



# Green Lights Program



## A Bright Investment in the Environment

The U.S. Environmental Protection Agency's (EPA's) Green Lights Program is a breath of fresh air for the nation's environmental health and economic growth. Green Lights, a voluntary program that encourages the widespread use of energy-efficient lighting, is proving that environment and industry can work together to create a cost-efficient and environmentally aware America.

As part of this unique partnership, Green Lights participants—including corporations, environmental groups, electric utilities, and state, city, and local governments—have come

together to promote the widespread use of efficient lighting systems that reduce pollution. By investing in these technologies Green Lights participants realize average returns of 25 percent with average savings in lighting electricity bills of 50 percent or more. Through the use of these technologies, partners are reducing emissions of pollutants associated with global warming, acid rain, and smog.

As the first of similar market-driven, non-regulatory "green" programs sponsored by EPA, Green Lights is revolutionizing the way America cleans up the environment.

## Energy-Efficient Lighting Prevents Pollution

Increased energy efficiency is the cornerstone of EPA's new pollution prevention strategy. Green Lights encourages voluntary reductions in energy use through revolutionary lighting technologies.

The process by which energy-efficient lighting reduces pollution is simple. Lighting accounts for 20-25 percent of electricity used annually in the United States. Lighting for industry, businesses, offices, and warehouses represents 80-90 percent of total lighting electricity use.

Generating electricity involves the burning of fossil fuels or running a nuclear reactor or hydroelectric plant. These processes often result in various types of pollution, including acid mine drainage, oil spills, natural gas leakage, toxic waste, and air pollutants.

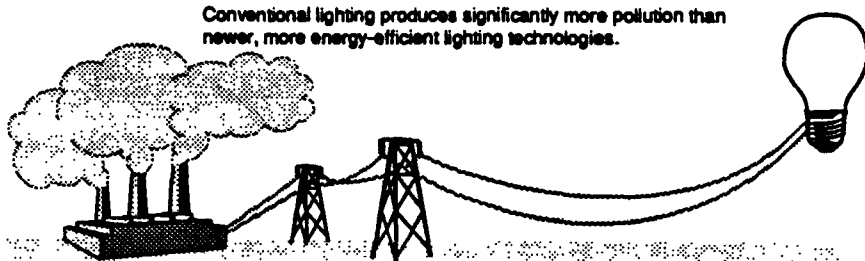
Energy-efficient lighting can reduce lighting electricity demand by over 50 percent, thereby enabling the power plant to burn less fuel. It is estimated that every kilowatt-hour of electricity avoided prevents the emission of 1.5 pounds of carbon dioxide, 5.8 grams of sulfur dioxide, and 2.5 grams of nitrogen oxides. It also reduces other types of pollution resulting from mining and transporting power plant fuels and disposing of power plant wastes.

If energy-efficient lighting were used everywhere profitable, the nation's demand for electricity could be cut by more than 10 percent. This would result in reductions of annual carbon dioxide emissions of 202 million metric tons (4 percent of the national total)—the equivalent of the exhaust emitted from 44 million cars. Reductions in annual emissions

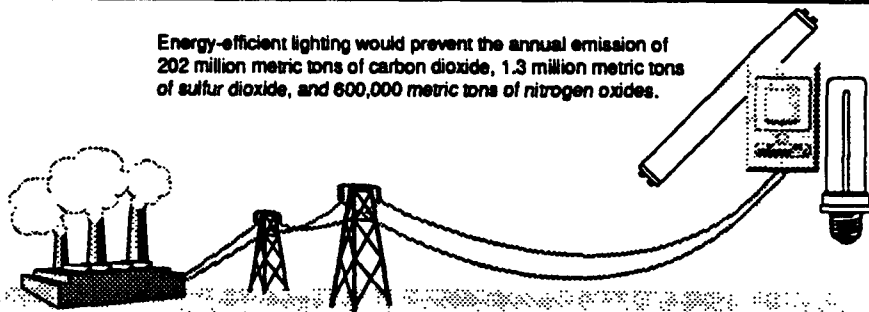
of sulfur dioxide would total 1.3 million metric tons (7 percent of the national total), and reductions in annual emission of nitrogen oxides would amount to 600,000 metric tons (4 percent of the national total). By the year 2000, Green Lights is expected to save 226.4 billion kWh, resulting in total electricity demand savings of 39.8 million kilowatts.

### A Cleaner Approach to Lighting

Conventional lighting produces significantly more pollution than newer, more energy-efficient lighting technologies.



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## Tackling the Barriers to Innovation

A goal of Green Lights is to encourage the widespread use of lighting technologies that use less energy. In doing so, Green Lights endeavors to reduce air pollution, while redirecting dollars toward profitable investment. Indeed, if energy-efficient lighting technologies are used nationwide, they will reduce electricity bills by \$16 billion per year.

Although the market is encouraging the use of energy-efficient lighting technologies, Green Lights is designed to tackle the barriers that impede the widespread use of these technologies.

<b>Common Problems</b>	<b>The Green Lights Solution</b>
<b>Lighting Is a Low Priority</b> - Few organizations focus on the opportunity to invest in their own lighting systems.	✓ Green Lights participants see lighting as an investment—a source of profits. Signing the MOU makes lighting an organizational priority.
<b>Lack of Information and Expertise</b> - Lighting information travels slowly outside the world of the lighting industry.	✓ Green Lights provides informational tools to help lighting investors make an informed upgrade decision.
<b>Difficult Financing</b> - Investments in energy-efficient lighting require up-front capital.	✓ Green Lights has developed a registry of financing resources available free of charge to all Green Lights participants.
<b>Restricted Markets</b> - Low demand for energy-efficient lighting technologies results in lack of consumer understanding about potential cost savings and enhanced lighting. Prices remain high due to small production runs.	✓ Green Lights promotes energy-efficient lighting technologies as cost-effective and high-quality products to consumers, and informs manufacturers about benefits of investing in new technologies.
<b>Split Incentives Between Landlord and Tenant</b> - To realize savings from a lighting upgrade, each tenant must renegotiate the lease with the landlord. The landlord rarely installs energy-efficient lighting in new construction, since utility charges are passed on to tenant.	✓ Green Lights is developing standard lease language that removes the split incentive barrier between landlord and tenant.

### Success Story: American Express

American Express, a Green Lights Partner since February 1991, upgraded the lighting at its 1.6 million-square-foot facility in lower Manhattan. More than 17,000 T12 "cool white" fluorescent lamps (the standard "tube" often seen in commercial lighting) were replaced with the more energy-efficient and superior quality T8 variety. The building's existing hybrid ballasts were replaced with electronic ballasts that consume less electricity, weigh less, make less noise, and create virtually no lamp flicker. Two hundred occupancy or motion sensors were installed throughout the building, reducing average annual lighting hours from 6,300 to 5,200. Motion sensors control lighting, depending on the presence of a person in the area.

As a result of the lighting upgrade, American Express has reduced the number of kilowatts used for lighting by almost 500 per year. Annual savings from the project are expected to be more than \$280,000—with an internal rate of return calculated at 38 percent. The annual pollution prevented is also impressive: 785,000 pounds of carbon dioxide, 5,500 pounds of sulfur dioxide, and 3,150 pounds of nitrogen oxides.

## Giving the Green Light to Energy Efficiency

### Your Part

To become a Green Lights Partner, an organization signs a Memorandum of Understanding (MOU) with EPA. In the MOU, Green Lights participants agree to survey their facilities and, within 5 years of signing the MOU, to upgrade 90 percent of their square footage, where it is profitable and where lighting quality is maintained or enhanced. Participants also agree to appoint an implementation manager who oversees participation in the program. As of August 1992, over 600 organizations have joined Green Lights.

### EPA's Part

The MOU also states EPA's commitment to Green Lights Partners. EPA provides Partners with the following products, information, and services:

**Decision Support System** - a state-of-the-art computer software package that enables Partners to survey lighting systems in facilities, assess lighting options, and select the best energy-efficient upgrade.

**Financing Registries** - user-friendly computer data bases of every third party financing program available.

**Ally Programs** - Allies include lighting manufacturers, lighting management companies, and electric utilities that have agreed to educate customers about energy-efficient lighting.

**Endorser Program** - Endorsers are membership associations and other organizations that promote Green Lights.

**Public Recognition** - Green Lights places public-service advertising in major magazines, newspaper articles, reports on new lighting technologies, a newsletter, and other materials. To encourage participants to promote their own Green Lights activities, EPA distributes ready-to-use promotional materials.

In addition, EPA contracts and grants provide the following services:

**Lighting Services Group** - provides technical support, including a technical services hotline, workshops, and a comprehensive *Lighting Upgrade Manual*.

**National Lighting Product Information Program** - serves as "consumer reports" of lighting, making valuable product information available.



**For more information, contact:** Green Lights, U.S. EPA, 501 3rd Street, NW (Mail Code 1), Washington, DC 20001  
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## EPA BUILDINGS PROGRAM

The EPA Buildings program is a partnership effort with business to increase efficiency in commercial buildings and to reduce air pollution caused by power generation. Expanding on the success of Green Lights and Energy Star Computers<sup>1</sup> programs, EPA's Buildings Program promotes increased efficiency in heating, ventilation, and air conditioning (HVAC) systems in commercial buildings. Through the Buildings Program, EPA and its business partners will expand markets for state-of-the-art HVAC technologies, resulting in increased energy savings, more competitive businesses and a cleaner environment.

The EPA Buildings Program will include a series of technological initiatives, each aimed at improving the efficiency of a specific part of HVAC systems in commercial and office buildings. This strategy of staged HVAC improvements is designed to give program participants a high degree of flexibility in their implementation of the Buildings Program.

EPA's role in the Buildings Program is to help overcome some of the traditional barriers to investment in higher-efficiency HVAC system components, including first cost, lack of information and diffuse investment decision-making. For each stage of the Buildings Program, EPA will work closely with its corporate partners, providing objective documentation on the technologies, software tools to facilitate building surveys and investment analyses, and a network of other corporations and other organizations involved as Partners in the Buildings Program. Expanding the market for state-of-the-art HVAC technologies will help reduce their first cost, and in some cases partners in the Buildings Program will also take part in large-scale aggregated purchases to capture additional discounts.

The Green Lights and Energy Star programs set the stage for the Buildings Program, not only because of their demonstrated track record of success, but also because implementation of the Green Lights and Energy Star Computers programs significantly reduces the amount of heat emitted by lighting fixtures and computers, and thereby reduces the cooling load of office buildings by up to 20 percent.

The first initiative of EPA's Buildings Program focuses on improving the efficiency of air handling systems in commercial buildings, largely through the application of variable speed drives (VSDs) to fan motors. This application of VSD technology uses currently-available and reliable equipment to achieve substantial and cost-effective energy savings. While the number of VSD installations on air handling systems has steadily grown in the past decade, current applications remain far short of the cost-effective potential. A goal of the EPA Buildings Program is to expand the market for VSD controls to accelerate the reduction in the cost of the technology. In addition to developing and distributing

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After only a year and a half, the Green Lights Program now has over 640 participants, representing more than 100 of the Fortune 500's listings of the nation's largest manufacturing and service organizations and over 3% of the nation's commercial floorspace. The Energy Star Computer Program, launched on June 17, now has 12 partners accounting for more than 40% of the personal computers sold in the U.S.

informational materials and analytical decision support tools, the EPA Buildings Program will include a strategy to encourage program participants to plan and coordinate mass purchases of VSDs, in order to receive lower large-volume prices.

## **SAVINGS FROM VARIABLE SPEED DRIVES**

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Air handling accounts for up to 30% of electricity use in commercial office buildings and, the Electric Power Research Institute estimates, over 10% of all the electricity consumed in the commercial sector. For individual companies the resulting expenses can be significant. Air handling for a single 100,000 square foot office building can cost \$25,000 to \$60,000 per year.

Actual air handling needs vary considerably over the day and year as air conditioning needs change. In most older buildings, the constant speed AC motors in air handling systems operate continuously at full-speed, regardless of air flow requirements. This results in large amounts of wasted energy during most times of the year. Moreover, these motors are frequently oversized, and thus waste energy even on the hottest days.

Potential energy savings in air handling systems are particularly large because a reduction in fan speed results in a greater than proportional energy savings. For example, a 20% reduction in fan speed results in energy savings of almost 50%. Air handling systems have been designed to capture some of these potential energy savings -- these are called variable air volume (VAV) systems.

The predominant VAV systems use mechanical means (i.e., variable inlet vanes) to control air flow to match changing building requirements and reduce fan energy use. However, VSDs are substantially more efficient than inlet vane controls, using from 30% to 60% less energy. For a 100,000 square foot office building, upgrading with variable speed drives can reduce operating expenses by between \$7,500 and \$36,000 annually. Installing VSDs on existing VAV systems will be the first retrofit pursued by participants in the EPA Buildings Program.

Variable speed drives save energy by constantly adapting fan motor speed to match the actual air flow demands determined by activity within a building. Under constant voltage, an AC motor's speed is directly proportional to the frequency of the supply current. VSDs control the motor's speed and energy use by varying the frequency of the AC current supply, which results in tremendous energy savings. VSDs typically pay for themselves in 1-4 years with a cost of conserved energy of 1¢-4¢/kwh.

In addition, because fan motors are commonly oversized, VSDs can reduce peak electricity demand and result in extra savings on utility bills. Even greater peak demand and energy savings are possible when VSDs are installed in conjunction with high efficiency lighting and office equipment, because these technologies produces less heat, thereby reducing cooling and air handling needs.

Finally, reduced maintenance costs and extended equipment lifetimes are additional benefits of VSD applications. VSDs allow for the "soft" start of motors and fans which reduces wear on belts and bearings.

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## **EPA BUILDINGS PROGRAM: NEXT TECHNOLOGIES**

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Future phases of the EPA Buildings Program will promote enhanced energy efficiency through improved control strategies, high efficiency unitary air conditioners and centrifugal chillers, heat pumps, waste heat recovery, heat pump water heaters, and load-reducing building envelope improvements.

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