GreenMatters

Everything You Need to Know Now About Energy-Efficient Lighting

Nature Calls:
Eco-Awareness Inspires Consumers, Utilities & Manufacturers to Step Up

ENERGY STAR®
GU24 Fixture Programs Make Upgrades Easy

An Incandescent Truth:
Alternatives to Banning Bulbs

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Taking a new direction

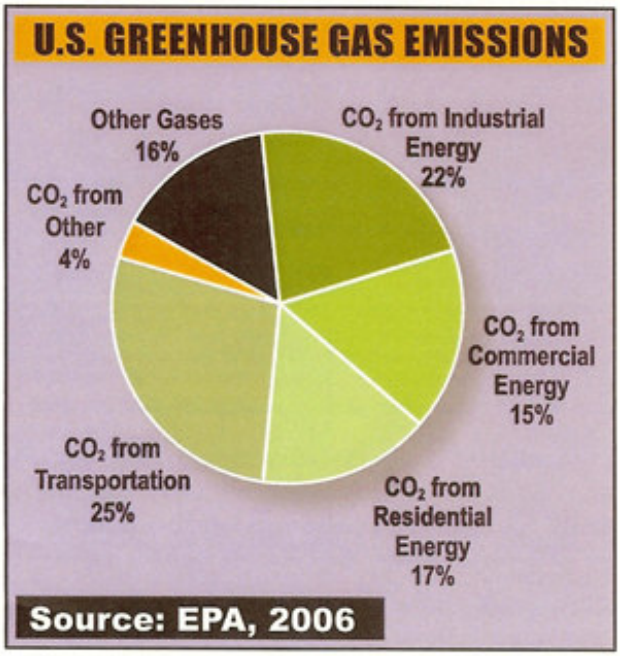
Generation Green

As global energy issues gain attention, efficient lighting plays a key role in minimizing the cumulative carbon footprint.

Not long ago, one would occasionally hear the phrase "thinking green" or "environmentally friendly," which meant that an individual, a family or a corporation would make lifestyle choices and practices that were ecologically positive. This group was viewed as idealistic, impractical and "outside the box."

Today, the environment is all about the box and what is inside it. In just a few short years, the public has become acutely aware of the urgent need to save our natural resources by eliminating or reducing the use of items that contribute to a negative environmental impact.

The lighting industry has recognized the benefits of compact fluorescent lamps (CFLs) for more than 20 years, but until recently, CFLs were primarily used in commercial and hospitality applications. Thanks to programs like ENERGY STAR® and support from many high-profile public figures, consumers are now discovering the numerous benefits of CFLs and actively supporting the changeover to more efficient light sources.



Compact Fluorescent Lighting Now

Smaller options and improved technology make today's CFLs more versatile.

The mini spiral lamps that are so prevalent today are all based on the same principles as the pin-based (plug-in) twin-tube lamp, which represents the origins of compact fluorescent lighting and is still in popular use today. The only difference with the spirals, besides their shape, is that the ballast is now part of the lamp, while the twin-tube plugged into a separate socket/ballast system. Advancements in the electronics have allowed the ballast to be reduced in size significantly, allowing for the smaller, one-piece design.

There have been many additions to the pin-based product offering, such as the triple-tube lamps. These lamps come in sizes up to 42W and are widely used today in applications where heat issues can affect ballast performance.

The most significant CFL advancement would have to be the new T2 ultra mini spiral. These extremely compact lamps truly broke the CFL acceptability barrier by matching the size of a standard 60W A19 incandescent lamp. As a result, a CFL can easily fit into an existing socket without appearing awkward or oversized. As technology moves forward, CFLs have been recognized as a reliable alternative in many commercial applications. The new higher-wattage T5 spirals in 55W and larger sizes offer a light output equal to 250W and above. These lamps are being used in Hi-Bay-type warehouse lighting fixtures as a replacement for some high-intensity discharge (HID) systems.

A truly new twist on the CFL category is just that: a twist-lock. The new GU24 (GU = pin-based, 24 = 24 mm apart) base platform has set the stage for a new direction in lighting efficiency. The GU24-based CFL is the culmination of many years of technology shifting from one platform to another. This evolution started with retrofitting to dedicated ballast-and-lamp combinations, to socket ballasts with plug-in lamps and now to the one-piece, self-ballasted CFL with a fluorescent socket specified by the American National Standards Institute (ANSI): the GU24 base. This cost-effective, small-sized lamp has enabled lighting fixture designers to maintain the proportion and size of an incandescent design while using the lower-profile GU24 socket with its CFL counterpart.

The GU24 self-ballasted CFLs have not only brought energy-efficient lighting center stage in the decorative fixture arena; they have simplified and demystified the process for many manufacturers looking to offer products in this category.

ENERGY STAR qualified GU24 lamps do, however, require a higher level of performance than the standard medium-base CFL products which carry the ENERGY STAR logo. The ENERGY STAR program is managed by two government agencies. The U.S. Department of Energy (DOE) heads up the CFL lamp replacement program, while the Environmental Protection Agency (EPA) oversees the Residential Light Fixture program. Previously, the EPA fixture program was based on the concept of an individual lamp and ballast platform that was tested to meet or exceed the program's requirements. The lamps that are used in this configuration do not carry an ENERGY STAR qualification, nor does the ballast. The two components in use together, once approved, qualify as an approved platform. Other testing and submittals are required to achieve the right to mark the lighting fixture with the ENERGY STAR logo. The GU24 lamp presented a scenario in which both agencies decided to work in tandem to set the performance goals of GU24 products. It was determined that the new GU24 would be required to meet the performance levels of the EPA's Residential Light Fixture program, which requires a minimum life rating of 10,000 hours, while the DOE's minimum for medium E26-based lamps is 6,000 hours.

Other requirements, such as additional lumen maintenance and accelerated life test/stress tests are required. Currently, GU24-based products can be submitted to the EPA Residential Light Fixture program as an approved platform to obtain ENERGY STAR status. The DOE guidelines presently have the GU24-based CFLs listed in a new draft awaiting final approval for inclusion in their program. This will enable lamp manufacturers to market ENERGY STAR qualified replacement GU24 CFLs and ensure the integrity of the lighting fixtures' qualification ■

CFL FAQs

Switching from traditional incandescent light bulbs to CFLs is an effective accessible change every American can make right now to reduce energy use at home and prevent greenhouse gas emissions that contribute to global climate change.

Do CFLs contain mercury?

CFLs contain a very small amount of mercury sealed within the glass tubing — an average of 5 mg. (Older thermometers contain about 500 mg. of mercury.) No mercury is released when the bulbs are intact or in use. Mercury is currently an essential component of CFLs, enabling the bulb to be an efficient light source. Many manufacturers have taken significant steps to reduce the mercury used in their fluorescent lighting products. In fact, the average amount of mercury in a CFL is anticipated to drop by the end of 2007, thanks to technology advances and a commitment from members of the National Electrical Manufacturers Association (NEMA).

What precautions should I take when using CFLs in my home?

CFLs are made of glass and can break if dropped or handled roughly. Be careful when removing the bulb from its packaging, installing it or replacing it. Always screw and unscrew the lamp by its base (not the glass) and never forcefully twist the CFL into a light socket.

What should I do with a CFL when it burns out?

The EPA recommends that consumers take advantage of local recycling options for CFLs, where available. The EPA is working with CFL manufacturers and major U.S. retailers to expand disposal options. Consumers can contact their local municipal solid waste agency directly, or go to www.lamprecycle.org.

How should I clean up a broken fluorescent bulb?

1. Open a window and leave the room (restrict access) for at least 15 minutes.
2. Remove all materials you can without using a vacuum cleaner. Do not use bare hands.
3. Place all cleanup materials in a plastic bag and seal it. If your state permits you to put used or broken CFLs in the garbage, seal the CFL in two plastic bags and put it in the outside trash (if no other disposal or recycling options are available). Wash your hands after disposing of the bag.
4. The first time you vacuum the area where the bulb was broken, remove the vacuum bag once done cleaning the area (or empty and wipe the canister). Put the bag and/or vacuum debris, as well as the cleaning materials, in two sealed plastic bags in the outdoor trash or protected outdoor location for normal disposal.

Green Pays:

Utilities lead with consumer incentives and education

Utility companies have long played an active role in shaping the marketplace. Long ago, utilities would give away toasters and other energy-consuming products as a way to increase demand for electricity. Now it is just the opposite; utility companies are working hard to reduce demand, and compact fluorescent lamps (CFLs) and CFL-based fixtures are the way to do it on the lighting front.

Why would a utility want to reduce demand for electricity? Isn't electricity the product that the utility is selling the public? And why would they go so far as to pay to reduce demand? There are several reasons:

Cost Effective: It can be more cost-effective to reduce demand than to build new power generation plants, so rates remain cheaper for their customers. This reason is often cited in new growth areas that are experiencing a lot of new construction, bringing more housing onto the grid.

Moderate Demand: The ability to moderate demand means that utility companies will not have to buy energy when there are electricity shortages due to weather swings or constrained supply. The energy crisis of 2001 made everyone acutely aware of the volatility and importance of electricity pricing.

Legislation: In some states, utility companies are required by law to reduce consumption, while some are required to spend a certain amount of profit on conservation programs. Energy-efficient lighting is an easy and cost-effective way to reduce consumption or demand.

Lower Utility Bills: Utilities want to do what's best for their customers. Conservation helps people lower their bills, which is sure to please rate payers everywhere. There are secondary benefits to using energy-efficient lighting, too. Because CFLs emit less heat (while using less electricity), they also reduce cooling costs — especially helpful in hotter climates.

Eco-Awareness: As green marketing becomes more mainstream, conservation and efficiency are savvy marketing choices. Decreasing energy consumption means that less coal is burned to generate energy, so less mercury is emitted into the atmosphere; mercury that would end up in our streams and oceans, into the food chain and the fish we eat, for example. Even with the limited amount of mercury in fluorescent lighting, using CFLs and CFL-based fixtures decreases your carbon footprint.

When CFLs first entered the marketplace, it was difficult to get consumers to adapt their purchasing choices. CFLs were expensive and large. There were issues with color quality and early lamp failure. People associated them with institutional fluorescent lighting. As this emerging technology improved, it was necessary to educate consumers on the benefits of compact fluorescent lighting to change these early perceptions. Utility companies stepped in to promote this product, reaching out through many channels: residential, commercial, new construction, retrofit, industrial, multi-family, etc.

Utility programs shape the marketplace in two primary ways: incentives and education. Some utilities offer instant-off coupons that can be used at retailers to

What you should know: Mercury

Mercury is an element (Hg on the periodic table) found naturally in the environment. Mercury emissions in the air can come from both natural and man-made sources. Utility power plants (mainly coal-fired) are the largest man-made source. Mercury that naturally exists in coal is released into the air when coal is burned to make electricity.

Energy-efficient CFLs present an opportunity to prevent mercury emissions from entering the environment because they help to reduce emissions from coal-fired power plants. Coal-fired power generation accounts for roughly 40 percent of the mercury emissions in the United States.

The EPA is implementing policies to reduce airborne mercury emissions. Under regulations the EPA issued in 2005, mercury emissions from coal-fired power plants will drop by nearly 70 percent by 2018.

offset the higher initial cost of this new technology. Some work with manufacturers to "buy down" the cost of product. And some reach out to showrooms, retailers and distributors. Through bill stuffers and community outreach events—often with free bulb giveaways—utilities provide education for consumers, even making presentations in schools to increase awareness early. They also work with manufacturers and retailers to ensure the product they are promoting is available. This is especially important in the new construction channel.

In regions where utility programs are strong and sustained, market penetration of compact fluorescent lighting is higher. Utility programs work because utilities are seen as trusted sources of information in their communities. People are used to going to their utility company with questions. Where utilities don't have incentive-based programs, the majority at least provide educational information regarding CFL-based lighting on their web sites — information as basic as telling consumers which lights in the home to switch from incandescent to fluorescent, and as in-depth as explaining how a CFL actually produces light.

When it comes to lighting, utilities support the ENERGY STAR program, often linking to www.energystar.gov, which is the place to go for information about quality energy-efficient lighting products. ENERGY STAR qualified products assure the consumer of quality, decreasing the potential for dissatisfaction and encouraging future use of CFL-based lighting.

As October approaches, and with it Energy-Efficiency Month, ENERGY STAR's national *Change a Light, Change the World Campaign* will increase awareness of ENERGY STAR qualified lighting. The Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE) — both sponsors of the ENERGY STAR program for lamps, fixtures and a wide variety of other electrical products — will promote the benefits of changing out your five most commonly used lights in your home from incandescent sources to energy-efficient CFLs. Retailers and manufacturers, working with utility programs, take advantage of this increased visibility to run their own promotions that draw customers into their stores.

Legislation and building codes also drive change in the marketplace. California took a leading role in 2005 when it adopted new guidelines in the California Building Standards Code, commonly called Title 24. With a goal of decreasing energy consumption, it dramatically changed lighting specifications for any permitted projects (new construction, remodels and additions) by requiring high-efficacy fluorescents, CFLs or high-intensity discharge lamps. Recessed cans had to be ICAT-rated and incandescents had to be used with dimmers or occupancy sensors. Most electronically ballasted, pin-based fluorescents qualified. This greatly impacted the lighting market as manufacturers developed or modified and labeled product that was "Title 24-compliant." By creating a market for them, Title 24 increased the amount of decorative fluorescent fixtures available. Building codes in many states require use of CFL-based lighting combined with motion sensors or photocells.

Washington recently revised its building code this past July. The change mandates outdoor lighting that is "permanently mounted to a residential building or other buildings on the same lot shall be high-efficacy luminaires." If the fixtures are not high-efficacy, "they must be controlled by a motion sensor with an integral photocontrol photosensor." The use of fluorescents has always been a good choice in outdoor applications, where color rendering has not been as critical. And there is a wide range of products available to meet all applications and temperature variances.

Most people would agree that improving the environment does matter. But it is often easier to agree than to put into practice the necessary steps that make those improvements happen. When it comes to energy-efficient lighting, utility companies, legislation and building codes are changing the way consumers look at, think about and apply lighting. ■

ENERGY STAR RISING

Growing consumer awareness of the EPA's and DOE's ENERGY STAR program aids in selection of high-quality, energy-efficient products.

LEARN MORE AT energystar.gov

Since its inception in 1992, the ENERGY STAR program has grown to include more than 50 product categories and more than 9,000 partner organizations, with more than 2.5 billion ENERGY STAR products sold in the United States alone. With help from ENERGY STAR, Americans prevented 37 million metric tons of greenhouse gas emissions in 2006 alone. That's like taking 25 million cars off the road for a year. Additionally, Americans have saved more than $14 billion on their utility bills, thanks in part to ENERGY STAR.

The program, a joint effort between the U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA), continues to build industry and financial partnerships to offer low-cost energy solutions that reduce consumer expense, improve global energy security and mitigate factors that contribute to global climate change.

One of the fastest-growing categories in the conservation of energy is lighting fixtures. The ENERGY STAR guidelines set by the EPA address quality, assuring consumers of bright, warm, long-lasting illumination from products with the ENERGY STAR designation. Consumers are getting the message, purchasing more than 300 million ENERGY STAR qualified products in 2006, including lighting. In fact, sales of ENERGY STAR qualified lighting products have grown steadily since 2000. The federal government is working hand-in-hand with business to bolster energy conservation. The ENERGY STAR program is designed to overcome market barriers to create energy-efficient products and services. By decreasing risk, ENERGY STAR has been able to facilitate growth in energy-efficient lighting use and green construction.

If every home in America replaced just one incandescent bulb with an ENERGY STAR qualified alternative, the energy saved would be enough to light more than 3 million homes for an entire year. It would also save more than $600 million in annual energy costs and reduce greenhouse gases by the equivalent of the emissions of more than 800,000 cars. ■

Incandescent Banned?

Around the world, there have been news reports about proposed government legislation to ban the use of incandescent light bulbs by a specified date. Europe, Australia, Canada and the United States have been the most vocal nations on the subject. While the concept of the ban seemed to be received with slightly more acceptance in other countries, the United States expressed great concern over this industry-shaking news.

In the United States, the incandescent bulb ban legislation has been proposed by individual states, each with its own timeframe and guidelines. Some states, such as California, had multiple bills presented.

One California bill focused on making lighting more efficient, rather than calling specifically for a ban on incandescent lamps. This concept is also present in a bill currently before Congress, which proposed a federal lighting efficiency program requiring increased minimum lumen-per-watt performance levels in stages over a proposed timeframe.

Recently, discussions between government representatives and lamp manufacturers have taken place, and the following timetable for more efficient incandescent lamps has been determined.

Modified Spectrum General Service Incandescent Lamps

Common Wattage	Lumen Range	New Wattage Cap	Effective Date
100	1118-1950	72	July 1, 2012
75	758-1117	53	January 1, 2014
60	548-757	43	January 1, 2015
40	232-547	29	January 1, 2018

Clear, Inside Frost and Soft White General Service Incandescent Lamps

Common Wattage	Lumen Range	New Wattage Cap	Effective Date
100	1490-2600	72	July 1, 2012
75	1010-1489	53	January 1, 2014
60	730-1009	43	January 1, 2015
40	310-729	29	January 1, 2018

Where to Use CFLs

Creating an indoor lighting plan usually takes three major factors into consideration: General illumination/ ambient lighting gives a space an overall lighted appearance. Task lighting specifically places light in desired areas to perform work or read. Dramatic/ decorative lighting creates mood and adds interest to interior design. Often, outdoor lighting represents a fourth consideration to an entire lighting plan.

Energy-efficient CFLs are made in a variety of styles to fit practically every incandescent equivalent currently being used. Many CFLs are offered in dimmable and three-way versions, which allow the user greater control of the lamp's light output. When working with CFLs, it is recommended that you assess the lamp's abilities for the given application.

CFLs would be a wise choice for general lighting use such as in kitchens, bathrooms, bedrooms, laundry rooms, mud rooms and garages. They are perfect for use in shaded and directional table and floor lamps for reading and lighting a room.

CFL downlights can provide illumination for work surfaces in kitchens and other task-oriented rooms. Improved color rendering with new phosphor combinations make CFLs welcome in bathroom vanities, too.

Smaller CFL lamping options have enabled their use in a wider range of decorative fixtures. CFLs are less suited to decorative accent lighting. Since CFLs are not a point light source, it is very difficult to control the beam pattern. Lighting a small area or bringing attention to an object would be more challenging.

The use of CFLs is not limited to interior spaces. With average maximum starting temperatures of 0 degrees Fahrenheit, CFLs are used in landscape fixtures, post, wall and hanging lanterns. CFLs' long life also makes them an intelligent choice for outdoor use.

Welcome Home, Fluorescent

Smaller light sources and high ENERGY STAR standards make new fluorescent fixtures easy on the eye and the environment.

When fluorescent lighting was originally used in the home, everyone accepted that it had poor color rendering, would not light quickly, made humming noises and had zero fashion quotient. No wonder these fixtures were relegated mainly to garages, laundry rooms and utility rooms. Now, changes in technology have given manufacturers the ability to create fluorescent designs with aesthetic appeal as well as functionality, so every room in the house — and outdoor lighting — can take advantage of energy savings.

The U.S. Environmental Protection Agency built quality assurances into its ENERGY STAR guidelines for fixtures to ensure they produce bright, warm light while using 75 percent less energy, generating 75 percent less heat and lasting up to 10 times longer than standard incandescent lighting. ENERGY STAR qualified indoor fixtures are laboratory-verified to have less than a one-second start time and have a color rendering index of at least 80. These fixtures use electronic ballasts, so there is no more hum or buzz during operation, and they come with a two-year warranty — double the industry standard — for added peace of mind.

In order to qualify for the ENERGY STAR program, indoor fixtures must be sold complete with ballast and bulbs, with the exception of linear and recessed fixtures (which do not include bulbs). Previous ENERGY STAR guidelines required that fixtures have a separate ballast and bulb combination, which created design barriers due to the resulting overall height of the ballast and bulb together. Manufacturers worked around this by designing fixtures where the bulb was meant to be seen, a look that wasn't always mainstream.

Even when design was not affected, cost could be an issue. The price of otherwise basic, enclosed CFL fixtures (such as flush mounts) went way up when manufacturers had to include the bulb and separate ballast in order to receive an ENERGY STAR designation. With its low profile and self-ballasted design, the GU24 CFL solves both issues, enabling more design freedom and greatly reducing costs.

Outdoor ENERGY STAR qualified fixtures do not require a bulb to be included. Otherwise, they have similar requirements to indoor fixtures with a few exceptions. Qualified outdoor fixtures must have an automatic shut-off switch (photocell) and additionally, some require a motion sensor (if incandescent). Photocells, which are more prevalent, guarantee that a fixture will be turned off during daylight hours. Motion sensors ensure that a light will not remain on all night, so even fixtures with incandescent sockets can receive ENERGY STAR qualification with this feature.

One of the most critical pieces of technology being developed and improved is the dimming of ENERGY STAR qualified fixtures. Currently this technology exists in the ballast/pin-based platform and is in development for the GU24 platform.

A new and simple innovation has surfaced in the market: a medium-base-to-GU24 socket (one-way locking) adapter. Securing this adapter into an incandescent socket allows the fixture to become a dedicated fluorescent fixture (does not automatically make a fixture ENERGY STAR qualified), while the locking mechanism prevents installation of a high-wattage incandescent bulb into that socket for the life of the fixture.

The introduction of ENERGY STAR Advanced Lighting Pac ages (ALP) is also making fixture upgrades easier. This is a construction option that home buyers can select for a higher initial cost that is offset by lower energy bills immediately and over long-term use. Based on new guidelines effective Sept. 1, 2007, as long as at least 60 percent of a home's hard-wired fixtures (including outdoor) are ENERGY STAR qualified—regardless of where the fixtures are used—a package can receive the Advanced Lighting Package designation. ■

RENAISSANCE

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Light Bulb Conversion Chart

Fluorescent Bulbs Wattage	Incandescent Bulbs Wattage
13	60
18	75
26	110
42	150

Color Chart

2700 K	Warm White
3000 K	Soft White
4100 K	Cool White
5000 K	Bright White
6500 K	Daylight White

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