

# Transitioning to LED Lighting Technology Helps Facilities Reduce Lighting Energy Consumption and Costs

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## Overview

### **The Lighting Industry and its Benefits to Facility Managers**

Reduce costs by replacing existing lighting technology with energy efficient LEDs

### **LED Overview**

Understanding what LEDs are, and their benefits to facility managers

### **LED Applications in Consumer and Industrial Facilities**

A hypothetical look at replacing inefficient outdoor and indoor lighting with LED lamps

### **The Bottom Line**

A hypothetical facility switches to LED lighting and saves \$216,268 over the lifetime of the LED fixture

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## **The Lighting Industry and its Benefits to Facility Managers**

The U.S. Energy Information Administration (EIA) estimates that the total electricity consumed for lighting by the commercial sector in 2010, including commercial and industrial buildings and public streets and highway lighting, was 300 billion kilowatt hours (kWh). This figure amounts to about 22 percent of commercial sector electricity consumption, and about 8 percent of the total U.S. electricity consumption.

According to the Department of Energy's 2010 Buildings Energy Data Book, the average commercial building in the United States uses \$.70 of electricity per square foot in lighting costs annually. Meanwhile, 13 percent of commercial buildings in the United States are between 25,000 and 50,000 square feet. So by the math, for a typical 35,000-square-foot building, lighting costs would be \$24,500 annually. This annual lighting cost is for the average building, however in other applications, energy consumption for lighting is far higher.

"Facility managers can reduce operating and service costs, increase safety, and improve the appearance of their facilities by implementing LED lighting sources," said Manager of Product Research and Development and Engineering James Steedly, who also serves as MaxLite's resident LED expert. "Today, the benefits of LED lighting make it a win-win situation when compared to metal halide fixtures. For any metal halide fixture, the LED counterpart will outperform it in all categories: service life, mean delivered lumen output, correlated color temperature (CCT), color consistency, overall service life, power consumption, harmful UV, operating temperatures, light distributions and instant start."

In general, it is not reasonable to estimate savings for all light emitting diodes (LED) bulbs, but when looking at specific applications, consumers can garner significant reductions in lighting energy costs. If facilities across the United States reduce their energy consumption by



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converting to LED lamps, there is room for substantial reduction in energy consumption and costs nationwide.

#### **LED Overview**

By transitioning from metal halide, high pressure sodium and incandescent bulbs to energy-efficient LED lamps, consumers can see an almost immediate reduction in power consumption and lower utility bills. LEDs not only reduce energy consumption, but because they do not produce any significant heat during operation consumers have the added benefit of reduced cooling costs.

Consumers can introduce LED lighting into their environments without sacrificing the quality of light, while at the same time adding functionality. Today, LED lamps offer advanced binning techniques that allow for consistent, evenly distributed light. According to the U.S. Department of Energy's Office of Energy Efficiency Renewable Energy (EERE)'s LED Basic section of their website, "A typical incandescent lamp lasts about 1,000 hours; a comparable CFL lasts 8,000 to 10,000 hours, and the best linear fluorescent lamps can last more than 30,000 hours." LED bulbs have a long life of up to 50,000 hours, and reduce the need for bulb changeouts and the associated maintenance costs.

While in the past LEDs were mainly used for exit signs, traffic lights, and spotlights, today many LED lamps are omnidirectional and are the ideal energy-efficient and environmentally friendly lighting solution for decorative, ambient and general lighting applications. Compared to metal halide fixtures that often change in color from white to a purplish hue over time, LED bulbs typically retain their color over time.

The costs of LED lamps are decreasing as an industry, and they are more affordable than ever before. And according to McKinsey & Company's 2011 report entitled "Lighting the way: Perspectives on the global lighting market," it is estimated that there will an average 28

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Many LED bulbs are also compatible with daylight harvesting, occupancy sensor, HVAC shade controls, and building control systems for additional energy and money saving benefits. These systems use daylight to supplement light levels, so that the required light level is maintained, but the amount of LED light and power is reduced.

With LED lighting, there is also a linear relationship between brightness and wattage while dimming; when a bulb is dimmed down to 50 percent, the amount of energy used to light the fixture is also at 50 percent. In comparison, when a standard fluorescent bulb is dimmed down to 50 percent, the amount of energy used to light the fixture is at 80 percent.

Industry-leading LED lighting manufacturers design LED bulbs that operate according to the U.S. Department of Energy's Lighting Facts® program standards. Through this benchmark pledge program, lighting manufacturers that adhere to strict design and performance standards use the Lighting Facts product label to document their products' performance accurately throughout the marketplace. These easy-to-read package labels are user friendly and enable consumers to understand LEDs specifications and performance.

LED bulbs are tested to LM-79, set forth by the Illuminating Engineering Society of North America (IESNA), which is the approved method of measuring the electrical and photometric measurements of solid state lighting products; specifications include lumens, luminous intensity, CCT, wattage, efficacy, and color rendering index (CRI). LEDs are tested by third-party laboratories to ensure that specifications on a products' package are accurate.

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LED Canopy Fixtures				
		Existing Fixture	Retrofit Fixture	Savings
<b>Electricity</b>	Product	250 watt Metal Halide Canopy Light	70 watt LED Canopy Light	
	Consumption/Fixture	290 w	70 w	76%
	Consumption/Year	254,040 kWh	61,320 kWh	254,040 kWh
	Costs/Year	\$27,944	\$6,745	\$21,199
<b>Maintenance</b>	Lifetime	20,000 hours	50,000 hours	
	Lamp Cost/fixture	\$19	\$0	
	Labor Rate/Hour	\$50		
	Lamps Changed/Hour	6 lamps/hour		
	Initial Investment	Product (bulb and fixture)	\$250	\$350
	Rebate	\$0	\$200	
	Product (bulb and fixture)	\$250	\$150	
<b>Total Cost</b>	Initial Product Cost	\$25,000	\$15,000	\$10,000
	Electricity Costs/5 years	\$139,722	\$33,726	\$105,996
	Maintenance Cost /5 years	\$5,986	\$0	\$5,986
	<b>Total Cost/5 years</b>	<b>\$170,708</b>	<b>\$48,726</b>	<b>\$121,982</b>
<b>ROI</b>			<b>-.45 years (immediate)</b>	

\*Assumptions: 24 hours/day runtime; \$.11 kWh power price (national average); 100 fixtures retrofitted

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**LED Applications in Consumer and Industrial Facilities: Outdoor and Indoor**

*Outdoor*

For outdoor use, LED parking lights, canopy lights and wall packs replace high-pressure sodium and metal halide fixtures. High-pressure sodium fixtures have an average life of 25,000 hours, a low color rendering and a low Kelvin temperature, typically with an orange/yellow tinge, and are high-energy consumers of up to 400 watts.

“The LED counterpart will deliver more lumens over the service life of the fixture than the metal halide fixture,” said Steedly. “LED fixtures also do not produce harmful UV rays, which are the primary cause for accelerated fixture deterioration. LED fixtures’ operating temperatures are also considered warm to the touch at 40 to 50 degrees Celsius (104 to 122 degrees Fahrenheit), compared to 250 degrees Celsius (482

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LED Wall Pack				
		Existing Fixture	Retrofit Fixture	Savings
Electricity	Product	175 watt Metal Halide Wall Pack	40 watt DLC-Approved LED Wall Pack Light	
	Consumption/Fixture	198 w	40 w	80%
	Consumption/Year	86,724 kWh	17,520 kWh	69,204 kWh
	Costs/Year	\$9,540	\$1,927	\$7,612
Maintenance	Lifetime	20,000 hours	50,000 hours	
	Cost/lamp	\$16	\$0	
	Labor Rate/Hour	\$50		
	Lamps Changed/Hour	6 lamps/hour		
Initial Investment	Product (bulb and fixture)	\$200	\$350	
	Rebate	\$0	\$100	
	Product (bulb and fixture)	\$200	\$250	
Total Cost	Initial Product Cost	\$20,000	\$25,000	(\$5,000)
	Electricity Costs/10 years	\$95,396	\$19,272	\$76,124
	Maintenance Cost /10 years	\$5,329	\$0	\$5,329
	<b>Total</b>	<b>\$120,725</b>	<b>\$44,272</b>	<b>\$76,453</b>
ROI			.61 years	

\*Assumptions: 12 hours/day runtime; \$.11 kWh power price (national average); 100 fixtures retrofitted

degrees Fahrenheit) for metal halide fixtures.”

In a hypothetical retrofit of 100 250-watt metal halide canopy lights, operating at 290 watts with the ballast energy consumption included, these fixtures were replaced with 100 70-watt LED canopy lights, enabling consumers to see a 76 percent reduction in electricity costs and an immediate ROI. Consumers also need to replace metal halide fixtures two or more times during the same lifetime as the LED equivalent, for \$5,986 in additional maintenance costs over the course of the LED fixtures’ lifetime. Although the initial cost of the LED canopy light is higher than the metal halide canopy light, when the average rebate is deducted, the LED fixture’s cost drops to \$100 less than the metal halide equivalent.

At the end of the LED fixtures’ lifetime of 5-years, operating 24 hours a day, consumers would have spent \$170,708 on the metal halide fixture, bulb replacements, maintenance and electricity; during that same time period, consumers would have spent \$48,726 on the LED

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At the end of the LED fixtures' lifetime of 5-years, operating 24 hours a day, consumers would have spent \$170,708 on the metal halide fixture, bulb replacements, maintenance and electricity; during that same time period, consumers would have spent \$48,726 on the LED canopy light equivalent, for a savings of \$121,982 over the 5-year period.

LED Flat Panels				
		Existing Fixture	Retrofit Fixture	Savings
	Product	2x2 Fluorescent Troffer with two T12 Lamps & Electromagnetic Ballast	45 watt LED 2x2 Flat Panel/Troffer	
<b>Electricity</b>	Consumption/Fixture	90 w	45 w	50%
	Consumption/Year	34,493 kWh	17,246 kWh	17,246 kWh
	Costs/Year	\$3,794	\$1,897	\$1,897
<b>Maintenance</b>	Lifetime	20,000 hours	50,000 hours	
	Lamp Costs/Fixture	\$14	\$0	
	Labor Rate/Hour	\$50		
	Lamps Changed/Hour	12 lamps/hour		
<b>Initial Investment</b>	Product (bulb and fixture)	\$100	\$300	
	Rebate	\$0	\$75	
	Product (bulb and fixture)	\$100	\$225	
<b>Total Cost</b>	Initial Product Cost	\$10,000	\$22,500	(\$12,500)
	Electricity Costs/13 years	\$49,500	\$24,750	\$24,750
	Maintenance Cost /13 years	\$5,583	\$0	\$5,583
	<b>Total Cost/13 years</b>	<b>\$65,083</b>	<b>\$47,250</b>	<b>\$17,833</b>
<b>ROI</b>			<b>5.38 years</b>	
*Assumptions: 10.5 hours/day runtime; \$.11 kWh power price (national average); 100 fixtures retrofitted				

canopy light equivalent, for a savings of \$121,982 over the 5-year period.

In a hypothetical retrofit of 100 175-watt metal halide wall packs, operating at 198 watts with the ballast energy consumption included, these fixtures were replaced with 100 40-watt DLC-approved LED wall packs, allowing consumers to see a ROI in just over seven months. Consumers also need to replace the metal halide lamps two or more times during the lifetime as the LED fixture, for \$5,329 in additional maintenance costs during the LED fixtures' lifetime. While, the initial cost of the LED wall pack is higher than the metal halide equivalent,

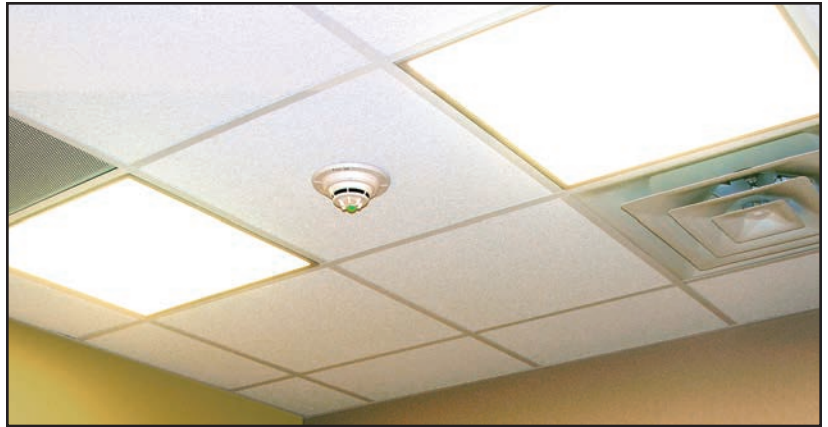
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**“LED Flat Panels generate volumetric lighting,” said Steedly. “They fill the room with 180 degrees of light distribution without dead zones or glares. No other fixtures have as much lit surface area as a Flat Panels, and there are no issues with eye strain or adjustments, allowing for less stress on the eyes.”**

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when the average rebate is deducted, the LED bulbs' cost drops to just \$50 more than the metal halide equivalent.

Over the course of a 10-year timeframe, consumers would have spent \$120,725 on the metal halide wall packs, bulb replacements, maintenance and electricity, while consumers who purchased the LED wall packs would have spent \$44,272 on the fixtures and electricity, for a savings of \$76,453.

#### *Indoor*

For indoor use in facilities across the United States, facility managers are replacing fluorescent troffers with magnetic ballasts with the LED Flat Panel equivalent. While the U.S. Environmental Protection Agency classifies fluorescent lamps as hazardous waste, in need of separate waste disposal, fluorescent lamps are commonplace in dropped ceilings in commercial applications, including offices, schools, hospitals and retail stores. The LED fixtures feature instant on technology, without flickering or buzzing noises, and do not change color when dimmed.

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In a hypothetical retrofit of 100 90-watt 2-foot by 2-foot fluorescent troffers with two T12 lamps and electromagnetic ballasts, these fixtures were replaced with 100 45-watt 2-foot by 2-foot Flat Panels.

Consumers can see a ROI in just over five years, when operated 10.5 hours a day, but they offer a 50 percent reduction in energy costs.

When maintenance costs are considered, consumers need to replace fluorescent troffers at least two times during the lifetime of the LED equivalent, for an additional \$5,583 savings. The initial cost of the LED Flat Panel is \$125 higher than the fluorescent equivalent with a rebate

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## MaxLite

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At the end of a 10-year period, consumers would have spent \$65,083 on the fluorescent troffers, replacements, maintenance and electricity, while consumers who purchased the LED Flat Panels would have spent \$47,250, for a savings of \$17,833.

### The Bottom Line

During the lifetime of each of the three fixtures retrofitted above, consumers would save \$121,982 on the canopy lights, \$76,453 on the wall packs, and \$17,833 on the LED Flat Panels, for a total savings of \$216,268 just by replacing these three types of fixtures in one facility. Of course, the above figures are hypothetical, but they do serve as an accurate basis for a real-life retrofit application.

What can LED retrofits do for your facility?

### About MaxLite

Founded in New Jersey in 1993 as a joint venture with SK Enterprise Co., Ltd., a leading South Korean manufacturer of energy efficient lighting products, MaxLite inherited a true tradition of energy efficient lighting manufacturing that dates back to 1955. Today, MaxLite is a privately held lighting company which designs, manufactures and distributes LED fluorescent energy efficient lighting products. Since its founding, MaxLite has worked to develop a reputation as a leading global manufacturer and marketer of energy efficient and environmentally friendly lamps and luminaires. MaxLite offers an extensive line of indoor and outdoor lighting fixtures including LED and fluorescent luminaires. MaxLite established the MaxLED™ brand which includes: Edge Lit Flat Panels, Direct Lit Flat Panels, full cutoff Wall Packs, Garage and Canopy Luminaires, Nightlights, Exit Signs, Optical Panels, Lightbars, and LED light sources. MaxLite is headquartered at 12 York Ave in West Caldwell, New Jersey 07006. Tel. 1.800.555.5629 Website: [www.maxlite.com](http://www.maxlite.com)



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