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Lighting Energy Analysis & Proposal Service

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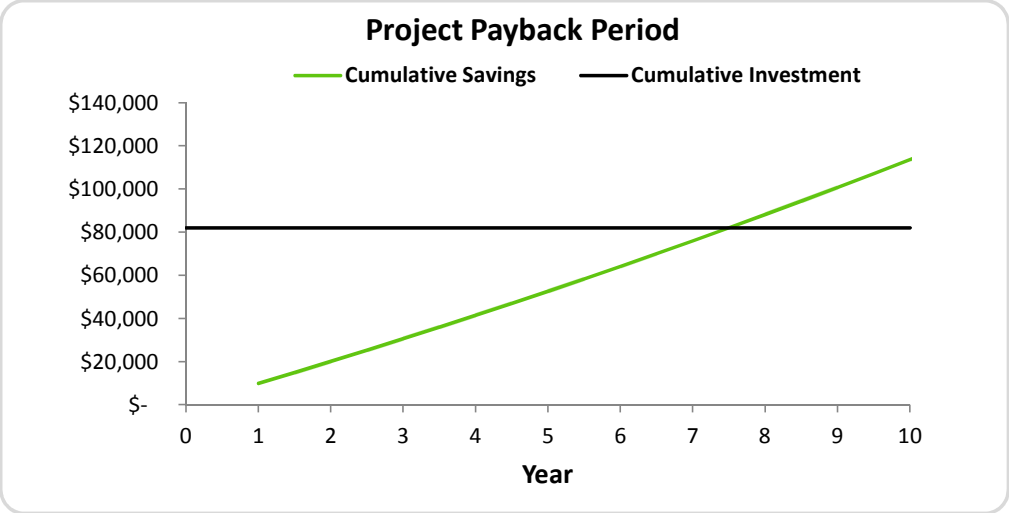
Executive Summary

The proposed retrofit solution is a Lutron energy efficient lighting control system. The following lighting control strategies shall be implemented in your Commercial Office to optimize the energy usage:

- Manual Control
- Occupancy Sensing
- Daylight Harvesting

For energy savings and return on investment calculations, the baseline was assumed to be the current lighting control system that includes Manual Switching.

Lighting Energy Savings	**38.1%**
Annual Energy Savings	**66,136 kWh**
Material & Commissioning Cost	$45,990
Estimated Installation Cost (by others)	$49,834
Estimated Rebates & Incentives	$(13,767)
Estimated Net Project Cost	**$82,057**
Payback (Years)	**7.5**
10 Year *IRR	**6.1%**



*The IRR is the rate of return that makes the net present value of all cash flows (positive and negative) from an investment equal to zero.

Building Information

Proposed Control Strategy By Space Type

Space Type Name	Manual Control	Timeclock	Occupancy Sensing	Daylight Harvesting	High-End Tuning	Personal Control	Central PC Control
Office Interior	●		●				
Office Perimeter	●		●	●			
Public Space Interior	●		●				
Public Space Perimeter	●		●	●			
Storage/Rest/Utility	●		●				
*Lobby/Hallway	●		●				

Building Operations

51.7 weeks/year		
**Avg Normal Hours:	12.1 hrs/day	**3,374 hrs/yr**
***Avg Lights On Hours:	13.9 hrs/day	**3,893 hrs/yr**
Avg Days per Year:	279.849 days	
Total Building Size	34,000 sqft	

Electricity Rate (/kWh):	$ 0.15
Utility Inflation Rate:	3.00%
****HVAC Savings:	1W for 5W of lighting Saved

Any Spaces with an "" refer directly to values from Source (1) on page 6 of this report.
** Normal Hours represents the period of time from the moment the first person enters the space in the morning until the last person (could be cleaning crew / facility or secruity staff) leaves the space. Normal Hours are generally longer than the typical Business Hours of a building type.
***Lights On Hours is defined as actual amount of time within a 24 hour day that lights are left on. It is the Normal Hours credited or discounted for the chance of occupants switching ON or leaving the lights ON through Manual Switching of the lights.
****HVAC Energy Savings is the reduction in HVAC Costs needed to offset the heat generated by the lighting system. This ratio is highly dependent upon geographic location.

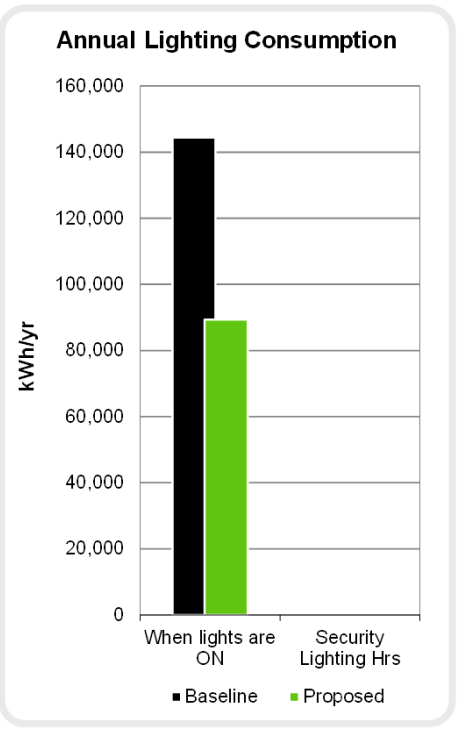
Solution Cost Estimation and Energy Performance

	Baseline	Proposed
Material & Commissioning Cost (if needed):	$-	$45,990
Estimated Installation Cost (by others):	Not Included	$49,834
Estimated Total Project Cost:	$-	$95,824
Estimated Rebates & Incentives:	None	$13,767
Estimated Net Project Cost:	**$-**	**$82,057**
Est. Net Project Cost per Square Foot:	**$-**	**$2.01**

Annual Energy Consumption Breakdown

	Baseline	Proposed
Connected Lighting Load:	**36.65 kW**	**36.65 kW**
*Annual Workday Hrs when Lights are ON:	2,849 hrs/yr	2,977 hrs/yr
*Annual Afterhours when Lights are ON:	1,093 hrs/yr	29 hrs/yr
*Average Power Used when Lights are ON:	36.65 kW	29.75 kW
Energy Consumed when Lights are ON:	**144,480 kWh**	**89,412 kWh**
Secruity Lighting Hours:	4,794 hrs/yr	5,730 hrs/yr
Security Lighting Power Used:	0.00 kW	0.00 kW
Security Lighting Energy Consumed:	**0 kWh**	**0 kWh**
Total Lighting Energy Consumption:	**144,480 kWh**	**89,412 kWh**

Annual Lighting Energy Savings (%)	**38.1%**
Annual Lighting Energy Savings (kWh)	**55,068 kWh**
Annual HVAC Savings	**11,069 kWh**
Total Annual Energy Savings	**66,136 kWh**
First Year Energy Savings	**$9,920**



Pollution Savings

Utility Fuel Source	Sulfur Dioxide (lbs)	Nitrous Oxide (lbs)	Carbon Dioxide (lbs)	Total Pollutants (Tons)
Gas	0	350	82,671	41.51
Oil Fired	540	219	112,167	56.46
Coal Fired	1,312	642	141,664	71.81
US Avg Source	772	408	101,519	51.35

* Annual Lighting Operating Hours includes the time when the lights are ON during the normal workday & afterhours.

Sources:
R. Arnold Tucker, Microcomputer Software for Evaluating Lighting Operations, Energy Engineering, Vol. 90, No. 1, 1993.
U.S. Environmental Protection Agency, Green Lights Lighting Upgrading Manual, September 30, 1994

Long Term Cost of Ownership

The following lifecycle analysis includes the cost of ownership in terms of initial investment, energy cost,

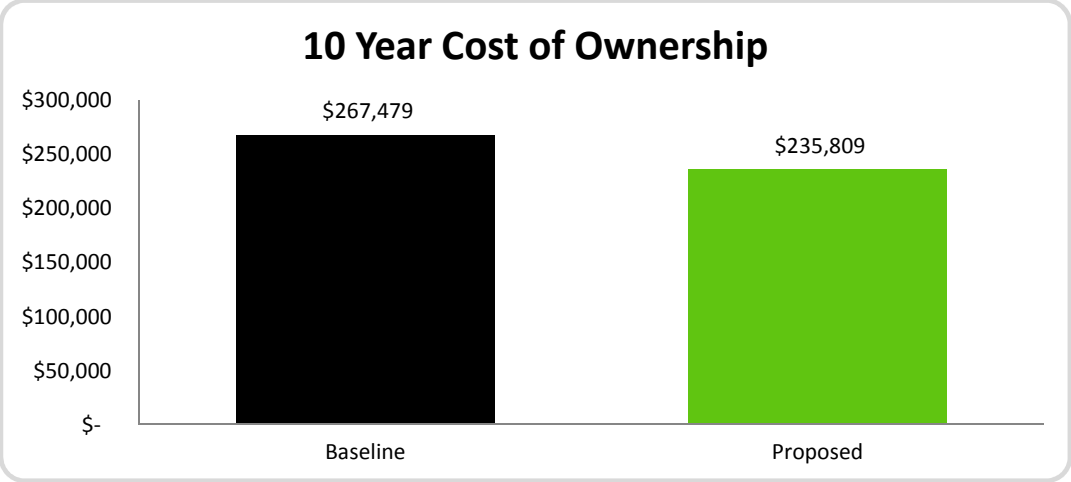
Reduction in Maintenance Cost by:

- ☐ Longer Ballast Life
- ☐ Reduction in Churning Cost with digitally addressable ballasts
- ☐ Reduction in Churning Cost with wireless sensors & controls
- ☐ Centralized Control & Monitoring

Other Additional Benefits:

- ☐ Increased Property Desirability
- ☐ Increased Productivity
- ☐ Smart Grid Integration/Demand
- ☐ Others:

	Baseline	Proposed	Reduction
10 Year Cost of Ownership:	**$267,479**	**$235,809**	**12%**



Year	Baseline			Proposed		
	Initial Investment	Lighting Energy Cost	Additional HVAC Cost	Initial Investment	Lighting Energy Cost	Additional Savings
0	$ -			$ 82,057		
1		$ 21,672	$ 1,660		$ 13,412	Not Included
2		$ 22,322	$ 1,710		$ 13,814	Not Included
3		$ 22,992	$ 1,761		$ 14,229	Not Included
4		$ 23,682	$ 1,814		$ 14,655	Not Included
5		$ 24,392	$ 1,869		$ 15,095	Not Included
6		$ 25,124	$ 1,925		$ 15,548	Not Included
7		$ 25,878	$ 1,982		$ 16,014	Not Included
8		$ 26,654	$ 2,042		$ 16,495	Not Included
9		$ 27,453	$ 2,103		$ 16,990	Not Included
10		$ 28,277	$ 2,166		$ 17,499	Not Included

Assumptions Discussion

Lighting Energy Savings By Space

Space Type Name	Baseline Operating Hours	**Sw/TC/Occ Savings	Proposed Operating Hours	***Daylight Harvesting Savings	High-End Tuning Savings	Personal Control Savings	Cumulative Savings
Office Interior	3,006	14%	2,574	-	-	-	14%
Office Perimeter	3,006	14%	2,574	53%	-	-	49%
Public Space Interior	4,756	22%	3,718	-	-	-	22%
Public Space Perimeter	4,756	22%	3,718	37%	-	-	43%
Storage/Rest/Utility	1,500	50%	750	-	-	-	50%
*Lobby/Hallway	5,094	37%	3,218	-	-	-	37%

Any Spaces with an "" refer directly to values from Source (1), below.
**Switching, Timeclock, and Occupancy Sensing all result in a reduction of Operating Hours. The reduction of operations hours for a space type is calculated using the most energy effiecient strategy selected. "n/a" appears for spaces where the Baseline strategies are identical to the Proposed strategies, resulting in no reduction in operating hours compared to the Baseline.
***Daylight harvesting saving percentages are only applied to lighting operating hours when daylight is available. See Source (2) for more information.

Sources:
[1]VonNieda B, Manicca D.& Tweed A. 2000. An Analysis of the energy and cost savings potential of occupancy sensors for commercial lighting systems. Proceedings of the Illuminating Engineering Society. Paper #43.
[2]Gibson, T. (2003). Daylight software validation study and development of a simplified method to predict the energy impacts of facade design and daylighting controls in private offices (Master's Thesis). University of Colorado, Boulder, Co.

Benefits of Lighting Control

Installing a Lutron lighting control solution offers intangible benefits that are not quantified in this energy proposal. These benefits provide significant value to you and your facility and their impact should not be overlooked.

- **Increase productivity and comfort**
  Studies show that proper lighting is beneficial for employees. The improved comfort and satisfaction brought by daylighting, task-appropriate electric lighting, and individual lighting control can result in reduced absenteeism and increased productivity.

- **Flexibility**
  Create a more flexible space that reconfigures to meet changing needs. Easily group and ungroup lights and shades to transform a space without rewiring. Each group can be tuned to meet specific light needs for different activities.

- **LEED® (Leadership in Energy and Environmental Design)**
  LEED is a rating system managed by the United States Green Building Council (USGBC) that provides a national standard for what constitutes a green building. Efficient lighting controls may contribute to obtaining up to 40 out of 110 points in LEED 2009 for New Construction and Major Renovations. For more information visit www.lutron.com/LEED.

- **Sustainability**
  Founded in 1961 with the invention of the first energy-saving light dimmer, Lutron is the world leader in total light management: the control of daylight and electric light to maximize employee comfort and productivity while minimizing electric energy use. We are a proud member of the U.S. Green Building Council. And since 1961, we have been designing industry-leading technology that saves energy and reduces green house gas emissions.

- **Increase property desirability**
  Energy-efficient buildings can help to retain and attract tenants by improving the desirability of work spaces. Improve your ability to rent to clients looking for competitive utility costs and sustainable, "green" buildings with LEED certification.

Client List

Lutron has provided energy-efficient light control systems for thousands of clients, including Fortune 500 corporations, hospitals, universities and both State and Federal governments.

- AIA Headquarters
- AllSteel Showroom
- American Airlines Credit Union
- AMP Global Executive Conference Center
- Aramco Control Room
- AT&T Network Ops
- Bank of China
- Bank of China World Headquarters
- Bloomberg Financial News
- Borner, Slosberg & Humphrey
- Costamarre
- Diners Club Headquarters
- Exxon Corporate Headquarters
- Gannett, USA Today
- HA Building
- HealthSouth Corporation
- Industrial Bank of Taiwan
- Litecontrol Corporation
- Lucent Technologies
- Mitsubishi
- NAP of the Americas
- New York Life
- Reuters America Holdings
- Taipei Financial Center
- TAQA New World
- The New York Times
- Verizon Call Center

Savings: Over $600,000 each year by managing light with Quantum.

The New York Times Building, New York, New York, USA

Green Facts

Buildings	1
Square Feet	over 600,000 sq. ft.
Lighting Fixtures	over 15,000
Lighting Energy Savings	72%
Annual CO_2 Reduction	over 3,300 metric tons

Lutron Electronics Incorporated

The Industry Leader

For over 50 years, Lutron has met and exceeded the higest standards of quality, making us the industry leader in light control. As an industry innovator, Lutron holds over 1,700 patents and manufactures over 15,000 products, including the invention of the first solid-state dimmer and fluorescent dimming technology.

Lutron is also the most highly recommended and most consistently selected light control provider in the market due to exceptional reliability and customer support. Lutron is the only company that can control both daylight and electric light, and as a complete light control provider, we manufacture the equipment installed and are fully accountable for system performance and reliability.

Sustainability Fast Facts

Lutron customers save over 9 billion kWh of energy each year.[1] This is equivalent to:

- As much energy as 2,000 windmills produce in one year.[1]
- Enough energy to light 4.5 million homes for one year.[1]
- Enough energy to light and power Times Square for 10 years.[2]
- As much CO_2 as 2 million acres of trees absorb in one year.[2]

Sources:
[1]Massachusetts Institute of Technology, U.S. Department of Energy, and Lutron sales data.
[2]Same sources as above plus Con Edison.