MUSEUM OF SCIENCE & HISTORY

Bill Wooten

Technical Services Manager

SUMMARY OF MOSH ENERGY SAVING UPGRADES

MOSH chose an upgrade to LEDs because LED's have zero UV emission and a 50,000 hr warranted life span. We are hoping to get 7 years use for the majority of our lamps. Additionally, the extremely low wattage of LEDs, in comparison to any other lamp on the market, results in a huge decrease in heat, which dramatically decreases the load on AC Systems.

- Replaced 1335 lamps with LED equivalents. Lamps replaced were fluorescents, halogen, metal halide, and incandescent.
  Total savings: 38237 Watts

- Replaced 90 manual light switches with 88 occupancy sensors and 2 max 12 Hr timers.
  Savings: variable, but expected to be 30 to 50 % more "off" time for all equipped spaces compared to manual switching.

- Upgraded A/C heating and cooling controls from 1980's analog controls to a digital system with humidity controls and a Variable Frequency Drive (VFD) motor control. Systems that used to run at 100% capacity approximately 20 hrs per day now run at 30% capacity 24 hrs per day.

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- Replace all Appliances with Energy Star rated equipment.

- When repairing roofs, add a layer of R-15 rated insulation plus use reflective final coverings.

The Infamous Cliché

Think "OUT OF THE BOX"

Examples:

1. Cost to replace Air Handling Unit in the MOSH Planetarium was close to 50,000 dollars. Installation of automated logic cost $8,000. Result- Unit runs at 98 to 100% efficiency. Humidity is fully controlled allowing temperature setting to be 74 degrees instead of 70 degrees.

2. Reach-in Freezer in the kitchen malfunctioned with repair estimate of $1300.00. A conversation with the users proved that there was no need anymore for that kind of capacity. Solution: Have refrigerant removed from existing freezer and sent for recycle, $300.00. Recycle freezer box and mechanicals. Replace unit with residential Energy Star rated 16 cft. stand alone freezer. $550.00. Total cost: $850.00. Result- Energy hog oversized unit gone. New low energy cost unit that meets actual needs installed.

3. Adding insulation during a roof repair adds about 6% to the cost but savings on A/C can be enormous. Upgrade could pay for itself in 3 years.

FACTS WE HAVE PROVEN

1. Choice of bulbs is important, there are “tricks” we learned the hard way. (3000K is the Kelvin to choose)

2. Occupancy sensors can save you allot! But proper planning is important.

3. There are Health and Productivity benefits.

4. Decreased Maintenance Costs. (i.e. : no ballasts, 50000 Hr lamps)

5. Digital control of humidity and temperature control based on occupancy can save big dollars.

Savings Estimate for ENERGY STAR Qualified Light Bulbs

LEARN MORE AT energystar.gov

Results Overview

The ENERGY STAR models of your selected light bulbs will save approximately 78%. Each year you will save approximately 850 kWh of electricity and $85. Over the life of the light bulbs you will save approximately $438 in electricity costs and $636 in equipment replacement costs. By choosing ENERGY STAR you will reduce emissions by approximately 1,308 pounds of carbon dioxide annually, which is equivalent to the emissions reduction of not driving your car for 42 days.

Results Detail

	Quantity	Annual Total					Life Cycle Total				% Electricity Savings with ENERGY STAR	Total additional purchase price	Simple payback period for additional initial cost (years)	Assumed equipment lifetime (years)
		Electricity cost savings	Electricity savings (kWh)	Electricity cost	Electricity consumption (kWh)	Emissions reduction (pounds of CO2)	Electricity cost savings	Electricity savings (kWh)	Avoided cost for replacement bulbs & labor	Net cost savings				
CFL														
Bulb 1 (15 W CFL replacing 75 W)	1	$21	208	$5	52	320	$45	480	$9	$51	80%	$2.80	0.1	2.3
	0													
LED omnidirectional														
Bulb 1 (12 W LED replacing 60 W)	1	$17	166	$4	42	256	$102	1,200	$49	$127	80%	$24.60	1.0	7.2
Bulb 2 (17 W LED replacing 53 W)	1	$12	125	$6	59	192	$76	900	$172	$201	68%	$47.60	1.2	7.2
LED flood/spot reflector														
Bulb 1 (10 W LED replacing 50 W)	1	$14	139	$3	35	214	$85	1,000	$234	$281	80%	$37.70	0.7	7.2
Bulb 2 (14 W LED replacing 75 W)	1	$21	212	$5	49	326	$130	1,525	$172	$253	81%	$49.20	1.0	7.2
Total	5	$85	850	$23	236	1,308	$438	5,105	$636	$912	78%	$162	0.8	-

Notes: Savings for ENERGY STAR lighting includes an avoided cost for replacements because efficient lighting typically lasts longer than conventional lighting.
More efficient lighting releases less heat into the surroundings, so upgrading to ENERGY STAR lighting may also have an impact on your heating and cooling costs.
Total additional purchase price is the incremental cost for ENERGY STAR equipment reduced by any rebate/incentive amount entered on Inputs tab.
Life cycle cost savings are given in terms of present value based on a real discount rate of 4%. See General Assumptions tab to adjust the discount rate.
Life cycle net cost savings = life cycle electricity cost savings + avoided replacement cost - additional purchase price
Simple payback calculation is based on total additional purchase price, annual electricity cost savings and annual bulb replacement costs

If every American home replaced their 5 most frequently used light fixtures or the bulbs in them with ones that have earned the ENERGY STAR, we would save approximately $8 billion each year in energy costs, and together we would prevent the greenhouse gases equivalent to the emissions from 10 million cars.

This calculator was developed by U.S. EPA and DOE to estimate the energy consumption and operating costs of light bulbs and the savings with ENERGY STAR.
New ENERGY STAR qualified light bulbs are compared to the average available new conventional light bulbs. Actual savings may vary based on use and other factors.
See www.energystar.gov for information on other ENERGY STAR products.

FINAL COMMENTS

Since the beginning of the installation, which began in November of 2011, we have seen a savings of $3,500 to $5,200 **(avg approx $4,000)** per month on our electric bill.

IT WORKS!!!

Don't shy away from these upgrades because you are comfortable with the technology you have now.

And never forget what lowering your electrical load also does for Carbon Emissions

Calculators are available for almost any upgrade by searching

"Energy Star Calculators"