state in response to the energy crisis of 2001.

In 2002, EPA will:

- Add new products for the commercial marketplace to the ENERGY STAR family. 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. EPA expects to update specifications for boilers. 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.
- Develop additional energy performance ratings to provide benchmarking capabilities for hotels, discount stores and home centers, and central offices (telephone switching stations).
- Continue to promote the national building energy performance rating system and work with building owners and managers to double the number of buildings rated and the number of buildings that qualified as ENERGY STAR in 2001.
- Release innovative energy and financial performance metrics to Wall Street and the financial community to better assess the impact of energy use on businesses' bottom line.
- Work with restaurant and hotel companies to expand the purchase of ENERGY STAR products to increase energy savings opportunities.
- Continue working with energy service providers to integrate the national building energy performance rating system into their service offerings.
- Continue to collaborate with utilities, states, and regional energy program partners to promote ENERGY STAR's national energy performance rating system, including the launch of new partnerships in the Northeast, Northwest, Midwest, Texas, and California.

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 increasing 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 2001 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 reductions 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.

"General Motors is proud to be part of the ENERGY STAR program, which we believe is an excellent example of a collaborative public-private partnership. EPA's recognition of GM's excellence in energy management reinforces our drive to reduce energy use. These kinds of energy initiatives are good for the environment, good for business, and good for our customers."

— Elizabeth A. Lowery
Vice President, Environment and Energy
General Motors Corporation

ENERGY STAR in the Industrial Sector

ENERGY STAR encourages superior corporate energy management, providing tools and resources specific to meet the needs of manufacturers. In 2001, ENERGY STAR continued its work with the U.S. manufacturing industry; highlights of this activity include:

- Collaborating with partners on concentrated efforts to improve energy performance within two major U.S. industries—motor vehicle assembly and brewing.
- Developing energy performance indices for motor vehicle and brewing facilities.
- Revamping the peer networking opportunities for industrial participants in ENERGY STAR and conducting two national meetings to facilitate peer discussion of effective strategies to reduce energy consumption among participants.
- Welcoming new partners to the program, for a combined total of more than 470 companies representing 14 percent of U.S. industrial energy use.
- Continuing technical support for small and medium size enterprises; more than 40 percent of the partner companies have 100 or fewer employees.

In 2002, EPA will:

- Produce final energy performance indices for motor vehicle assembly and brewing plants and begin development of similar indices for three additional industries.
- Conduct energy performance focus group meetings with the auto and brewing industries.
- Enhance ENERGY STAR in the industrial sector by initiating concentrated efforts to improve energy performance with three new industries.
- Expand the peer-exchange opportunities for U.S. industry and ENERGY STAR partners by improving the national networking meetings and by providing additional settings for such exchanges.
- Continue to partner with industrial organizations, large and small, around a joint goal of improved energy performance.

2001 ENERGY STAR Award Winner

General Motors Corporation

Pontiac, Michigan

General Motors, a world leader in vehicle manufacturing, has a comprehensive corporate energy management program that tracks the energy performance of its business operations worldwide. General Motors established its global Energy and Environment Strategy Board to integrate energy and environmental issues with core business decisions. As a result, its corporate energy program includes (1) aggressive continuous-improvement energy performance goals, (2) a clear procurement policy covering energy purchasing and the acquisition of manufacturing process and building operation equipment, (3) benchmarking of plant energy performance internally as well as with key competitors, and (4) the Energy $avings Project Implementation Process to promote energy projects on equal grounds with other core business operations. General Motors uses its partnership with ENERGY STAR to promote energy performance throughout the corporation. General Motors' corporate energy commitment has saved more than $400 million in the past 6 years and for 2001 expects a reduction of 4.8 trillion BTUs from its 2000 levels. The cost savings for the reduction in 2001 translates to an equivalent profit margin for vehicle sales of $800 million.

ENERGY STAR Award Winners

Partner of the Year—Product Manufacturers

Alside
Cuyahoga Falls, Ohio

Canon U.S.A., Inc.
Lake Success, New York

Good Earth Lighting
Wheeling, Illinois

Maytag Corporation
Newton, Iowa

Panasonic
Secaucus, New Jersey

Philips Lighting Company
Somerset, New Jersey

VELUX America Inc.
Greenwood, South Carolina

Whirlpool Corporation
Benton Harbor, Michigan

Partner of the Year—Retailer

Sears, Roebuck & Co.
Hoffman Estates, Illinois

Change A Light, Change the World Award

GE Lighting
Cleveland, Ohio

Midwest Energy Efficiency Alliance
Chicago, Illinois

OSRAM SYLVANIA
Danvers, Massachusetts

Excellence in Service and Product Provider Performance

Servidyne Systems, LLC
Atlanta, Georgia

Excellence in Energy Management

Arden Realty, Inc.
Los Angeles, California

BJ's Wholesale Club, Inc.
Natick, Massachusetts

Food Lion, LLC
Salisbury, North Carolina

General Motors Corporation
Pontiac, Michigan

Hines
Houston, Texas

Jefferson County Public Schools
Golden, Colorado

Starwood Hotels & Resorts Worldwide, Inc.
White Plains, New York

Excellence in Business and Public Education

Society of Industrial and Office Realtors
Washington, DC

Excellence in New Homes

Reliant Energy HL&P
Houston, Texas

D.R. Wastchak, L.L.C.
Tempe, Arizona

Ence Homes
St. George, Utah

New Jersey ENERGY STAR Homes
Mount Laurel, New Jersey

Vermont Energy Investment Corporation
Burlington, Vermont

Excellence in Manufactured Housing

Champion Enterprises, Inc.
Auburn Hills, Michigan

Excellence in Home Improvement

New York State Energy Research and Development Authority
Albany, New York

Excellence In Consumer Education

Northeast Energy Efficiency Partnerships, Inc.
Lexington, Massachusetts

Northwest Energy Efficiency Alliance
Portland, Oregon

Sacramento Municipal Utility District (SMUD)
Sacramento, California

Wisconsin Energy Conservation Corporation
Madison, Wisconsin

Corporate Commitment Award

Verizon Communications Inc.
New York, New York

Special Recognition Awards

Industry Leadership
Hunter Fans
Memphis, Tennessee

Technical Innovation
Royal Vendors, Inc.
Kearneysville, West Virginia

Online Information
Lowe's Home Improvement
Wilkesboro, North Carolina

"Using renewable energy to reduce our ecological footprint represents one of the cornerstones of Kinko's Environmental Vision Statement. For Kinko's, purchasing green power makes a very real impact in an area that is important to our customers and to our team members."

— Gary Kusin
President and Chief Executive Officer
Kinko's

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.

Combined Heat and Power Partnership

Through its Combined Heat and Power Partnership, EPA works with industry, states and local governments, universities, and other institutional users to facilitate the development of efficient CHP projects. EPA is focusing the bulk of its efforts on small and medium-sized CHP applications by identifying candidate industrial and commercial hosts in select state markets. Partners benefit from technical assistance, networking, peer exchange, and public recognition of their contribution to the environmental benefits of CHP.

2001 Energy Star CHP Award Winner

Cinergy Solutions

Cincinnati, Ohio

In 2001, Cinergy Solutions purchased existing separate heat and power equipment from BP-Texas City and completed a significant overhaul of the equipment. This upgrade allowed Cinergy Solutions to switch the gas turbine and boiler from independent operation to run as a combined heat and power unit. The 13-MW gas turbine CHP unit uses 17 percent less fuel than onsite thermal generation and purchased electricity. Using this comparison, this project annually reduces carbon dioxide emissions by 78,000 tons, saves the energy equivalent of 160,000 barrels of oil, reduces nitrogen oxide emissions by 40 tons, and saves the economy $2.5 million in fuel costs.

In 2001, the CHP Partnership:

- Launched its program in October with 18 founding partners representing a variety of industrial sectors.
- Assisted in regulatory streamlining via the issuance of draft guidance for source definition under EPA's New Source Review Program.
- Published a catalog of technologies to provide information to air regulators, end users, and others about the emission profiles, operating characteristics, and efficiencies of a variety of onsite generation technologies.

In 2002, EPA will:

- Launch the CHP Partnership's Web site (www.epa.gov/chp) as a one-stop shop for information about CHP project development.
- Work with DOE and the U.S. Combined Heat and Power Association to sponsor a series of national meetings to address key issues related to CHP project development.
- Enlist up to 40 new partners.
- Assist in finalizing the draft guidance for source definition under EPA's New Source Review Program.
- Co-sponsor state-specific CHP workshops that bring together energy and environmental regulators, industry, and interested CHP developers in Illinois and New York.
- Provide direct project assistance to as many as 10 new CHP projects across the country.

MIT Cogen Facility

"The MIT 'Cogen' project provided a special opportunity for MIT's environmental and energy research to be applied full scale at home. It provides benefits of electrical reliability, fuel cost stability, and greatly reduced environmental impact. We appreciate EPA's CHP ENERGY STAR award for the positive reinforcement it provides in support of MIT's goal to be a model environmental citizen."

— Peter L. Cooper
Director of Utilities, Department of Facilities
Massachusetts Institute of Technology

2001 ENERGY STAR CHP Award Winner

Massachusetts Institute of Technology

Cambridge, Massachusetts

MIT In 1995, the Massachusetts Institute of Technology (MIT) completed installation of a 21-MW gas turbine with a heat recovery steam generator. The turbine incorporates a dry, low NO_x combustor technology, which was developed at MIT, to lower nitrogen oxide emissions while avoiding the expense, power losses, and ammonia emissions from typical end of pipe controls. MIT's central CHP facility provides power, process steam, heating, and cooling to the campus and uses 28 percent less fuel than onsite thermal generation and purchased electricity. Using this comparison, this project annually reduces carbon dioxide emissions by 72,000 tons, saves the energy equivalent of 120,000 barrels of oil, reduces nitrogen oxide emissions by 240 tons, and saves the economy $1.7 million in fuel costs.

"The key reason we joined the Green Power Partnership is that by buying renewable energy we can help reduce our dependence on fossil fuels. Buying green power is another way to demonstrate that what's good for people and the environment is good business."

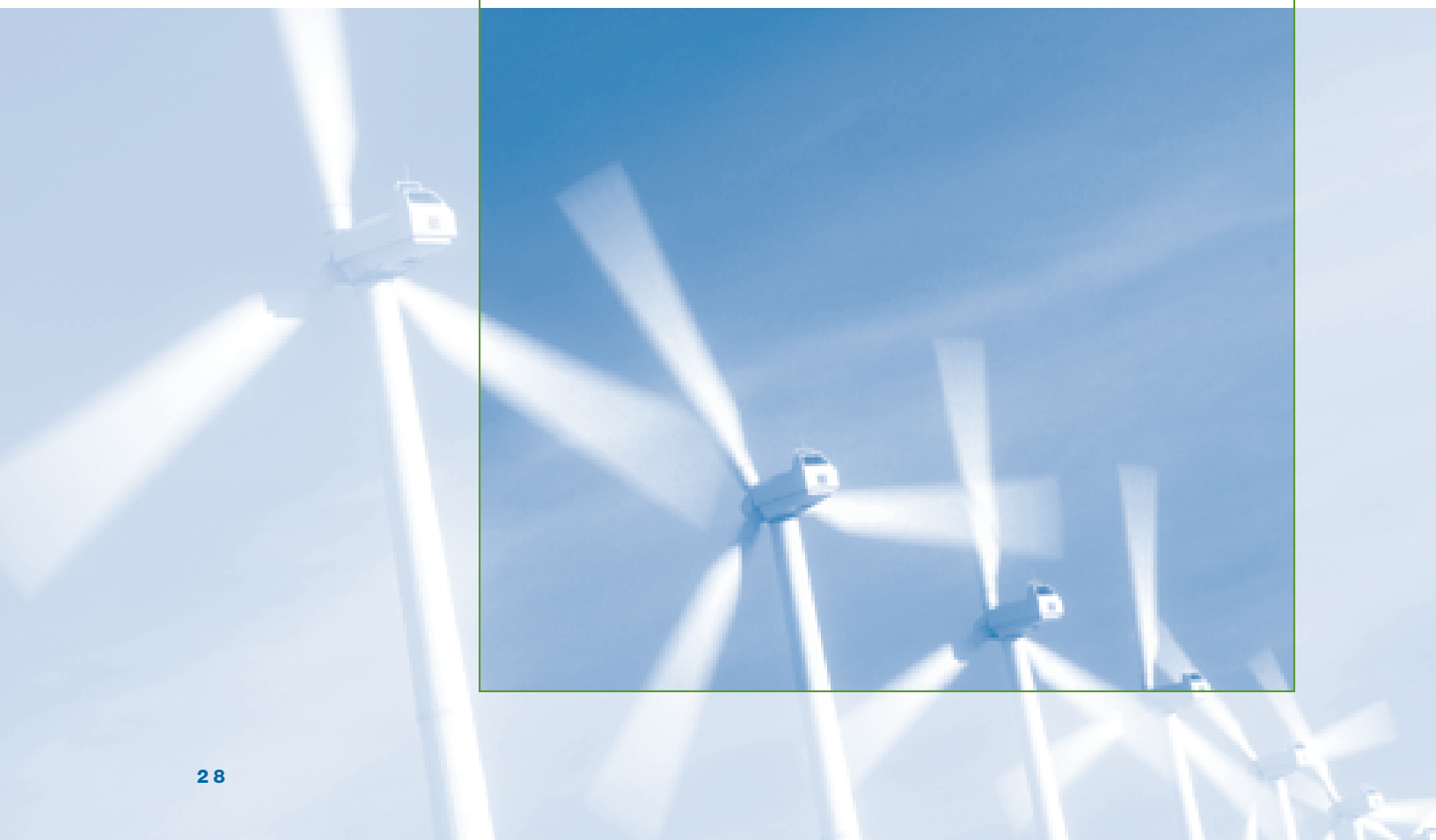
— Fred Kelle
Chairman and CEO
Cascade Engineering

Green Power Partnership

The Green Power Partnership, a new voluntary program developed to take advantage of the pollution prevention opportunity created by the increasing availability of green power, is working to standardize green power procurement as part of best practice environmental management. Partners sign a one-page Letter of Intent making a commitment to switch a specific percentage of their electricity to renewable sources within one year. In return, EPA provides technical assistance and recognition.

In 2001, the Green Power Partnership:

- Launched in July with 20 companies, government agencies, and other organizations making a commitment to green power.
- Provided national recognition to leading green power purchasers through the Green Power Leadership Awards.
- Developed a Web site (www.epa.gov/greenpower) to provide technical, market, and public recognition information related to green power.
- Published E-GRID 2000, updating the existing comprehensive E-GRID database of air emissions for the U.S. electric generation industry.



In 2002, EPA will:

- Recruit at least 40 additional partners willing to make a green power purchase commitment.
- Launch a Provider Partners program to integrate green power marketers, utility green pricing programs, and tradable renewable certificate vendors into the partnership.
- Publish a green power procurement guide, case studies, and other materials that help organizations understand the benefits and costs of green power options.
- Publish a Web-based tool that allows electricity users to understand the emission impacts associated with the electricity they consume.

Wind Farm Under Construction

"EPA's Green Power Partnership bridged the gap between supplier and customer, enabling Bay Windpower to build Michigan's largest wind farm. Bay Windpower I, our Mackinaw City Project, is up, on line, below budget, and 'sold out.' We are currently developing more than 100 MW of new projects to protect our Great Lakes for future generations."

— Rich Vander Veen, President
Bay Windpower, L.L.C.

Partnership Commitments Spur Construction of New Wind Turbines

The Green Power Partnership builds demand for green power among consumers of electricity, ultimately leading to the development of new renewable capacity. Founding partners, Cascade Engineering and Steelcase, Inc., will rely on the electricity produced by a new wind farm in Mackinaw, Michigan, developed by Bay Windpower. Their commitment to purchasing green power was a significant economic factor enabling the creation of the wind farm project. Such commitments are an essential ingredient to developing additional clean energy resources.

2001 Green Power Leadership Awards

In July 2001, the Green Power Partnership, in collaboration with DOE and the Center for Resource Solutions, presented the First Annual Green Power Leadership Awards.

Green power purchaser awards were given to:

Kinko's
Ventura, California

New Belgium Brewing Company
Santa Monica, California

University of Colorado
Boulder, Colorado

Toyota Motor Sales, USA
Torrance, California

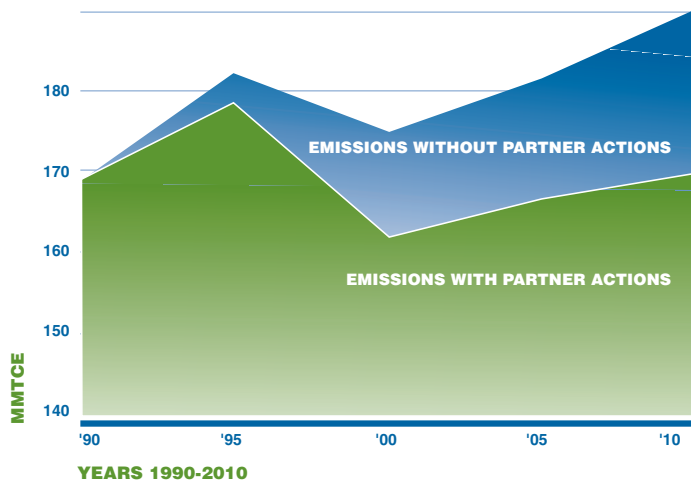
Carnegie Mellon University
Pittsburgh, Pennsylvania

Fetzer Vineyards
Hopland, California

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, however, 21 times more effective at trapping heat in the atmosphere than one ton of CO_2. At the same time, methane is also a valuable source of energy, being the major component of natural gas.

FIGURE 7.
Partner actions are projected to maintain methane emissions below 1990 levels through 2010



Source: EPA Climate Protection Partnerships Division

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 the Landfill Methane Outreach Program, Natural Gas STAR Program, and Coalbed Methane Outreach Program. 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 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 2001, and they are projected to maintain emissions below 1990 levels through 2010.

Landfill Methane Outreach Program

Landfills are the largest source of U.S. human-related (anthropogenic) methane emissions. Capture and use of landfill gas not only reduces methane emissions directly, but also reduces CO_2 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 as an energy source. Working with landfill owners, state energy and environmental agencies, energy suppliers, industry, communities, and other stakeholders, LMOP lowers the barriers to landfill gas-to-energy project development.

Launched in December 1994, LMOP achieved significant reductions through 2001, reducing methane emissions from landfills by 3.7 MMTCE in 2001 alone. The number of landfill gas-to-energy projects grew to almost 325 by the end of 2001.

LMOP focuses its outreach efforts on smaller landfills not regulated by EPA's New Source Performance Standards and Emission Guidelines. The program's varied tools help landfill owners and operators overcome barriers to project development. Such tools include 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 2001, LMOP:

- Assisted in the development of 23 new landfill gas-to-energy projects, with more than 40 additional projects under construction and expected to be online soon.
- Signed on 39 new partners, bringing the total number of LMOP partners to 285.
- Awarded two competitive grants designed to spur innovative project development at smaller landfills to the County of Chesterfield, Virginia, and the Blue Ridge Resource Conservation and Development Council of Sugar Grove, North Carolina.

In 2002, EPA will:

- Host seven state-specific workshops to present the benefits of landfill gas energy recovery, discuss project development activity and opportunities, and address state-specific issues affecting landfill gas projects.
- Establish a Green Power Strategy to identify new project development opportunities presented by the growing market for green power.

"The project demonstrates a successful public-private sector partnership, and the value of a single company's commitment to environmental protection."

— Tom Jennings
Manager of Power & Utilities
Rolls-Royce

LMOP 2001 Award Winners

Project of the Year: Middlesex County Utility Authority Landfill Gas-to-Energy Project

Middlesex, New Jersey

This project stemmed from a successful partnership between the National Energy Resource Corporation (NERC) and the Middlesex Generating Company, LLC. NERC targeted three large landfills to supply landfill gas to fuel the County's wastewater treatment operations and provide power to the grid. National Energy Resource Corporation applied path-breaking finance and development strategies over 5 years to overcome numerous implementation barriers. NERC's successful approaches included innovative permitting, regulatory, and sales agreement strategies. Today the landfill gas production facilities at the Middlesex, Edison, and Industrial Land Reclaiming landfills are connected by an 8-mile underground pipeline running beneath the Raritan River to the largest landfill gas-fueled advance-stage energy center east of the Mississippi. The environmental benefits of the project's energy production include displacing 18 MW of fossil-fueled power and reducing greenhouse gas emissions by more than 1.6 million tons of carbon dioxide equivalent through the year 2000.

Project of the Year: Lopez Canyon Landfill Project City of Los Angeles, Bureau of Sanitation

Los Angeles, California

Initiated by the City of Los Angeles, Bureau of Sanitation, this project involves the collection and use of landfill gas for energy at three landfill sites in southern California, and financing an Environmental Awareness Center for the city. The Bureau persevered for 13 years to overcome a number of barriers to the project's development, including an unfavorable electric power market, geological site conditions (seismic faults), and numerous regulatory and financial hurdles. In 1998, the first energy production facility at Lopez Canyon was brought online and is now generating 6 MW of power. The City of Los Angeles manages the site's operation and maintenance, as well as a new Environmental Awareness Center that educates students and local residents about environmental conservation. In early 2001, the City constructed a 1.5-MW microturbine energy facility consisting of 50, 30-kilowatt microturbines. Scheduled to begin operating in the latter part of 2002, Lopez Canyon Microturbine energy facility is the largest of its kind in the world.

Partner of the Year: Horry County Solid Waste Authority, Inc.

Conway, South Carolina

Horry County successfully opened the state's first landfill gas-to-energy project on September 4, 2001, at its landfill in Conway, South Carolina. State-owned utility Santee Cooper partnered with the Horry County Solid Waste Authority, Horry Electric Cooperative, and Central Electric Power Cooperative to develop this innovative and environmentally beneficial energy project. It currently hosts two generators, with the possibility of adding two more. At full capacity, the 2.2-MW plant will reduce emissions of methane equivalent to planting over 80 million pine trees in a reforestation project. This provides the state with its first landfill gas project and its first green power generating station and green pricing program. Residential customers may purchase the landfill gas in blocks of 100 kWh, and commercial customers in blocks of 200 kWh. The gas is offered at a premium of 3 cents per kWh. One hundred percent of the revenue will be applied to future green power projects, providing customers an opportunity to support the development of renewable energy resources.

Industry Ally of the Year: Granger Energy–South Side Landfill Gas-to-Energy Project with Rolls Royce

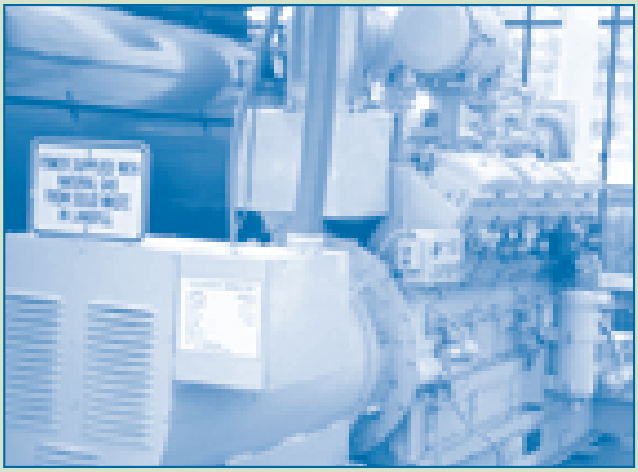
Indianapolis, Indiana

At the South Side Landfill in Indianapolis—the first landfill in Indiana to establish a gas project—Granger Energy worked with Rolls-Royce to supply landfill gas for the manufacturer's Indianapolis operational facilities. As part of the project, Rolls-Royce converted three of its large industrial steam producing boilers to accommodate the use of landfill methane in aircraft engine manufacturing operations. In 2001, Rolls-Royce also modified a 5-MW turbine that generates electricity for onsite use to run on landfill gas. Since the project was developed, Rolls-Royce has saved nearly $2 million in fuel costs, and in the year 2000 reduced emissions of greenhouse gases by over 240,000 tons of carbon dioxide equivalent, compared with their former natural gas use. Supported by the City of Indianapolis, the Mayor's office, and the Indiana Department of Environmental Management, this project received a Governor's Award in 2000 for Excellence in Pollution Prevention, as well as recognition from the Department of Energy for reduction in greenhouse gas emissions.

Energy Ally of the Year: International Truck and Engine Corporation, Springfield Assembly Plant

Springfield, Ohio

Springfield Gas Company, Inc., an independently owned company specializing in landfill gas extraction, partnered with International Truck and Engine Corporation's Springfield Assembly Plant to use landfill methane from the Tremont City sanitary landfill to fuel operations at the plant. Both partners adopted a proactive community outreach strategy to overcome the barriers to project development. International is now using the landfill gas in process paint ovens, hot water boilers, and other units. The use of landfill gas in radiant heat surface coating ovens is believed to be the first of its kind in an industrial application. The project allows the plant to replace purchased natural gas with the landfill methane, saving an estimated $100,000 annually and reducing greenhouse gas emissions from the landfill by the equivalent of 150,000 tons per year of carbon dioxide.



Granger Energy–South Side Landfill

" We value our partnership with LMOP—they serve as a great resource for the LFG industry."

— Joel Zylstra, President
Granger Energy Company

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 the 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 2001, reducing methane emissions from natural gas systems by 4.6 MMTCE in 2001 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 positive feedback from partners, demonstrates the effectiveness of these tools in promoting methane reduction activities.

"Participation in Gas STAR helps El Paso Energy achieve our corporate goal of combining outstanding business performance with outstanding environmental performance. Participation in Gas STAR makes perfect environmental and business sense."

— Greg Odegard
Vice President of Environmental Health and Safety
El Paso Energy Corporation

In 2001, Natural Gas STAR:

- Represented 58 percent industry participation across all major sectors (production, processing, transmission, and distribution).
- Partnered with 11 new companies, bringing the total number of partners to 94.
- Successfully implemented a new online reporting system to enhance program implementation.

- Completed an evaluation of gas recovery opportunities from gas processing plants that identified significant economic potential for reducing methane losses through directed inspection and maintenance programs.

In 2002, EPA will:

- Expand Natural Gas STAR in all sectors to represent 59 percent industry participation.
- Launch a series of technology transfer workshops for the natural gas processing sector.
- Initiate a 2-year study to identify additional cost-effective methane emission reduction opportunities from the gas production and processing sectors.

Natural Gas STAR 2001 Partners of the Year

BP

Houston, Texas

BP received the 2001 Natural Gas STAR Producer Partner of the Year award for achieving cumulative program reductions of 3.3 billion cubic feet (Bcf) of methane emissions and for outstanding support of the goals of the Natural Gas STAR Program. In its 2000 Annual Report, BP reported 616 million cubic feet (Mmcf) of new emission reductions, bringing its annual emission reduction total to 1.7 Bcf. Since BP joined Natural Gas STAR in 1998, the company has identified and implemented many innovative emission reduction opportunities. In addition, BP was instrumental in assisting the expansion of the program to the gas processing sector and participated in an EPA-sponsored study of emission reduction opportunities from gas processing plants. BP has supported the program's regional technology transfer workshops and has contributed to the development of technical materials, including EPA's Lessons Learned studies and Partner Reported Opportunity (PRO) Fact Sheets.

Columbia Gas Transmission and Columbia Gulf Transmission

Merrillville, Indiana

Columbia Gas Transmission Corp. and Columbia Gulf Transmission Co., subsidiaries of NiSource, Inc., were named 2001 Transmission Partners of the Year. EPA honored the companies for excellent program implementation, outreach efforts, and contributions in the area of technology transfer. In their 2000 Annual Report, Columbia Gas Transmission and Columbia Gulf Transmission reported annual emission reductions of 3.5 Bcf of methane. To date, the pipeline companies have reported methane savings of more than 13.2 Bcf. Columbia Gas Transmission and Columbia Gulf Transmission have also identified and implemented more than 10 innovative emission reduction technologies and practices. They have been aggressive in communicating the benefits of the Natural Gas STAR Program to other companies and have contributed to the development of PRO Fact Sheets and case studies.

PECO Energy

Philadelphia, Pennsylvania

PECO Energy received the 2001 Natural Gas STAR Distribution Partner of the Year award. Since joining the Natural Gas STAR Program in 1995, the company has reported cumulative reductions of approximately 46 Mmcf of methane emissions. In its 2000 Annual Report, PECO reported emission reductions of 9 Mmcf—the result of successfully implementing many PROs such as testing gate station pressure relief valves with nitrogen instead of methane, optimizing the operation of high-pressure distribution systems, and implementing a random meter calibration program. PECO has been a strong participant in Natural Gas STAR Program-sponsored activities and has contributed to journal articles and development of the program's technical materials.

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 (CMM) projects. Outreach efforts focus on providing high-quality, project-specific information. CMOP has achieved significant results through 2001.

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 2001. 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.

Following 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 Bcf of methane annually. CMOP is collaborating 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 gassy U.S. underground coal mine to apply these tools and facilitate projects which achieved a reduction of 2.3 MMTCE in 2001.

In 2001, CMOP:

- Helped reduce methane emissions at 23 project sites by providing high-quality, project-specific information to mine operators, project developers, and other stakeholders.
- Supported the development of the largest CMM energy generation project in the world, a CMM fueled 88-MW electricity generating station. The project is a joint venture between CONSOL Energy Inc. and Allegheny Energy Inc., in Buchanan County, Virginia.
- Successfully promoted a small-scale demonstration of ventilation air oxidation technology in Australia.

In 2002, EPA will:

- Begin implementing the first commercial-scale demonstration of ventilation air oxidation technology in the United States.
- Develop the first U.S. methane emission inventory for abandoned coal mines and assess the cost-effective emission reduction opportunities.
- Evaluate the emerging market for ventilation air methane projects domestically and abroad, including the identification of new technologies and the assessment of project costs and benefits.

"This award demonstrates that commercial success in the energy business need not come at the expense of the environment. We are honored to receive this award, and pleased with the Administrator's continued support and encouragement of our coalbed methane commercialization efforts."

— J. Brett Harvey
President and Chief Executive Officer
CONSOL Energy Inc.

CONSOL Energy–Coal Mine Methane Power Project

CONSOL Energy Inc.

Pittsburgh, Pennsylvania

CONSOL Energy Inc. received EPA's Climate Protection Award for work in recovering and using coal mine methane. CONSOL Energy is an international industry leader in producing pipeline quality coalbed methane for sale. The company produces an average 123 Mcf of gas daily, from operations in southwestern Virginia, southwestern Pennsylvania, and northern West Virginia. CONSOL Energy's coal mine methane-specific recovery operations accounted for two-thirds of the U.S. coal industry's avoided emissions in 2000.

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 online reporting form, and EPA works with partners to verify these data.

Landfill Methane Outreach

EPA works with all stakeholders to compile up-to-date annual 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 from degasification systems. 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. In the future, the program will also be reporting emission reductions from ventilation air methane reduction projects.

TABLE 4.
Methane Programs: annual goals and achievements

	2001 Goal	2001 Achievement	2002 Goal
LMOP			
Number of Projects	225	214	235
Annual Methane Reductions (MMTCE)	3.7	3.7	3.9
Natural Gas STAR[1]			
Industry Participation (% in program)	——	58%	59%
Annual Gas Savings (MMTCE)	4.4	4.6	4.6
CMOP[2]			
Annual Methane Reductions (MMTCE)	2.0	2.3	2.1

[1] A new metric for industry participation is being applied for 2001 that assesses industry-wide involvement in the program across all major sectors (production, processing, transmission, and distribution).

[2] Revisions to the methodology for determining program achievements and emission reduction goals are currently under consideration. EPA anticipates applying these changes in 2002, which will facilitate a more accurate calculation of emissions and emission 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 2001, EPA and USDA:

- Assisted swine and cattle producers in projects that produced about 14 million kWh/year of renewable energy from farms capturing methane—energy then used by the farm and local community.
- Increased recognition of anaerobic digestion viability at commercial swine and dairy farms.
- Assisted states, including California and New York, in developing programs and policies for the broader deployment of methane-capturing technologies.

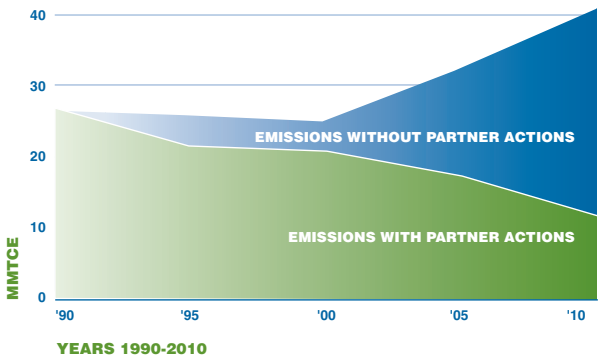
In 2002, EPA and USDA will:

- Continue the expansion of methane-reducing technologies in the livestock sector to help ensure clean water and air.
- Collaborate with state energy programs in the western, northeastern, southeastern and mid-western regions to facilitate the development of anaerobic digesters as renewable energy resources.

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 their industrial processes to reduce emissions of perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF_6)—all particularly potent greenhouse gases. When compared ton-for-ton with CO_2, they trap much more heat in the atmosphere. PFCs and SF_6 also have very long atmospheric lifetimes. Despite the potential for sizable growth in high GWP greenhouse gas emissions, these partner industries are expected to maintain emissions below 1990 levels through the year 2010.

FIGURE 8.
Partner actions can maintain voluntary program sector 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 (VAIP)

The primary aluminum producers are collaborating with EPA to reduce emissions of PFCs emitted as a byproduct of the smelting process. The goal is to reduce perfluoromethane (CF_4) and perfluoroethane (C_2F_6) where technically feasible and cost effective. Since the partnership began in 1996, participating industries have had notable success in characterizing the emissions from their smelter operations and reducing overall emissions.

U.S. Voluntary Partnership Catalyzes Groundbreaking Global Industry Commitment to Climate Protection

EPA launched the PFC Emission Reduction Partnership for the Semiconductor Industry in 1996. While the partnership's initial focus was reducing PFC emissions from U.S. semiconductor fabrication plants, EPA and its industry partners quickly recognized the advantage of addressing this global environmental challenge through international cooperation. The partnership also sought to maintain a "level playing field" for the multinational partner companies and thus encouraged other nations' governments to develop similar voluntary initiatives. Japan was the second country to establish a voluntary partnership following a Pathfinder's Meeting organized by Japan's Ministry of International Trade and Industry and EPA in 1996. With the United States and Japan gaining momentum in coordinating PFC emission reduction activities, the remaining major semiconductor producers including Europe, Korea, and Taiwan joined the effort soon thereafter.

Industry representatives from the United States and Japan communicated the importance of protecting the climate to the World Semiconductor Council (WSC). The WSC, whose members include the national semiconductor industry associations of Europe, Japan, Korea, Taiwan, and the United States, identified PFC emission reduction as its top environmental challenge.

In April 1999, WSC members proudly announced a technically challenging goal to reduce PFC emissions by at least 10 percent below the 1995 baseline level by year-end 2010. The WSC's goal represents the first greenhouse gas emission reduction target for an entire global industry. This type of responsibly aggressive goal setting assures international governments, industry suppliers, and the public of the industry's commitment to protect the climate.

The partnership achieved its initial goal to reduce emissions by 30 to 60 percent from 1990 levels by 2000 and has now extended work to 2005.

In 2001, the Voluntary Aluminum Industrial Partnership:

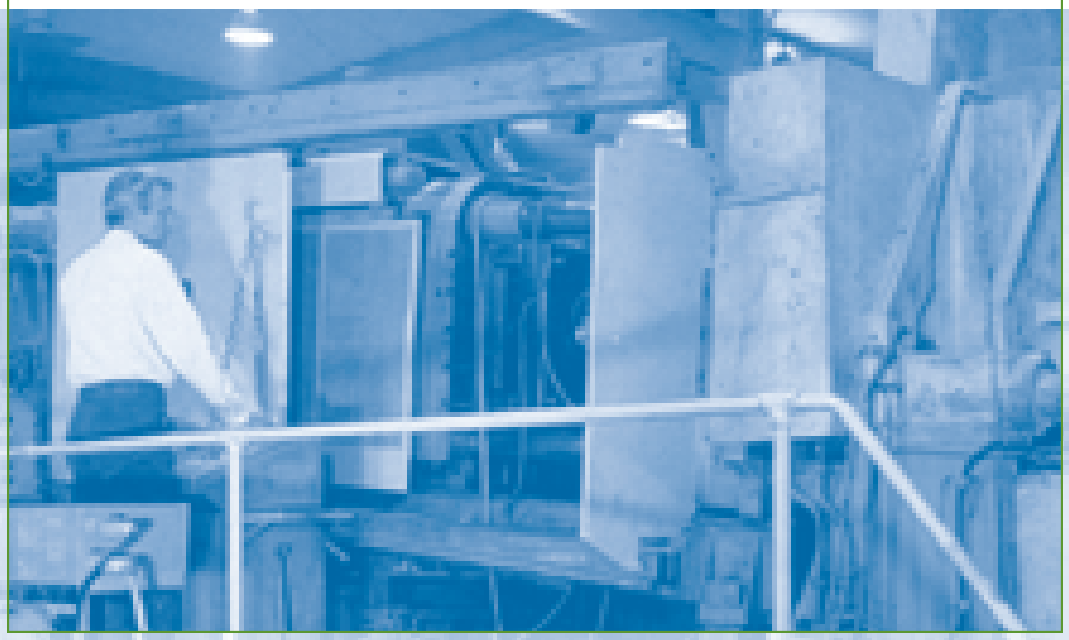
- Completed analysis and a spreadsheet tool on the "Cost of an Anode Effect." The work helps producers analyze the financial benefits of avoiding anode effects based on smelter-specific process data.
- Completed, in collaboration with the London-based International Aluminum Institute, a standardized smelter-specific PFC measurement protocol to help improve the consistency and comparability of global emissions data.
- Continued work with eight of the nine U.S. primary aluminum producers to better understand the generation of PFCs in the smelting process and to quantify smelter-specific emissions.

HFC-23 Emission Reduction Program

Industry is working with EPA to reduce emissions of the potent greenhouse gas, HFC-23, which is generated as a byproduct in the manufacture of the refrigerant 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.

Partners have reduced emissions of HFC-23 through process optimization and thermal destruction. Their efforts have helped reduce the intensity of HFC-23 emissions (the amount of HFC-23 emitted per kilogram of HCFC-22 manufactured) significantly. Despite a considerable increase in production since 1990, total emissions are below 1990 levels—a reduction of 5.1 MMTCE compared to business-as-usual.

In 2001, 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 hydrofluorocarbons.



The PFC Emission Reduction Partnership for the Semiconductor Industry

Since 1996, this partnership has served as a catalyst for semiconductor companies in Europe, Japan, Korea, Taiwan, and the United States to jointly set the first global target for reducing greenhouse gas emissions. Collaborating with EPA, these companies have identified and implemented process changes and manufacturing tool improvements in the production of integrated circuits to reduce emissions of PFCs.

In 2001, EPA worked closely with the partners to establish a data quality review process, enhanced emissions projections by developing an emission vintaging model, and co-authored with Japanese, European, and U.S. industry representatives a status report on semiconductor PFC emission reduction efforts for the Third International Symposium on Non-CO_2 Greenhouse Gases in Maastricht, The Netherlands.

SF_6 Emissions Reduction Partnership for Electric Power Systems

Initiated in 1999, this partnership provides a forum for the electric power industry to work with the U.S. government to reduce sulfur hexafluoride (SF_6) emissions to technically and economically feasible levels through identifying and encouraging adoption of best management practices.

In 2001, EPA:

- Expanded this effort to reduce SF_6 emissions to 63 partners, representing nearly 45 percent of net generating capacity. More than 80 percent of SF_6 sales are to this sector (utilities and electrical equipment manufacturers).
- Enhanced web site (www.epa.gov/highgwp1/sf6) resource offerings with SF_6 handling guidelines.

SF_6 Emission Reduction Partnership for the Magnesium Industry

The U.S. magnesium industry is working with EPA to identify and encourage the adoption of best management practices for reducing emissions of sulfur hexafluoride (SF_6), a potent heat trapping pollutant. This partnership to reduce emissions from magnesium production and casting operations already represents approximately 80 percent of U.S. magnesium industry emissions.

In 2001, EPA:

- Expanded the magnesium industry partnership to reduce SF_6 emissions to 16 partners, representing 100 percent of primary magnesium production and 80 percent of domestic casting capacity.
- Received the second annual emission reports from magnesium partners. Emission estimates are reported using software designed by EPA with input from the partners. EPA published the partnership's achievements and "Lessons Learned" in an annual report.

Mobile Air Conditioning Climate Protection Partnership

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 part of "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 four goals:

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

Bonneville Power Administration

Bonneville Power Administration (BPA), a power transmission system, provides service and power to Oregon, Washington, Idaho, and portions of Wyoming, Nevada, Utah, California, and Montana. BPA owns and operates more than three-quarters of the high-voltage transmission grid in the Pacific Northwest, which stretches across a service area of 300,000 square miles. In 2001, SF_6 loss from leaking equipment was reduced by 2,765 lbs. This represented a 62-percent reduction compared to BPA's previous emissions report and one of the largest percentage improvements by any partner in the SF_6 Emissions Reduction Partnership for Electric Power Systems. BPA has found that system reliability improves as SF_6 equipment integrity improves, and that monitoring of SF_6 equipment leads to the discovery of potential problems before they become critical failures.

- To communicate technical progress to policy makers and the public.
- To document the current and near-future opportunities to improve the environmental performance of mobile air conditioning system design, operation, and maintenance.

In 2001, this partnership benchmarked HFC-134a systems for energy efficiency and is using this information to compare the climate performance of CO_2 systems. SAE draft standards for new refrigerants are near completion and scheduled for global acceptance. The partnership has held meetings in Europe and North America, and organized the July 9-11, 2002 "Automotive Alternate Refrigerant Symposium." This symposium will feature road tests of prototype motor vehicles using HC, HCFC-152a, and CO_2 refrigerants, as well as dozens of technical papers.

TABLE 5.
Stewardship Programs: annual goals and achievements

	2001 Goal	2001 Achievement	2002 Goal
Voluntary Aluminum Industrial Partnership			
Industry Participation (% in program)	—	95%	95%
Reductions (MMTCE)	1.9	1.9	2
HCFC-22			
Industry Participation (% in program)	—	100%	100%
Reductions (MMTCE)	4.6*	5.1	4.7*
Other Stewardship Programs* **			
Industry Participation (% in program)	—	50 – 100%**	60 – 100%
Reductions (MMTCE)	0.4	0.4	0.8

* These goals have been adjusted downward to reflect lower than expected HCFC-22 production in 2001 and the closure of one of the four U.S. HCFC-22 plants. The 2001 industry average HFC-23 emission factor actually declined more than expected.

** Participation varies from 50% of net generating capacity for electric power systems to 100% for primary magnesium producers.

*** Lower than expected production or actual production declines in the aluminum, magnesium, and semiconductor industries have decreased the actual and expected achievements of these sectors.

In 2002, the High GWP Environmental Stewardship Programs will:

- Negotiate a new agreement with the aluminum industry 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.
- Expand the SF_6 Emissions Reduction Partnership for Electric Power Systems (utilities) to 80, representing 60 percent of the industry's net generating capacity, and develop relationships with electrical equipment manufacturers to further reduce SF_6 emissions.
- Announce an emission reduction goal for the SF_6 Emission Reduction Partnership for the Magnesium Industry at EPA's second conference on SF_6 and the Environment in November. Continue to 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 ozone-depleting substance replacement industries.
- Continue to explore and document the performance of new vehicle air conditioning designs.

International Climate Protection Award Winners

Since 1998, 68 individuals, companies, and organizations from 12 countries have earned EPA's Climate Protection Award honoring outstanding accomplishments in protecting the Earth's climate. The 20 award recipients have demonstrated their commitment to the environment through innovation in engineering, policy, and marketing. Their leadership will reduce greenhouse gas emissions and inspire others to do their part. This year's winners are from Canada, Chile, Italy, Japan, and the United States.

Corporate and Governmental Awards

Air Products and Chemicals, Inc.
Allentown, Pennsylvania

City of Portland, Oregon
Portland, Oregon

C2D, US Army CECOM RD&E Center
Belvoir, Virginia

CONSOL Energy Inc.
Pittsburgh, Pennsylvania

DuPont
Wilmington, Delaware

Hitachi, Ltd. and Hitachi America, Ltd.
Dallas, Texas

NJDEP/DSRT Office of Innovative Technology
Trenton, New Jersey

Ontario Power Generation's Energy Efficiency Program
Ontario, Canada

Shaklee Corporation
Pleasanton, California

Verizon Communications Inc.
Newark, New Jersey

Association, Partnership, and Team Awards

CO_2 Hot Water Supply Unit Design Team
Kariya-shi, Japan

International SEMATECH's PFC Emission Reduction Working Group
Austin, Texas

Land and Water Fund of the Rockies
Boulder, Colorado

Voluntary Aluminum Industrial Partnership for PFC Reductions
Washington, DC

Individual Awards

Dr. Fabio R. Borri, STMicroelectronics
Brianza, Italy

Dr. Luis Abdón Cifuentes, Pontifica Universidad Catolica de Chile
Santiago, Chile

Yoshinobu Hayakawa, NEC Corporation
Kawasaki, Japan

Rev. Richard L. Killmer, National Council of the Churches of Christ
New York, New York

Robert L. Markle, U.S. Coast Guard
Washington, DC

Robert T. Wickham, Delegate, UN International Maritime Organization
Stratham, New Hampshire

"The Aluminum Association and its members are proud of our voluntary partnership with EPA. It was the right thing to do, and it has resulted in a more than 40 percent PFC emission reduction over the past decade. We are committed to further reductions because we and our 145,000 employees want to leave the earth a better place for our children."

— Brian W. Sturgell
Executive Vice President, Alcan Inc.

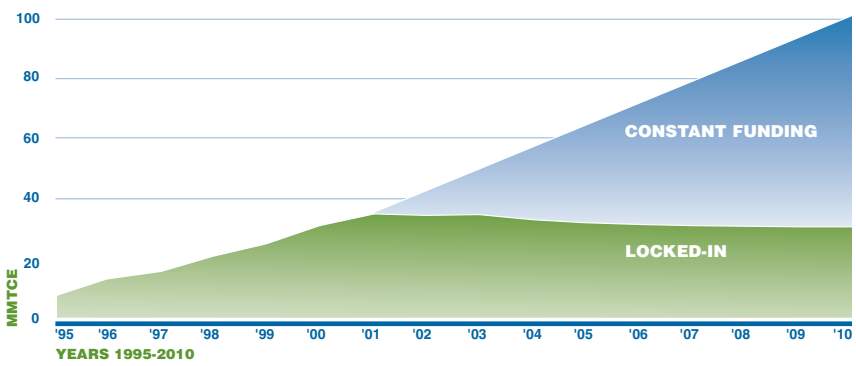
EXPECTATIONS FOR 2002 AND BEYOND

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 partnerships to benefit our planet and its people by continuing to reduce local and global air pollution.

EPA plans to:

- Encourage more businesses to become Climate Leaders by creating corporate-wide inventories and setting aggressive greenhouse gas emissions reduction goals.
- Add products and services to the ENERGY STAR family, as well as review and update performance specifications for product areas already labeled.
- 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 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 hotels, warehouses, convenience stores, and industrial facilities.
- Establish additional partnerships with more businesses and organizations, focusing particularly on state and local governments, and school districts.
- 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 maintain emissions below 1990 levels.

FIGURE 9.
Annual reductions in greenhouse gas emissions can be more than doubled by 2010



Source: EPA Climate Protection Partnerships Division

All of EPA's Climate Protection Programs are designed to achieve long-term greenhouse gas emission reduction goals, which were set through an interagency process in 2001 and communicated to the Secretariat of the Framework Convention on Climate Change in the *U.S. Climate Action Report 2002*. In 2010, the programs represented in this report are expected to reduce greenhouse gas emissions by more than 100 MMTCE compared to business-as-usual (see Figure 9).[5]

[5] EPA estimates the reduction in greenhouse gas emissions across the entire set of climate programs to be about 180 MMTCE in 2010.

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Endnotes for Table 2

NPV of Bill Savings. Each total represents the net present value (NPV) of the total savings in energy bills, in 2001 dollars, realized by partners or purchasers of ENERGY STAR labeled products through 2012. Many of these investments, such as the building improvements associated with ENERGY STAR, have lifetimes as long as 15 years. A cut-off of 2012 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.

NPV of Technology Expenditures. Each total represents the NPV of costs to partners, in 2001 dollars, of their investments in energy efficiency, including the cost of financing the investment over its life at a 4.0-percent real rate of interest. These expenditures include any price premium, and the cost of financing that premium, for the purchase of ENERGY STAR labeled products. The benefits of these capital expenditures or 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 2002 and 2012. Four 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.*

NPV of Net Savings. Net Savings is the difference between Bill Savings and Technology Expenditures. For ENERGY STAR partners and consumers, each total represents the NPV of using ENERGY STAR products. For methane partners it represents the NPV of the income stream generated by their projects.

MMTCE. Each total under Million Metric Tons of Carbon Equivalent represents the amount of carbon emission equivalents avoided by the investment and use of energy-efficient products through 2012 plus the emissions avoided by the methane programs and by the programs that reduce 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 CO_2/kWh; in 2005, it is assumed to be 1.20 lbs CO_2/kWh; and in 2010, it drops to 1.09 lbs CO_2/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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