2010 G-ROI® REPORT

Green Return on Investment Analysis for

Commercial Lighting in U.S. Office Buildings

U.S. businesses are under increased pressure to a) reduce costs; b) go green. One simple way to do both is to make smart investments in green products and services that reduce operating costs, thus offering a sensible return on your investment. At GREENandSAVE we call it G-ROI®, your Green Return on Investment.

GREENandSAVE seeks, through information and consultation, to aid property owners and facility managers in making the wisest and most appropriate investments in green. This G-ROI® Report issue focuses on the current state of energy consumption, comparison of the leading energy reduction tactics, the specific advantages of top performers like LED lighting, and how to get started.

I sincerely hope this report helps your company save money by going green.

Regards,

Charlie Szoradi
CEO, GREENandSAVE, LLC

State of the Energy Union

The U.S. consumes approx. 25% of the world's energy with less than 5% of the total world population. The $400 billion the U.S. will spend on energy in 2010 is trending toward $500 billion in 2020. Almost half of our energy consumption (48% per Fig. 1) is for buildings, which means the private sector can make a major impact without waiting for government programs or macro initiatives.

Between the years 1980–2000, energy expenditures remained relatively flat. However, costs have been rising, and according to DOE forecasts, will continue to rise. Given the current corporate interest in cost containment, new green technologies offer owners and managers the means to save energy and money.

*U.S. Department of Energy Annual Energy Outlook Report #DOE/EIA-0383 (2009)

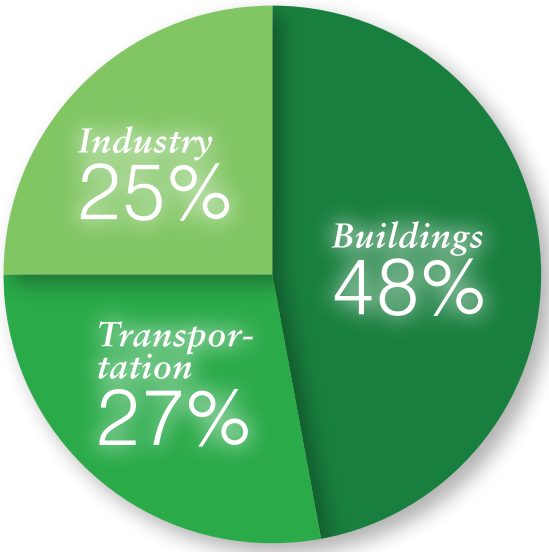


Figure 1: 2010 US Energy Consumption
Source: U.S. Dept. of Energy

Compare and Contrast

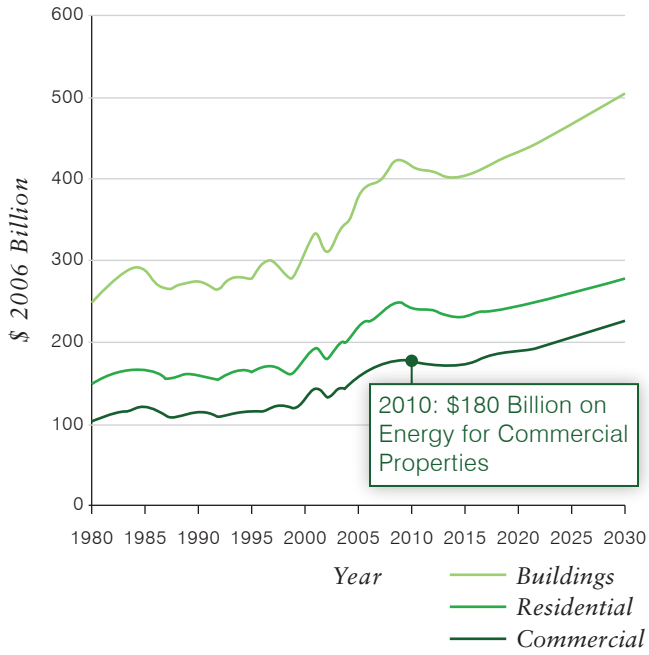
All energy reduction tactics are not created equal, especially when it comes payback times. Like any investment, some have higher returns and quicker payback than others. The U.S. Mid-Range Abatement Curve (Fig. 3) is a powerful indicator for private sector managers to make smart investments in powerful cost savings.

Initiatives to the left are most cost-effective in savings, reducing energy waste, and, in turn, reducing CO2 emissions.

G-ROI® Ranked by Type of Investment

1. Commercial Buildings: LED Lighting
2. Commercial Buildings: New Shell Improvements
3. Commercial Buildings: Combined Heat and Power
4. Onshore Wind: Medium Penetration
5. Distributed Solar PV
6. Coal Power Plants: CCS New Builds with EOR
7. Onshore Wind: High Penetration
8. Commercial Buildings: HVAC Equipment Efficiency
9. Solar CSP
10. Car Hybridization

Figure 2: U.S. Building Energy Expenditures
Source: U.S. Dept. of Energy



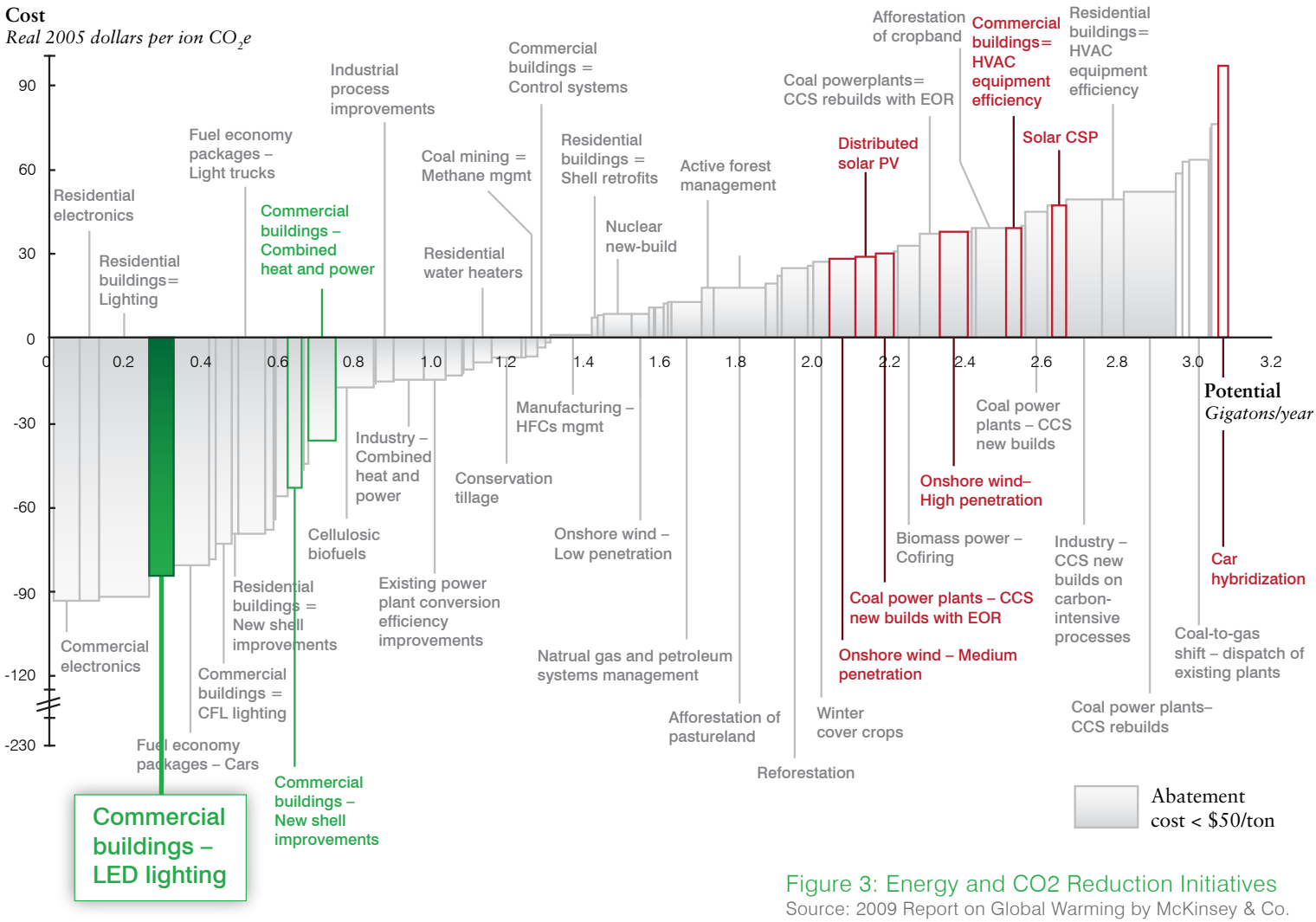


Figure 3: Energy and CO2 Reduction Initiatives
Source: 2009 Report on Global Warming by McKinsey & Co.

Performance metrics are key to smart management. When analyzing costs managers find *cost as a percentage of total energy* higher with traditional lighting. Very few facilities run sub-meters on lighting, and do not go through the electricity bill line-by-line. The real cost of lighting is often hidden. Fig. 4 highlights both the **average percentage of lighting relative to total energy for a typical U.S. office,** and **average cost per employee.**

Managers may use this back-of-the-napkin tool to estimate opportunities for savings with LED lights. **LEDs reduce operating costs by 50%, and savings are approximately $60 per employee per year.**

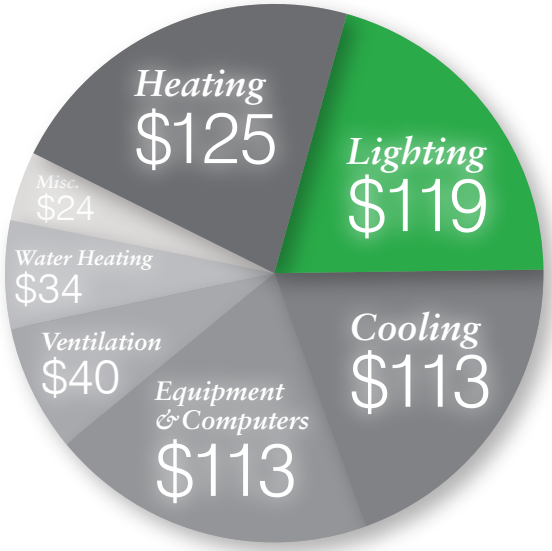


Figure 4: U.S. Energy Cost Per Employee
Source: GREENandSAVE.com and U.S. Dept. of Energy

How Much of Your Electricity Cost is from Lighting?

Naturally, different types of facilities use more electricity for lighting than others. Toping the chart for highest percentage of lighting use are hospitals, which are open 24/7, and retailers, which are increasingly open longer hours. The potential for LEDs to dramatically help restaurants and industrial warehouse/factories reduce operating costs is also extremely high. Restaurants most often use legacy incandescent lamps for their dimming feature, so they do not convert to CFLs. Warehouses and Factories often have inefficient high bay fixtures, making them strong candidates for savings as well. This chart also does not illustrate the 24/7 areas within any property—like covered parking garages and fire stair towers—that are federally mandated to be lighted around the clock.

Source: www.LEDsavingsolutions.com, DOE

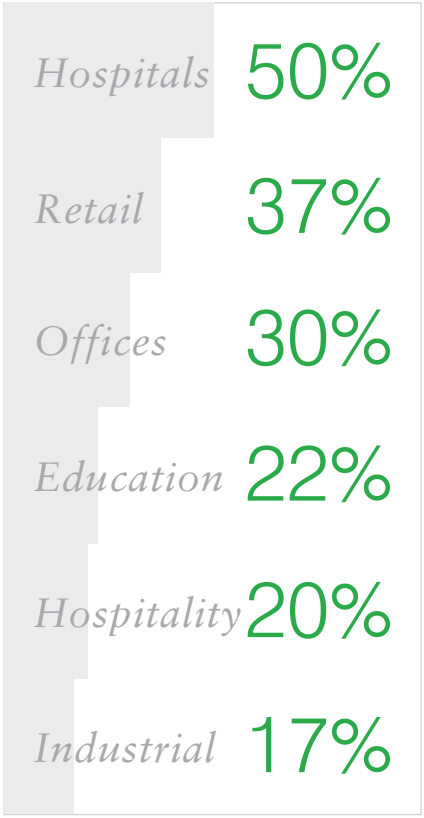


Figure 5: U.S. Lighting Percentage of Electricity
Source: LEDSavingSolutions.com and U.S. Dept. of Energy

LED Lighting is a Smart Investment

LED lights can reduce the cost of lighting by 50% to 80% and many last up to 80,000 hours, which equates to several decades under typical usage levels. The extended longevity of LEDs reduces the cost of replacing other bulbs every few years. Plus, LED lights do not contain Mercury, an environmental toxin that is extremely costly to handle and discard.

Investment Analysis

G-ROI® calculations are based on the following statistics for U.S. offices:

- Number of U.S. office buildings: **736,000 buildings**
- Total square footage of U.S. offices: **12,044,000,000 sq. ft.**
- Percentage of offices relative to total U.S. properties (non-residential): **17.9%**
- Average hours of office operation: **53 hours/week**
- Average annualized hours of operation: **2,756 hours/year**
- Average commercial cost of one kWh: **10.6 cents/kWh**
- Annual electricity consumption for office lighting: **82 billion kWh/year**
- Average traditional office lighting cost per sq. ft. per year: **$0.72**
- Pounds of CO2 saved for every $1 of electricity saved: **13 lbs**
- Pounds of CO2 emitted annually for mid-sized SUV/car: **12,000 lbs (6 Tons)**

The G-ROI® calculations below are also based on key data for LED Lighting:

- LED kWh reduction over a blended average of traditional and fluorescent lamps: 50%
- LED lifetime expectancy: 50,000 hours
- Lifetime expectancy of LEDs for average offices given average operating hours: 18.1 years
- Average savings per foot/year with LEDs: $0.36
- To put this level of savings in context across the other types of properties, see Fig. 6 and Fig. 7 of this G-ROI® Report.

National Impact Data: The previous information was taken from U.S. Census, DOE, ENERGY STAR, and private sector data.

G-ROI® for U.S. Office Buildings

- Annual savings for offices with LED retrofits: **$4,346,000,000.**
- Savings over the life of the LED retrofits: **$78,846,153,846.**
- Annual reduction of CO2 emissions with LED retrofits: **28,249,000 Tons**
- Reduction of CO2 emissions over the life of the LED retrofit: **512,500,000 Tons**
- Total CO2 equivalent in vehicles taken off the road: **4,708,167 vehicles**

Figure 6: U.S. Property Type Data
Source: LEDSavingSolutions.com from U.S. Dept. of Energy data

Property Type	# of Buildings in the US	Total Square Footage	% of Total non-residential sq. ft.	Average Hours per week of operations	Annual Electricity consumption for lighting in kWh	kWh/ sq. ft./ year
Office	736,000	12,044,000,000	17.9%	53	82,000,000,000	7
Warehouse and Storage	603,000	10,477,000,000	15.6%	49	39,000,000,000	4
Mercantile 'Retail'	667,000	10,398,000,000	15.4%	65	90,000,000,000	9
Education	327,000	8,651,000,000	12.8%	50	33,000,000,000	4
Lodging	153,000	4,521,000,000	6.7%	150	36,000,000,000	8
Public Assembly	305,000	4,393,000,000	6.5%	54	8,000,000,000	2
Religious Worship	307,000	3,405,000,000	5.1%	29	5,000,000,000	1
Service	478,000	3,388,000,000	5.0%	63	18,000,000,000	5
Vacant	253,000	1,908,000,000	2.8%			
Health Care - Inpatient	11,000	1,865,000,000	2.8%	165	22,000,000,000	12
Food Service	349,000	1,851,000,000	2.7%	84	12,000,000,000	6
Other	102,000	1,222,000,000	1.8%	49	17,000,000,000	14
Public Order and Safety	72,000	1,168,000,000	1.7%	95	5,000,000,000	4
Health Care - Outpatient	116,000	1,053,000,000	1.6%	56	8,000,000,000	8
Food Sales	174,000	994,000,000	1.5%	118	14,000,000,000	14
TOTALS	**4,653,000**	**67,338,000,000**	**100.0%**	**77**	**389,000,000,000**	**7**

Figure 7: U.S. Property Type via LED Lighting
Source: LEDSavingSolutions.com from U.S. Dept. of Energy data

Property Type	Average Commercial cost of kWh	Average Lighting Cost/ sq. ft./year	Average Savings % with LEDs	Potential Savings/ sq. ft./ year with LEDs	Annual Savings with LEDs	CO2 saved/ $1 saved	Annual CO2 Savings in Tons
Office	$0.106	0.72	0.50	$0.36	$4,346,000,000	13	28,249,000
Warehouse and Storage	$0.106	0.39	0.50	$0.20	$2,067,000,000	13	13,435,500
Mercantile 'Retail'	$0.106	0.92	0.50	$0.46	$4,770,000,000	13	31,005,000
Education	$0.106	0.40	0.50	$0.20	$1,749,000,000	13	11,368,500
Lodging	$0.106	0.84	0.50	$0.42	$1,908,000,000	13	12,402,000
Public Assembly	$0.106	0.19	0.50	$0.10	$424,000,000	13	2,756,000
Religious Worship	$0.106	0.16	0.50	$0.08	$265,000,000	13	1,722,500
Service	$0.106	0.56	0.50	$0.28	$954,000,000	13	6,201,000
Vacant			0.50				
Health Care - Inpatient	$0.106	1.25	0.50	$0.63	$1,166,000,000	13	7,579,000
Food Service	$0.106	0.69	0.50	$0.34	$636,000,000	13	4,134,000
Other	$0.106	1.47	0.50	$0.74	$901,000,000	13	5,856,500
Public Order and Safety	$0.106	0.45	0.50	$0.23	$265,000,000	13	1,722,500
Health Care - Outpatient	$0.106	0.81	0.50	$0.40	$424,000,000	13	2,756,000
Food Sales	$0.106	1.49	0.50	$0.75	$742,000,000	13	4,823,000
TOTALS	**$0.106**	**$0.74**	**0.50**	**$0.37**	**$20,617,000,000**	**13**	**134,010,500**

Top Five Areas with Highest LED Lighting G-ROI® Payback in Less than 2 Years:

1. **Covered Parking Garages** -24/7 (168 hours/week)
2. **Fire Stair Towers & Lobbies for Offices, Hotels, and Multi-Family Residential** -24/7 (168 hours/week)
3. **High Bays for Factories, Distribution Centers, Warehouses, Gymnasiums** -16/5 to 24/5 (80 to 120 hours/week)
4. **Restaurants, Country Clubs, Auto Dealerships, Showrooms, etc.** Incandescent or Halogen Replacements for 10/5 to 16/5 (50 to 80):
5. **Wall Packs for service corridors and exterior lighting -** 10/5 to 24/7 (50 to 168): Interior and Exterior

Types of Lamps that Yield the Highest G-ROI® with an LED Lighting Retrofit:

- Incandescent, halogen, or HID (Metal Halide/ Mercury Vapor)
- T-12 fluorescent tubes of any length
- T-8 fluorescent tubes of any length
- T5s, quad pin CFL, Induction

Payback Horizon

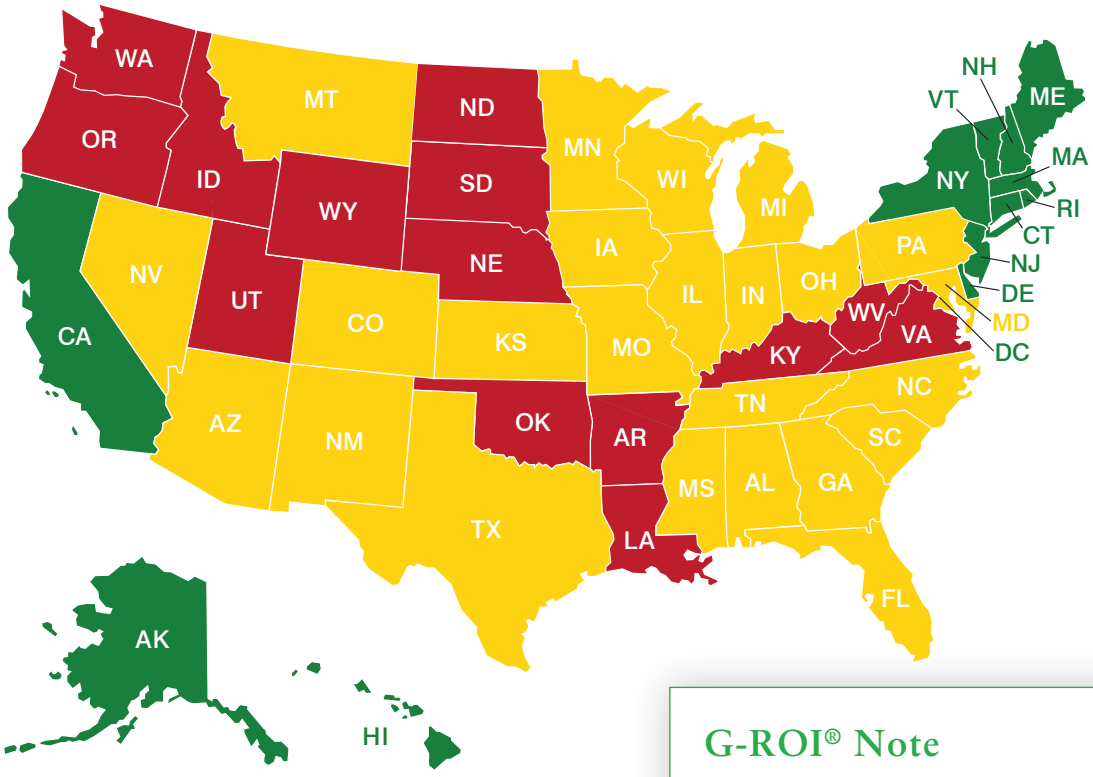
Three key factors typically determine the payback of commercial lighting:

1. Run time of the lights in the property, 10 hours a day vs. 24/7
2. Level of inefficiency of existing bulbs, T-12 fluorescent, CFL, etc.
3. Cost per kWh, 6 cents up to 23 cents

Bonus Factors

4. Federal Tax incentive eligibility
5. Utility rebate eligibility

Figure 8: Cost/kWh by State
Source: LEDSavingSolutions.com from U.S. Dept. of Energy data



Highest Cost kWh
Over 12 cents/kWh

Average Cost kWh
Between 8 and 12 cents/kWh

Lowest Cost kWh
Under 8 cents/kWh

G-ROI® Note

Research conclusion: Commercial LED lighting offers at least a 50% G-ROI® and a payback within two years if at least two of key criteria are met:

1) High run time
2) High cost per kWh
3) Inefficient existing lamps