

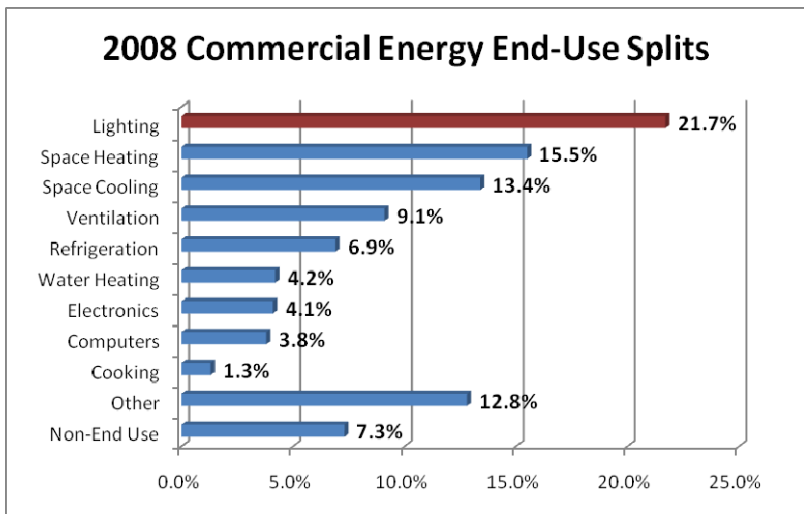
# Lighting Upgrades

## Capturing the Low-Hanging Fruit in Energy Efficiency

Quick paybacks make lighting upgrades one of the most cost effective solutions for reducing energy use. Upgrading lighting is typically an easy win-win solution, reducing energy consumption and operating costs, while typically requiring low capital costs to implement projects. Reduced energy consumption occurs directly through less energy for lighting, and energy use is further lowered by reducing cooling costs associated with waste heat from lighting. Operating costs are decreased through reduced maintenance while building occupants experience increased satisfaction and enhanced performance in their work environment. Lighting upgrades are traditionally the first area building owners explore when beginning their journey down the path towards energy efficiency, but can be combined with other retrofits for a whole-building approach.

### Background

According to the EPA, lighting consumes 18 percent of the electricity generated in the U.S., with another 4 to 5 percent being lost as heat waste that is generated by inefficient lighting. Lighting in commercial buildings accounts for close to 71 percent of overall lighting electricity use in the U.S.<sup>1</sup> Given the large consumption of energy use by commercial buildings, the creation of lighting upgrade policies and programs is vital to carbon reduction targets and economic vitality for building owners and communities as energy costs continue to rise.



*Lighting represents a large share of energy consumed by commercial buildings, often the number one application of electricity use.<sup>2</sup>*

### Benefits

**Improved Technology Allows for Reduced Energy Consumption.** As technology continually improves, so does the opportunity for reduced energy consumption through efficient lighting upgrades. High performance fluorescent lighting is considered the most efficient lighting in a commercial space. When paired with efficient fixtures such as occupancy or timed sensors and daylighting where feasible, the energy reductions continue to increase. For general or task lighting, replacing incandescent bulbs with compact fluorescent bulbs can achieve a 75% energy reduction.<sup>1</sup>

Outdoor lighting and other lighting that remains on full time (24/7), is another area to consider for significant energy reductions. Light emitting diodes (LEDs) use 80% less energy, have a useful life of 30,000-50,000 hours, a high resistance to breakage and vibration, perform well in cold temperatures, instantly start, and provide dimming and color control. These characteristics make LEDs ideal lighting in Exit signs and outdoor building lighting applications.<sup>3</sup>

**Quick Payback and Cost Savings.** High efficiency lighting retrofits can save 30-50% of a building's electricity usage, and can pay for themselves traditionally in three to five years. Savings may be direct from reduced consumption, as well as indirect from air conditioning savings if the inefficient lighting produced heat

waste. Simple changes also provide savings; compact fluorescent lights offer a \$40-\$50 savings over the life of the bulb and LED bulbs can reduce energy costs by 75%.<sup>4</sup>

**Building Occupant Benefits.** An occupant's mood, productivity, health, and safety can all be affected by the lighting used in a building. When lighting conditions improve in a commercial building, there is often a correlation in occupancy comfort. Over-illumination, glares, and poor lighting color can cause occupants headaches and lead to problems focusing. Occupants note less fatigue and eye strain when task lighting is provided where needed and lighting is properly dispersed. Increased worker productivity and reduction in sick days is further encouragement for lighting upgrades.

## Getting Started

A lighting upgrade program is an important step for increasing commercial buildings energy efficiency. In some instances, lighting upgrades may be mandatory. Minimum or required lighting standards have been implemented across the U.S. and provide several benefits. In fact, New York City requires that all covered buildings must install or modify all lighting systems to meet the New York City Energy Conservation Code by January 1, 2025. An extended time frame like New York City's is typical to ensure ample opportunity for buildings to comply.

### Step 1: Align with Utility or Other Incentives.

Engage your utility to understand their current and planned incentives for lighting upgrades. Determine if the utility company could support the program through monetary incentives or by providing free lighting audits to program participants. Most local or municipal utilities have kilowatt reduction goals and demand system management programs that may parallel lighting upgrade programs.

### Step 2: Require Lighting Audits.

A lighting audit can present a map of recommended lighting upgrades. By providing or requiring a lighting audit prior to the installation of lighting upgrades, unrealized potential savings may come to fruition. Align with incentives or entities that offer free or reduced cost lighting audits to keep program costs low, while increasing the overall kilowatt-hour reductions.

### Step 3: Increase Local Economy Through Job Growth.

If a building owner receives an incentive or rebate for lighting upgrades, requiring an audit by a certified partner will also benefit the local job economy. Given the job market's demands, consider providing certification and classes for job training on lighting installation or lighting audits. Previously unskilled or transitioning job trainees can receive valuable training that can be transferred to future jobs, or current unemployed laborers can return to work.

## Existing Policies or Programs

### **New York City, NY: Greener Greater Buildings Plan-Local Law 88**

<http://www.nyc.gov/html/planyc2030/html/about/ggbbp.shtml>

- **Adopted:** December 2009 / **Effective:** Immediately.
- **Affected Property Types:** Properties larger than 50,000 gross square feet (gsf), two or more buildings on the same tax lot that together exceed 100,000 gsf, or two or more buildings held in the condominium form of ownership that is governed by the same board of managers and that together



exceed 1000,000 gsf. (Required for all buildings except Tax Class One. Class One includes most residential property of up to three units, vacant land zoned for residential use in boroughs other than Manhattan, and most condominiums that are not more than three stories.)

- **Key Requirements:** Comply with standards required for new systems including:
  - Required or additional lighting controls (interior, light reduction, automatic shutoff).
  - Tandem wiring: share ballasts between two fixtures.
  - Exit signs: power cannot exceed 5 watts.
  - Interior lighting power requirements: calculated load must be less than the pre-calculated table loads.
  - Exterior lighting requirement: source efficiency of at least 45 lumens/watt.

## Austin, TX: Power Saver Program

<http://www.austinenergy.com/Energy%20Efficiency/Programs/Rebates/Commercial/Commercial%20Energy/lighting.htm>



- **Adopted:** 2004 / **Effective:** Immediately until funding is no longer available.
- **Affected Property Types:** Metered commercial customers, schools, federal, state and county facilities.
- **Key Requirements:**
  - Austin Energy representative schedules inspection to verify rebate opportunity and estimated amount.
  - Austin Energy performs final inspection to confirm installation before rebate is issued.
  - Rebate cannot exceed 50% of the total job costs, including equipment, installation, tax, etc.
  - Sample Rebates: T-8 and T-5-\$250/kW reduced, CFL-\$1/20 watt bulb, LED Exit Sign-\$20/sign.

## Santa Clara, CA: Silicon Valley Power Lighting Rebate

[http://www.siliconvalleypower.com/pdf/Lighting\\_v5.1.pdf](http://www.siliconvalleypower.com/pdf/Lighting_v5.1.pdf)



- **Adopted:** Programs began in 1998, updated in 2010.
- **Affected Property Types:** Any business or building type.
- **Key Requirements:**
  - Power Company must conduct pre and post site inspections.
  - Energy efficiency levels must exceed city code or development requirements.
  - Ballast and lamp combination must have energy savings to qualify for a rebate.
  - Must replace an incandescent, mercury vapor, or HID fixture, and all ballasts must be electronic.

## Complementary Policies

### Complementary Policy Landscape for Lighting Upgrades



For Access to the Commercial Buildings Toolkit visit <http://www.icleiusa.org/commercialenergypolicytoolkit>

For Further Information on Local Sustainability visit [www.icleiusa.org](http://www.icleiusa.org) & [www.imt.org](http://www.imt.org)

## *Complementary policies can make lighting upgrades much more effective.*

- **Mandatory energy audits** on the entire building support lighting upgrade programs. An audit provides energy usage of the building and recommendations for cost-effective efficiency improvements. Lighting upgrade programs may need to be combined with other building retrofits for optimal financing options.
- **Updated commercial building energy codes** also stimulate lighting upgrades by increasing efficiency requirements in new construction, and remodels.

## References

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[http://www1.eere.energy.gov/buildings/ssl/sslbasics\\_ledbasics.html](http://www1.eere.energy.gov/buildings/ssl/sslbasics_ledbasics.html)
4. Electric Power Research Institute. “Lighting Retrofit Manual.” (2002).  
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## Additional Resources

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- Lawrence Berkeley National Laboratory, Lighting Research Group.  
<http://lighting.lbl.gov/>
- Lighting Research Center.  
<http://www.lrc.rpi.edu/>
- U.S. Department of Energy. Energy Efficiency and Renewable Energy-Buildings.  
<http://www.eere.energy.gov/topics/buildings.html>