ARE LIGHTING RETROFITS WORTH THE INVESTMENT?

A lighting retrofit is the practice of replacing components in the system with counterparts that make it use energy more efficiently. A lighting upgrade is any strategy that reduces the system's energy use. Energy savings are realized over time that can be significant enough to not only pay for the new equipment, but produce a return on the investment.

While manufacturers and professional lighting managers have computer software that calculates the economic benefits of an upgrade, it pays to understand the principles.

Understanding Energy Consumption

Utilities bill their customers in a variety of ways, including an energy use charge, demand charge, power factor charge, fuel adjustment charge and other charges. In this section, we will focus on reducing energy consumption.

Energy Consumption (kWh) = Input Watts (kW) x Time (hours operated in a given year)

To reduce energy consumption, therefore, we can either reduce the input wattage or reduce the hours of operation. Input wattage can be reduced by replacing lamps and ballasts with more energy efficient counterparts or outright removal of lamps and ballasts. The hours of operation can be reduced using sophisticated controls and other methods.

For example... Let's look at two purely fictitious lighting systems, A and B. Lighting System A is the existing system and Lighting System B is a proposed retrofit system which simply includes more energy efficient lamps and ballasts. They produce comparable light output.

	Lighting System A	*Lighting System B*
Input Watts/Fixture	175	100
Hours of Operation/yr.	3000	3000
Energy Consumption/yr. divide by 1000	525,000 Wh	300,000 Wh
Energy Savings/Year (kWh)		225 kWh
Utility Cost/kWh	$0.10	%0.10
Energy Savings /yr. ($)		22.50
Number of Fixtures Retrofitted	100	100
Total Energy Savings/yr. ($)		$2,250.00

So we save $22.50 per year by replacing the lamps and ballasts in this fixture. For the 100 new fixtures; a savings of $2,250 per year. Additional energy savings can be calculated from the air conditioning system, which now works less hard because less heat is produced by the lighting system.

Installing new controls for occupancy sensors would reduce the hours of operation, or both strategies. If new controls were installed, in this case, would reduce the operating hours from 3,000/year to 2,300/year, therefore an additional $700.00 in energy savings, or a total of $2,950 per year.

Payback and Return on Investment

Now that we know how much money we're going to save while still enjoying comparable performance from the lighting system, it is time to do an economic analysis, which includes determining payback and return on investment (ROI). A full-fledged net present value analysis or life-cycle cost analysis is a major undertaking (best to use software), so for our purposes we will determine simple payback and ROI.

Simple payback is the amount of time in decimal years that will go by before a system upgrade option's energy savings reach the net installation cost (also called the initial cost):

Payback (Years) = Net Installation Cost ($) ÷ Annual Energy Savings ($)

5-Year Cash Flow ($) = 5 Years - Payback (Years) x Annual Energy Savings ($)

Five-year cash flow was chosen based on expectations of the life of the lamps; by factoring in the cost of lamp replacement and other maintenance costs, a 10- or 20-year cash flow can be produced.

Simple return on investment is an internal rate of return, expressed as a percentage, based on the relationship between annual energy savings and the net installation cost:

ROI (%) = [Annual Energy Savings ($) ÷ Net Installation Cost ($)] x 100

Together, they represent a simple and effective first step at determining whether the new equipment would be a good investment for its owner.

If the initial cost of the system (lamps/ballasts only) - - including the cost of the components and labor, waste disposal - - is about $70.00/fixture or $7,000 total (other initial costs may include financing, consulting fees, tax effects and waste disposal).

Simple payback is:	$7,000 ÷ $2,250 = 3.1 Years
Five-year cash flow is:	5 Years - 3.1 x $2,250 = $4,275
ROI is:	($2,250 ÷ $7,000) x 100 = 32%

These results usually must then be compared to the owner's financial policies regarding capital investment to see if the ROI meets the internal "hurdle rate" and therefore enjoy the best chance of a green light by senior management. It is often desirable to examine a number of upgrade options to make the best choice. Note that some utilities offer programs that reward lower energy consumption with a dollar rebate that can make the upgrade even more attractive; also note that an energy service company may finance the upgrade.

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