

lighting

bright new ideas



taking responsibility

As an individual, your efficient use of energy brings benefits such as lower bills, improved comfort levels in your home and a reduced personal impact on the environment.

Acting together, our individual choices add up—for the benefit of our community, our environment and our energy future. That's the power of working together.

As your community energy company, we are committed to sharing our experience and energy expertise. You can always contact us for:

- Answers to your energy questions.
- Energy efficiency information and advice.
- Help in evaluating energy-saving options.
- Assistance in finding energy-efficient products.

Better ways to illuminate your world

This booklet offers a world of easy, innovative ways to save energy and money while lighting your home. Visit mge.com or call us at 252-7117 for more information on these and other energy-saving ideas.

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Shining some light on LEDs for residential use



In addition to holiday decorations, light-emitting diodes (LEDs) are also an appropriate light source for a number of other residential applications. LEDs possess a variety of distinct features that differentiate them from traditional lighting such as incandescent and fluorescent.

These features make current LEDs suitable for use in recessed downlights, undercabinet lighting, desk and task lighting, accent lighting and outdoor lighting.

- **Directional light** – LEDs do not require reflectors or diffusers to shine light to where it is needed.
- **Longevity** – Many LEDs are estimated to last between 35,000 to 50,000 hours, which is 50 times longer than incandescent lighting and 8 times longer than compact fluorescent (CFL) lighting.
- **Durability** – LEDs perform well outdoors and in cold temperatures.
- **Safety** – As opposed to incandescent lighting, LEDs emit very little heat. However, if the LED is not well designed to dispense of the little heat it does produce, its estimated lifetime can be significantly reduced.
- **Instant on/off** – LEDs illuminate the moment they are switched on.
- **Rapid cycling capability** – LED lifetime is not affected by frequently switching them on and off.
- **Size** – LEDs can be very compact and unobtrusive.
- **Dimmable** – LEDs can be dimmed, but must be designed to do so, and not all are compatible with dimmer controls intended for incandescent bulbs.

White light quality

Unlike incandescent lighting, LEDs are not inherently white light sources. However, LEDs can achieve a white light comparable to that of an incandescent or CFL. Currently, ENERGY STAR® LEDs range between 2700°K to 4000°K in correlated color temperature (CCT). For comparison, a standard incandescent measures around 2700°K and a typical ENERGY STAR CFL lands between 2700°K and 3000°K.

Still a developing technology

LED technology continues to develop at a relatively brisk pace. Its unique lighting features, such as directionality, low wattage and efficiency, may benefit a number of residential uses. However, the higher cost and varying degree of quality of LEDs currently on the market underline the fact that this is a lighting technology still in progress.

New energy efficiency standards

The Energy Independence and Security Act of 2007 calls for increased minimum energy efficiency standards for general service lamps. This includes incandescent, CFL, LED and other lighting products. Beginning in 2012, the manufacturing and importing of 100 watt general service lamps will end, followed by 75 watts in 2013, and 60 and 40 watts in 2014. Though these new standards do not technically ban incandescent lamps, the majority of incandescent lightbulbs used by consumers today will not meet the requirements.

Compact fluorescents vs. incandescent bulbs



Incandescent lightbulbs are inefficient, converting only about 10% of the electricity used into light. The other 90% is wasted as heat.

Compact fluorescent (CFL) bulbs are about four times as efficient as incandescent bulbs. MGE recommends using fluorescent bulbs to save money and prevent pollution.

CFLs

- Last about 10 times longer than incandescents.
- Save about \$50 in electricity over the life of the bulb. The electricity saved avoids burning 400 pounds of coal at the power plant.



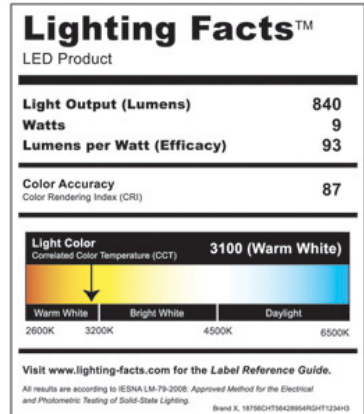
Look for the ENERGY STAR® label when buying lightbulbs, fixtures or lamps.



ENERGY STAR labeled products use less energy than other products. They reduce your energy costs and help to protect the environment. MGE is an ENERGY STAR partner. Learn more about qualifying products at www.energystar.gov or call MGE at (608) 252-7117.

When buying CFLs

- Buy a CFL that uses about 1/3 the watts of the incandescent you're replacing. This "divide watts by three" rule ensures plenty of light from CFLs.
- Another method is to look for lumens. Light output is measured in lumens, while power used is measured in watts.
- Check the lumen output label on an incandescent bulb that's the brightness you want, then look for a CFL with 20% more lumens. This ensures you'll get enough light from the CFL. Lumens per watt measures lighting efficiency much like miles per gallon measures automobile efficiency.
- Beware of the wattage equivalences suggested on the CFL packaging. To avoid disappointment, use the selection methods suggested in this brochure.



Lumen output label.

Efficacies of Today's Lighting Technologies	
Bulb Type	Efficacy (Lumens/Watt)
Incandescent	10 to 18
Halogen	15 to 20
Compact Fluorescent	35 to 60
Linear Fluorescent	50 to 100
Mercury Vapor	25 to 60
Metal Halide	50 to 90
High-Pressure Sodium	50 to 140
White LED	20 to 60

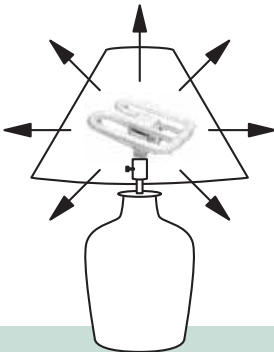
- Look for the ENERGY STAR label. ENERGY STAR qualified CFLs:
 - Have manufacturer-backed warranties of at least two years for residential use.
 - Meet requirements for efficiency, color of light, etc.
- Make sure the CFL will fit. CFLs are much smaller than they used to be, so they fit more lamps and fixtures than before. For most table lamps, circular or 2D-style CFLs are best.



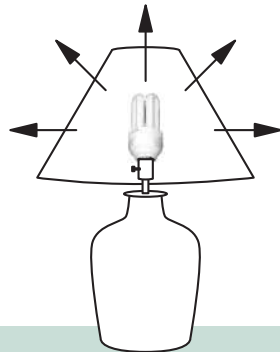
2-D



Circular (Circline)



2-D and circular styles direct light down for reading.



Other styles direct light sideways and up.

- Choose the color of light you want. Correlated color temperature (CCT) is expressed in degrees Kelvin (K) and refers to the primary spectrum of light from a bulb. The CCT affects the color tones of objects being viewed. Select bulbs that fit your lighting task.

Description	CCT	Characteristics
Warm White, Soft White	2,700°K to 3,000°K	Comparable to incandescent lights. Accentuates warm colors. Often preferred in homes and restaurants.
White, Natural White, Bright White	3,000°K to 3,500°K	Comparable to halogen incandescent lights. Shows accurate colors. Good for bathrooms, showing artwork and retail displays.
Cool White	4,000°K	Accentuates white and cool colors. Often used for hospitals and office lighting.
Daylight	>5,000°K	Accentuates cool or blue colors. Often preferred for viewing fine detail as in reading or sewing.

The color difference between incandescent and fluorescent bulbs may be noticeable if mixed in the same room. Using all fluorescent lights in a room can solve this issue.

Myths and facts about CFLs

Myths

- They flicker, hum and blink on and off when they start.
- They put out ugly bluish light.
- They don't fit in my fixture.
- They cost too much to purchase.
- They are too dim.
- They don't work with dimmers.
- They don't come in three-way styles.
- They don't last as long as claimed.

Facts

- Fluorescents with electronic ballasts don't flicker or hum, and they start instantly. Older-style fluorescents with magnetic ballasts were prone to these problems.
- Fluorescents now emit a warm white light similar to incandescents, although cool white lights are available for people who prefer light closer to sunlight.
- CFLs are now small enough for most applications.
- CFLs save enough electricity to pay for themselves two or three times over. The cost of lighting is mostly the electricity used, not the bulb cost.
- CFLs are available that produce more light than a 150-watt incandescent.
- Dimmable fluorescents are available, although they cost more than regular CFLs. Be sure the label says dimmable though! Otherwise, you could start a fire.
- Three-way CFLs are available.
- ENERGY STAR qualified CFLs come with a two-year warranty for residential use.

Where to buy energy-efficient lighting

Hardware stores, home improvement stores and lighting stores sell energy-efficient lighting. CFLs are often carried by chain stores and grocery stores that sell light bulbs. MGE encourages customers to buy from local retailers; however, the following online stores carry a wide variety of lights:

www.efi.org

(800) 456-5983

www.energyguide.com

www.bulbs.com

(888) 445-2800

Frequently asked questions about energy-efficient lighting

Q: Are LEDs ENERGY STAR rated? How do LEDs compare to CFLs?

A: Consumers can buy screw-in LEDs locally, though currently only a handful are qualified as ENERGY STAR. Screw-in LEDs are also considerably more expensive than incandescent and CFL bulbs. An ENERGY STAR qualified LED consumes at least 75 percent less energy and lasts at least 15 times longer than a standard incandescent bulb, and are at least as efficient as fluorescent lighting.

Q: I have trouble fitting CFL bulbs into my light fixtures. Are there small CFLs on the market?

A: The smallest CFL that will replace a 60-watt incandescent bulb is about 3.7 inches long (smaller than an incandescent bulb) and will fit in porch lights, table lamps and other small light fixtures.

Q: Can I put CFL bulbs inside an enclosed fixture?

A: Yes. An increasing number of CFLs can now fit in enclosed fixtures. Look at the product packaging to be sure the bulb is appropriate for enclosed fixtures.

Q: When shopping for CFLs, do I compare watts or lumens?

A: The amount of light a lamp produces is measured in lumens; watt is a measure of power consumption, not light output. Energy consumption and light output are both printed on lamp packaging so consumers can choose the highest amount of light for the least amount of energy.

Q: Can I use CFLs in recessed can lights?

A: Reflector CFLs are manufactured specifically for use in down lights or “cans.” They can help consumers save up to 75% in energy costs when used for general illumination (kitchen and hallways, for example).

Q: What is ENERGY STAR?

A: ENERGY STAR is a voluntary partnership between the U.S. Department of Energy, the U.S. Environmental Protection Agency, product manufacturers, local utilities and retailers. Partners promote efficient products by using ENERGY STAR labels and educating consumers about the benefits of energy-efficient products.

Q: Can I use CFLs outdoors?

A: Yes, but place the CFL in a location where it is protected from rain and snow and the minimum temperature requirements (as printed on the package) are met. Look for bulbs with a minimum starting temperature of 0° Fahrenheit or below.

Q: Can I use a CFL on a photocell or electronic timer?

A: Some photocells and electronic timers contain electronics that may be incompatible with those in a CFL, resulting in a shorter lamp life.

Q: Which fixtures should I convert to CFLs?

A: Start with lights that are used the most, usually the kitchen, living room and entry lights.

Q: Are CFLs better for the environment?

A: Incandescent bulbs cause the release of more than twice as much mercury as contained in fluorescent bulbs due to the greater amount of coal burned to power incandescents. See page 17 for bulb recycling information.

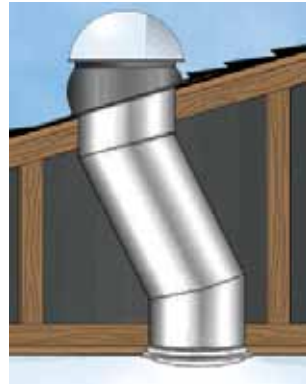
Q: Why do some CFLs take a minute or two to reach full brightness?

A: It's a trade-off that gives greater efficiency when the CFL is fully warmed up.

More ways to save on lighting

Daylighting

Sunlight is free! In addition to windows, skylights and roof windows, tubular skylights (light pipes) are available. Light pipes avoid the condensation problems of regular skylights. Many people prefer sunlight over artificial light.



Tubular skylight (light pipe)

Keep lights clean

Get all the light you are paying for by wiping dust off fixtures, lamps and lenses every 6 to 24 months as needed.

When in doubt, turn it out!

The most efficient light is one that's off when it's not needed. The persistent myth that it is better to leave lights on than to turn them off is wrong, even for fluorescents. Lights don't consume a big gulp of energy when they're turned on, so if a light won't be needed for a few minutes, turn it off. The cost of lighting is mostly the electricity used, not the cost of the bulbs.

Bulb Cost Comparison						
	Life Span (Hours)	No. of Bulbs	Operating Cost	Purchase Price	Life-Cycle Cost	Net Savings
15-Watt Compact Fluorescent	10,000	1	\$21	\$3	\$24	\$65
60-Watt Incandescent	1,000	10	\$84	\$5	\$89	-

Calculated at \$0.14 per kWh.

Use an ENERGY STAR CFL instead of a long-life incandescent bulb. Most **long-life incandescents** produce much less light per watt.

Choose new **low-wattage night-lights**. Some use only one-quarter watt compared to older seven-watt models.

What's a kilowatt-hour?

Kilowatt-hours (kWh) are units of energy. Electric meters measure the kWh used by customers. For example, a 100-watt lightbulb burning for 10 hours would use one kWh. A kWh costs about 14 cents at 2010 rates.

Other types of lighting

High-intensity discharge (HID) lights are good outside security lights. Many come with a dusk-to-dawn photocell. The bulb will not work in regular fixtures because it needs a ballast. HID bulbs may take several minutes to reach full brightness.

Two common HID lights:

- **Metal halide lamps** produce an excellent white color quality and a high lumens-per-watt (LPW) efficiency (see page 5). They are often used in gymnasiums, stores and other places where color rendition is important.
- **High-pressure sodium (HPS)** lamps are common in street-lights, and the 35- to 70-watt bulbs are excellent for residential outdoor security lights. HPS have a white-yellow glow with a high LPW efficiency (see page 5).

Halogen incandescents provide bright white light. Halogens are about 10% more efficient and last three to four times longer than standard incandescents. (Note: Don't use in wet locations.)

Quartz halogen bulbs produce a bright white light and intense heat. Lamps need a lens shield to protect the user from UV light and shattered glass in case the bulb overheats.



Reflector bulbs (Type R) work well for task or accent lighting. Reflectors come in spots which concentrate the light and floods which spread out the light. CFL reflector bulbs save money and last longer.



ER lamps or **elliptical reflectors** focus the light beam two inches ahead of the lamp. This reduces the amount of light trapped in the fixture. Replace a standard reflector lamp with an ER lamp, and cut the wattage by half.

PAR lamps or **parabolic-aluminized reflectors** have a durable glass lens that helps focus the light. Halogen PAR spots and floods produce light comparable to a standard reflector while using one-third less energy. Halogen PAR infrared (IR) bulbs save even more.

Recessed lights (can lights) may cause air-leakage problems, especially if they are in an insulated ceiling. Look for recessed lights that are airtight and rated for insulation contact (IC rated).

Low-voltage task lighting gives you more light in work areas. It uses halogen PAR or MR (multifaceted reflector) bulbs.



Use low-voltage halogens, T-5 fluorescents or ENERGY STAR certified LED fixtures for under cabinet lighting.

Low-voltage lights (typically, landscape lights, track lights or task lights) are popular do-it-yourself projects. They can save energy compared to their line-voltage counterparts.

Track lights provide flexible positioning of lights and are available in both low-voltage and line-voltage (120-volt) versions.

Photovoltaic lights are powered by sunlight in combination with rechargeable batteries. Many are self-contained and can be staked into the ground to mark paths or highlight landscaping.

Torchieres

Halogen torchieres are a safety hazard

According to the Consumer Products Safety Commission, in the United States alone, halogen torchieres have caused numerous fires and several deaths.

Many apartment complexes and college dormitories have banned halogen torchiere lamps because of high energy consumption and fire potential. The bulb in a halogen torchiere can reach 700 to 1,000 degrees Fahrenheit.

Environmental impact

Electricity used by halogen torchieres causes about 12 million tons of carbon dioxide emission each year—as much as 22 billion miles of driving.



A safe and energy-efficient alternative

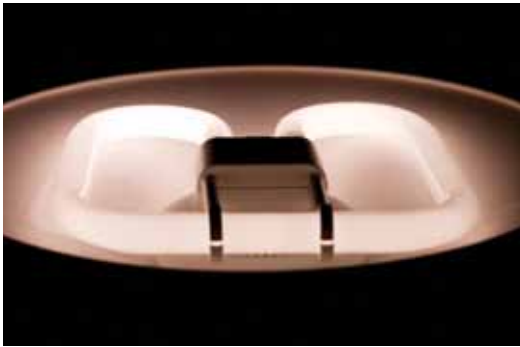
Compact fluorescent torchiere floor lamps:

- Produce natural-looking, high-quality light.
- Produce as much or more light than 300-watt halogen torchieres.
- Consume about one-sixth the electricity.

Look for compact fluorescent torchieres with the ENERGY STAR label for energy efficiency, safety and long life. They provide



Halogen torchiere: Dangerous energy waster



Compact fluorescent torchiere: Safe energy saver

as much light as a 300-watt halogen torchiere but use only 50 to 80 watts. The low operating temperature of fluorescent is much safer than halogen bulbs.

Special ballasts make these lamps two-way, three-way or dimmable.

Replace your halogen torchiere with an ENERGY STAR model and save more than \$200 in electric costs within seven years.

Controls for lighting

Motion sensors are popular for outdoor fixtures but are not compatible with fluorescent or high-pressure sodium lights.

Dusk-to-dawn photocells are a good idea if you want to leave a light on all night. Make sure the photocell can be used with CFLs to avoid creating a fire hazard.

Timers turn indoor lights on and off. They do not save much energy, but they do avoid leaving lights on unnecessarily. If putting a CFL on a timer, only use a mechanical timer, not a digital one.

Solid-state dimmer switches save energy by limiting the power delivered to the light. Note: Some new CFLs are dimmable.

Occupancy sensors turn lights on when a room becomes occupied and turn lights off after the room has emptied.

Recycling/disposal

Fluorescent bulbs contain mercury which is a hazardous substance that is not allowed in Dane County landfills. Avoid mercury contamination of the environment by recycling used bulbs. Stores that sell fluorescent bulbs in Dane County are also required to collect and recycle them.

For more information and a list of bulb recycling locations, see www.countyofdane.com/pwht/recycle/lamps_bulbs.aspx.

Report streetlight problems

As your community energy company, we help provide for the safety of our citizens and want to reduce unnecessary energy use.

Please help by reporting streetlights needing repair.*

Out at night (608) 252-7111
(select option 3)

On during the day (608) 252-7333

Cycling on and off (this means they
are going to burn out soon) (608) 252-7333

Or, simply send an e-mail to customerservices@mge.com with the following information:

- Your name and daytime phone number
- Address/intersection of the affected street lamp
- Brief description of the problem

*Note: Our service area covers most of the streetlights in Madison, Monona, Middleton, Fitchburg, Cross Plains, Maple Bluff and Shorewood Hills.

Glossary of terms

Ballast: A device needed to operate fluorescent and HID lights. Electronic ballasts are better than old-style magnetic ballasts for most purposes.

Bulb life: Number of hours the average bulb will operate.

Compact fluorescent lamps (CFLs): CFLs are small fluorescent tubes bent into compact shapes. Most CFLs come with an integral ballast, but two-piece designs have a separate ballast that lasts through four or five lamps (40,000 to 50,000 hours).

ENERGY STAR: U.S. government program that identifies energy-saving products. Get more information at www.energystar.gov or call 1-888-star-yes (1-888-782-7937).

Lumen: Measures the total light output of a bulb. The higher the lumen output, the brighter the bulb.

Lumens per watt (LPW): Higher LPW bulbs are more efficient, much like a car that gets more miles per gallon.

Watt: The amount of power needed to operate a lightbulb. Watts equal power in, not light out.

T5, T8, T12, etc.: Fluorescent tubes of different diameters. The “T” stands for tubular; the number is tube diameter in 1/8-inch increments. A T5 has a diameter of 5/8 of an inch and fits in shallow spaces such as under a kitchen cabinet. T8s are generally more efficient than the standard T12 tubes.

Resources/references

Lighting design

Integrated Building and Construction Solutions (IBACOS)
High Performance Lighting Guide
www.ibacos.com/high-performance-lighting-guide

The Lighting Pattern Book for Homes by Russell P. Leslie and Kathryn M. Conway. (MGE purchased several copies for libraries in our service territory.)

Ideas for Great Home Lighting by Scott Atkinson and the Editors of Sunset Books

American Lighting Association (ALA)
Phone: 1-800-274-4484
www.americanlightingassoc.com

The ALA provides information on the energy-efficient use of lighting for consumers, businesses and industry personnel. The ALA consists of lighting manufacturers, their marketing representatives and lighting showroom distributors.

Manufacturers

GE Lighting

www.gelighting.com

1-800-435-4448

Lights of America

www.lightsofamerica.com

1-800-321-8100, Ext. 222

MaxLite

www.maxlite.com

1-800-555-5629

Panasonic Lighting

www.panasonic.com

1-866-292-7292

Philips Lighting

www.nam.lighting.philips.com/us/

1-800-555-0050

Sylvania (Osram Sylvania)

www.sylvania.com

1-800-544-4828

Westinghouse Lighting (formerly Angelo Brothers/ABCO)

www.westinghouselighting.com

1-888-417-6222

MGE's lighting Web page

mge.com/home/appliances/lighting

Preventing light pollution/protecting dark skies

www.darksky.org (also has good links to other lighting information)

Lighting for older adults

Lighting the Way: A Key to Independence by Mariana Gross Figueiro
www.lrc.rpi.edu/programs/lightHealth/AARP/

Energy-efficient lighting

www.eere.energy.gov/consumer/your_home/lighting_daylighting/

ENERGY STAR®

www.energystar.gov/index.cfm?c=lighting.pr_lighting

For hard-to-find sizes

Energy Federation Inc.
www.efi.org

Bulbs.com

www.bulbs.com

listening. learning.

MGE takes responsibility to provide information and education to serve our customers and stakeholders. We educate customers today to help inform their decision making. We educate tomorrow's stakeholders so they can help plan our energy future.

If we all replace one incandescent bulb with a compact fluorescent, we'll save enough electricity to power 1,800 homes.

Working together we can make a difference.

Contact us for information about:


- Heating/Air-conditioning.
- Insulating/Weatherizing.
- Lighting.
- Windows/Doors.
- Appliances.
- Water heating.

Get more home energy information at:

- mge.com/home.
- Home Energy Line 608-252-7117.
- 800-245-1125.

Questions about billing? Call:

- 608-252-7222.
- 800-245-1125.

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your community energy company