

Saving Energy Through Lighting

Zach Major and Trey Zimmerman

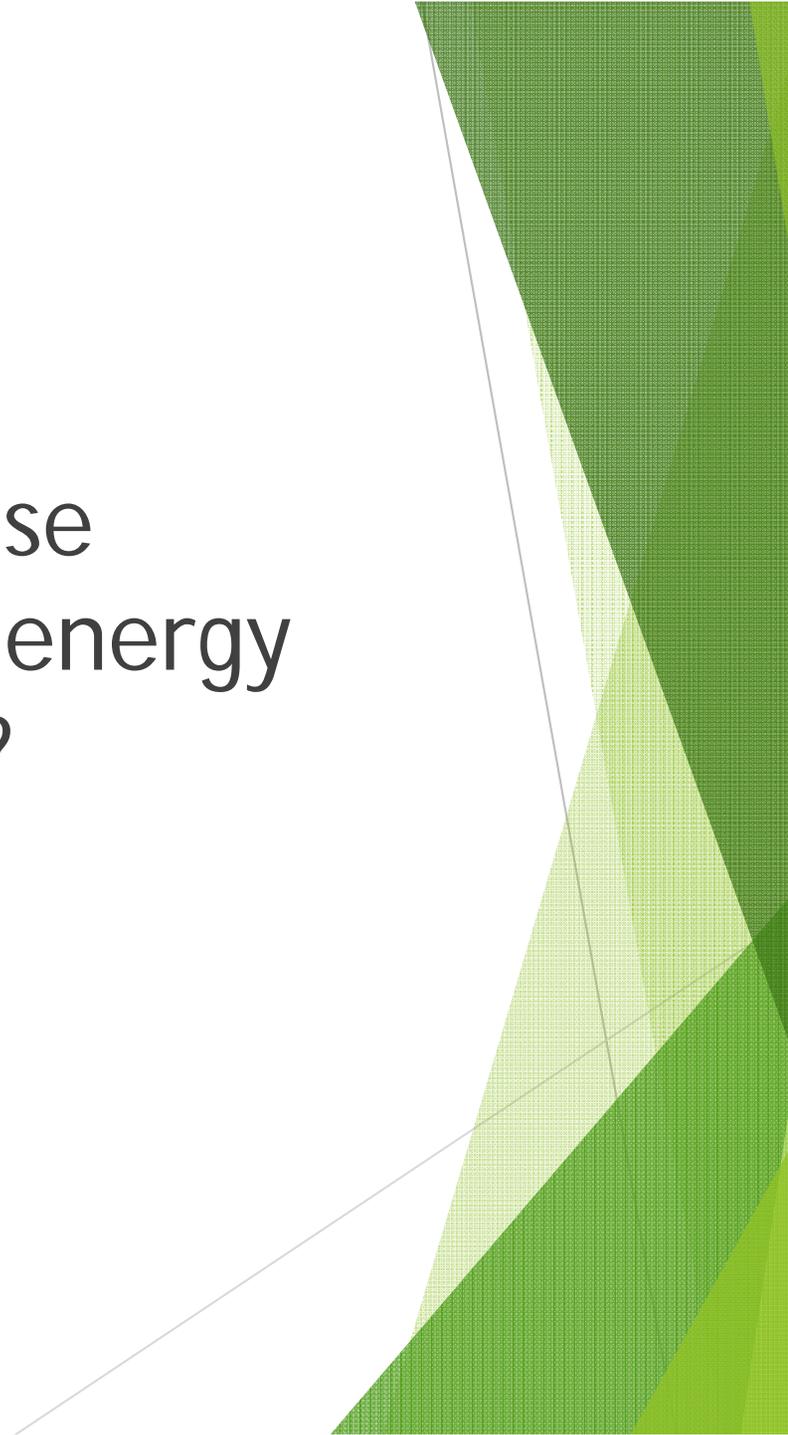
Sustainable Energy Technology Engineering Academy

Kenton County School District



Question

What is the best way to increase lighting efficiency and reduce energy costs at the Academy building?



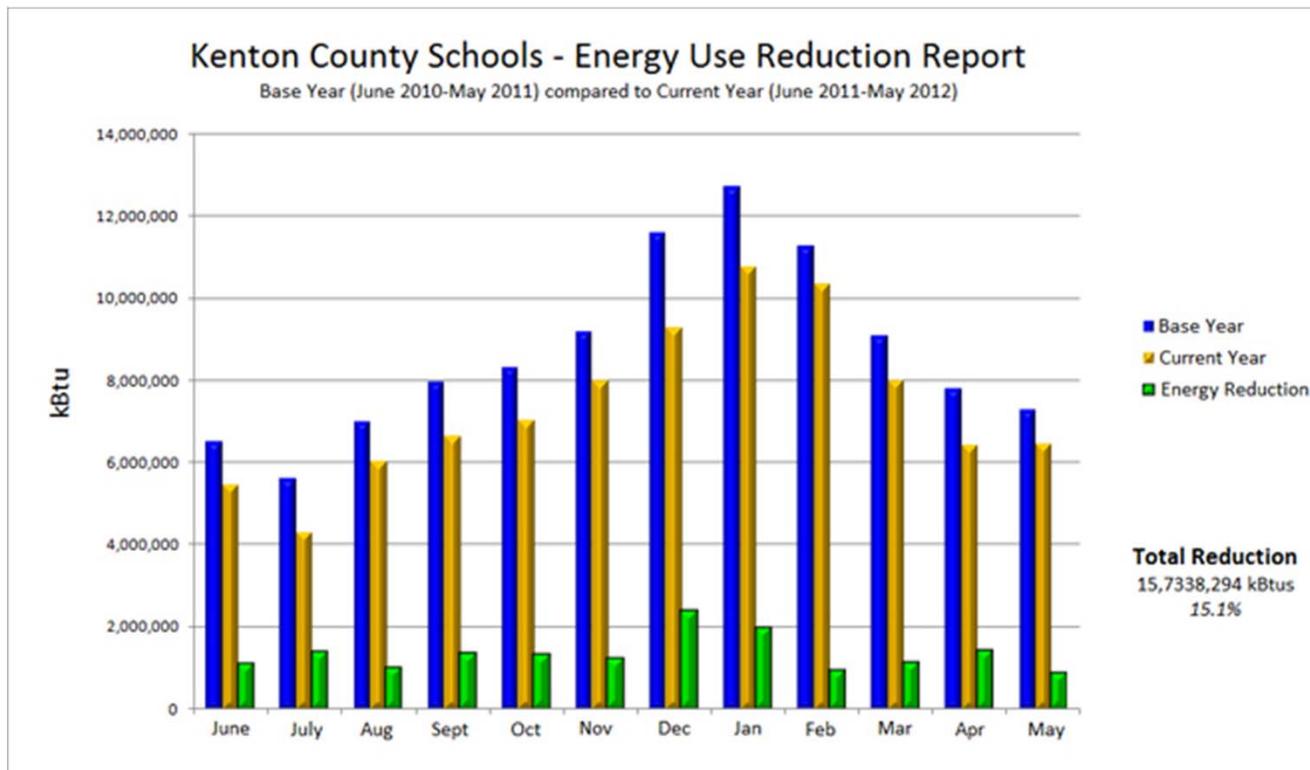
ypothesis

A combination of high-efficiency fluorescent and LED lighting will maximize reduction of use and cost at the Academy building.



Goals of Our Research

To save energy in a building that is 37 years old



Current Lighting

Current Lighting in the Academy building is a combination of:

T-8 and T-12 Fluorescent tubes



ballasts

Difference between Magnetic and
Electronic ballasts

Located in light fixtures



Top Lighting Tech

USLED L-GRID2



Phillips 15-Watt



Current Usage

	Demand (kw)	Demand Charge	Energy Charge	Usage (Hours/day)	kWh	Cost
	3.68	\$7.75	\$0.05	9	33.12	\$ 30.18
ice	3.68	\$7.75	\$0.05	9	33.12	\$ 30.18
	3.2	\$7.75	\$0.05	9	28.8	\$ 26.24
ment	2.4	\$7.75	\$0.05	9	21.6	\$ 19.68
sh	2.24	\$7.75	\$0.05	9	20.16	\$ 18.37
	2.24	\$7.75	\$0.05	9	20.16	\$ 18.37
	2.24	\$7.75	\$0.05	9	20.16	\$ 18.37
m	1.2145	\$7.75	\$0.05	1	1.2145	\$ 9.47
oom	1.12	\$7.75	\$0.05	24	26.88	\$ 10.02
Lab	1.624	\$7.75	\$0.05	24	38.976	\$ 14.53
e	0.772	\$7.75	\$0.05	24	18.528	\$ 6.91
hroom	0.8	\$7.75	\$0.05	24	19.2	\$ 7.16
	25.2105			Total of 1 Day	281.9185	\$ 194.95
				Total of 1 School Year	49899.5745	\$ 34,506.24

5-Watt Retrofit

Room	Demand (kw)	Demand Charge	Energy Charge	Usage (Hours/day)	kWh	Cost
Lab	1.4145	\$7.75	\$0.05	9	12.7305	\$ 11.60
Office	1.4145	\$7.75	\$0.05	9	12.7305	\$ 11.60
IT	1.23	\$7.75	\$0.05	9	11.07	\$ 10.09
Environment	0.9225	\$7.75	\$0.05	9	8.3025	\$ 7.56
English	0.861	\$7.75	\$0.05	9	7.749	\$ 7.06
Info	0.861	\$7.75	\$0.05	9	7.749	\$ 7.06
Math	0.861	\$7.75	\$0.05	9	7.749	\$ 7.06
Room	0.861	\$7.75	\$0.05	1	0.861	\$ 6.72
Workroom	0.21525	\$7.75	\$0.05	24	5.166	\$ 1.93
Science Lab	0 kw	\$0.00	\$0.00	0		
Science	0.369	\$7.75	\$0.05	24	8.856	\$ 3.30
Bathroom	0.15375	\$7.75	\$0.05	24	3.69	\$ 1.38
	9.1635			Total of 1 Day	86.6535	\$ 75.35
				Total of 1 School Year	15337.6695	\$ 13,336.95
				Cost		\$ 9,603.90
				Payback Period: 5-6 months		

Cost: \$12.59 each, Ballast: \$13
148 ballasts (4 lamp)

SLED Retrofit

	Demand (kw)	Demand Charge	Energy Charge	Usage (Hours/day)	kWh	Cost
	0.54	\$7.75	\$0.05	9	4.86	\$ 4.43
Office	0.54	\$7.75	\$0.05	9	4.86	\$ 4.43
	0.45	\$7.75	\$0.05	9	4.05	\$ 3.69
Management	0.36	\$7.75	\$0.05	9	3.24	\$ 2.95
Classroom	0.315	\$7.75	\$0.05	9	2.835	\$ 2.58
	0.315	\$7.75	\$0.05	9	2.835	\$ 2.58
Lab	0.315	\$7.75	\$0.05	9	2.835	\$ 2.58
Room	0.315	\$7.75	\$0.05	1	0.315	\$ 2.46
Room	0.18	\$7.75	\$0.05	24	4.32	\$ 1.61
Lab		\$0.00	\$0.00	0		
Room	0.135	\$7.75	\$0.05	24	3.24	\$ 1.21
Room	0.135	\$7.75	\$0.05	24	3.24	\$ 1.21
	3.6			Total of 1 Day	36.63	\$ 29.73
				Total of 1 School Year	6483.51	\$ 5,262.21
125 each unit						
			Payback: 4 months		Upfront cost	\$ 10,500.00

Avoided Costs

15 Watt Fluorescent		USLED
\$11,565.39	Year 1	\$18,744.03
\$21,169.29	After Year 1	\$29,244.03

Review

15 Watt Fluorescent		USLED
15337.6695	Kw Usage (1 year)	6483.51
\$13,336.95	School Year Cost Current: \$34,506.24	\$5,262.21
\$9,603.90	Upfront Cost	\$10,500.00
5-6 months	Payback Period	4 months

What's Next

Determine installation cost of each project

Recalculate critical data:

Upfront cost

Payback Period

Avoided Costs

Numbers will change, but savings will still be huge!



ources

Duke Energy

Greater Cincinnati Energy Alliance

Ryan Scalf

Chris Baker

Kenton County Energy Center

