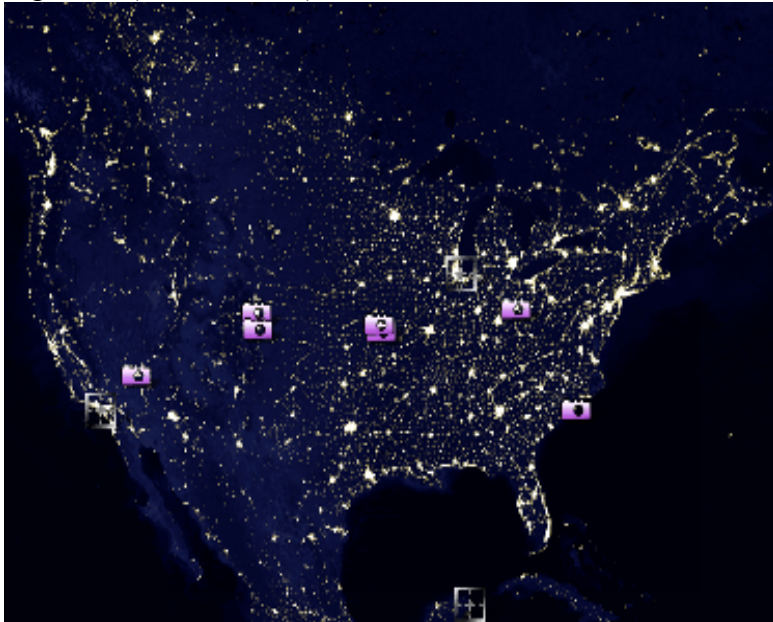


Cleveland Metroparks Zoo

Have you ever driven the highway at night or have been out to the country and wonder why you can see so many stars but once you drive into an area with lights the sky turns purplish pink? Maybe you have driven past a car dealership and even though they are closed, their building lights are on and their parking lot is flooded with light. This is called light pollution and some people have heard of it but should we care? The answer is yes. Not only does light pollution affect the occasional astronomer but it also affects birds, owl and bat survival, and not to mention the energy usage to keep all those lights on (Smith, 2005)! Studies have proved that artificial lighting at night affect the hunting patterns and flight patterns of bats (Stone, 2009). Figure 1 is a picture of the U.S. at night. Clearly there is an issue with many places leaving lights on at night. And this is just the U.S.

Figure 1: (NASA, 2000)



If you look at the entire U.S. you can see the major cities are the brightest. Why is that? Is it necessary for those areas with a lot of commerce and high populations to be lit up? There are hardly any cars and I'm pretty sure no one is going to the gym or picking up a new pair of shoes at 2:00am.

According to Jeremy Smith in his article "Starry Starry Night" he highlights the wider range of issues light pollution causes all over the world. High powered telescopes are being affected and cannot see as accurately and as far as they used to and there are

millions of dollars invested in these telescopes and observatories. Smith also mentions the amount of bird deaths each year that are attributed to light reflection on tall buildings. That number is higher than the number of birds that died in the Exxon Valdez disaster (Smith, 2005). Several other things that are affected by lighting at night are human and animal circadian rhythms, trout and halibut spawning, bat flying patterns and even the African dung beetle cannot orient itself based on the atmospheric polarization they use to travel (Smith, 2005).

As for some suggestions that have been offered to reduce the amount of light pollution is the direction of the light angles given off. In another article the angles of light refraction is suggestion by the International Dark-Sky Association was to focus large flood lights parallel to the horizon for the light is not projected up into the sky but focused down where it is needed for purposes like security (Chepesiuk, 2009)

So in order to help curb these ill health affects and affects on animal behavior and survival this project was formed after a previous study was done of individuals and their view of going lights out (Rivera, 2011). This reporter asks "What about large scale businesses?" instead of individuals. So the main goal of this project was to survey 176 businesses in the Strongsville, OH area gauge their awareness of light pollution and their willingness to go lights out at night when not open. The main question that needs to be answered is based on the business structure of either corporate or franchise are they mandated to keep lights on for security purposes? The main

Cleveland Metroparks Zoo

prediction is that the majority of business owners and managers are mandated to leave lights on due to security purposes but their attitude towards turning them off at night will be positive. The survey was designed to answer these and other related questions (See Appendix B).

Working with a colleague, form letters (Appendix A), surveys (Appendix B) and self addressed stamped envelopes were sent to 176 businesses in Strongsville, OH all located on Pearl Rd. south of Drake Rd. and north of Idlewood Trail. A part of State Route 82 between Interstate 77 and Pearl Rd. was also targeted (See Appendix D). This area was chosen due to the high amount of light pollution in the area as well as its close proximity to the Cleveland Metroparks Mill Stream Run Reservation (Cleveland Metroparks, 2011). Observations were made in the early morning hours of Saturday, November 5th, 2011 when most if not all businesses were to be closed and those that were noted to have their lights on inside the buildings were sent the mailings. Businesses that had cars parked out front and people clearly working inside were not counted. What follows are the results of those surveys.

Business Responses

Out of the 176 businesses that were sent surveys only 12 businesses replied. 8 were returned to sender unopened and one was returned opened and incomplete. 2 businesses agreed to an energy audit and a trial lights out and one included an environmental memo from their corporation about how their company is becoming more environmentally friendly (Appendix F). 6 of the respondents were owners or managers of small businesses, 4 were corporate and 2 were franchises. 33% answered "No, I have not heard of it" when asked if they have heard about light pollution. 25% answered "Yes, but I don't know what it is" when asked if they have heard about light pollution and 42% answered "Yes, I know what it is" when asked the same question.



Figure 2. Map of known respondents of the survey. The red stars are who responded. The black stars mark who responded and agreed to energy audit

Cleveland Metroparks Zoo

Based on the business answers to the question “Would you be willing to participate in an experimental project that could save your business money on the electric bill that includes an electrical audit?” we could gauge the willingness of the businesses to turn off their lights. Of the 12 responses, 2 agreed to participate (black stars on Figure 2) and one is already doing so with an electrical contractor (Appendix D). Responses are still coming in even as this article is being written.

What do we do now?

This study had a couple of flaws. Firstly the time of year was not ideal. Although, any time is ideal to help the environment but the holidays usually have an influx of coupons and mailings that these businesses might have lumped our surveys into. Another thing that could have affected the surveys is that the businesses just don't care to complete them or they're just really busy with the holiday season. Correct addresses for each business would help the return to senders and including each business's return address on the self addressed stamped envelopes would have given a clue as to who completed the surveys.

With the two businesses that agreed to participate in the audit and lights out will be completed by this reporter and will be advertised on an environmental blog. One thing that hopefully came out of these surveys was an awareness of light pollution even if the businesses just read the letter and did not complete the survey. One other study that could help follow up the businesses that did not respond to the surveys would be to research the night animals and their behaviors that are in the Cleveland Metroparks Mill Stream Run Reservation and compare that with the same species that perhaps inhabit a more rural Reservation or other park system such as Lorain County Metro Parks where light pollution is lower.

Acknowledgements

I would like to extend thanks to colleague Caitlin Harpst for her assistance with this project. I would also like to extend thanks for those businesses whom have agreed to the energy audit The UPS Store and Cleveland Laser Spa and for those who have completed the survey.

Cleveland Metroparks Zoo

References

Chepesiuk, Ron, 2009. Missing the Dark Health Effects of Light Pollution. Environmental Health Perspectives, 117, 1. January.

Cleveland Metroparks. Mill Stream Run Reservation. Retrieved from

http://www.clemetparks.com/visit/index.asp?action=rdetails&reservations_id=1013.

Earth, 2011. Appendix E Map. Created November 2011.

NASA's Visible Earth, 2007. Earth at Night. Retrieved from <http://www.nightearth.com/>.

Rivera, Antoinette, 2011. (Unpublished) Measuring Awareness of Electrical Usage and Sources.

Smith, Jeremy, 2005. Starry Starry Nights. The Ecologist, November, 2005. Pages 57-62.

Stone, Emma Louise, Jones, Gareth, Harris, Stephen , 2009. Street Lighting disturbs Commuting Bats. Current Biology 19, 1123–1127, July 14, 2009.

Cleveland Metroparks Zoo

Appendix A

Caitlin Harpst and Antoinette Rivera
AIP Graduate Students
Miami University
Cleveland Metroparks Zoo

November 12, 2011

To Whom It May Concern:

We are local students in the area and are writing to you today to ask for your participation in a research project. By assisting us in this project you may very well end up saving your company and your community a lot of money.

The goal of this project is to reduce the amount of light pollution and energy expenses generated by local companies. Through our own observations we have discovered that several local businesses leave extensive inside and outside lighting on overnight. It occurred to us that these businesses are creating light pollution and using a lot of energy in the process. Such energy usage is very detrimental to the environment for a number of reasons. It also occurred to us that said companies are probably creating an excessively large energy bill. Such issues are seemingly easily avoided by simply reducing or eliminating overnight lighting.

However we know that nothing is as cut and dry as the flip of a switch. That is why we have created this project. Included with this letter is a survey that we kindly ask you to complete and return to us via the pre-addressed and posted envelope provided. Once the survey is completed we will follow up with your business (if applicable given survey responses) individually to discuss your responses and the next steps. It is our hope that with your participation we will be able to affect local and global change that could improve our community, help the environment, and save your company money!

We appreciate you taking the time to read our letter and look over the survey. Once again this research project will have great effects on your community but we will only reach our goal with your help. If you choose to participate we would like to thank you in advance for doing so! If you however chose not to participate we appreciate you taking the time to review our request. We look forward to hearing from you soon.

Sincerely,

Caitlin Harpst

Antoinette Rivera

Cleveland Metroparks Zoo

**Appendix B
Business Lights Out Survey**

What kind of Business Structure are you a part of?

- Corporate
- Franchise
- Small Business
- Non-Profit

Have you heard of light pollution?

- Yes, I know what it is.
- Yes, but I don't know what it is.
- No, have not heard of it.

Do you purposely leave lights on at night? What purpose does it serve?

Are you mandated to leave lights on?

- Yes
- No
- Don't Know

Do you think it would save your business money if you were to put lights on a timer or leave them off completely at night when closed?

- Yes
- Maybe
- No
- Don't Know

Would you be willing to participate in an experimental project that could save your business money on the electric bill that includes an electrical audit?

- Yes
- No

If so, please include the following if applicable:

Business Name: _____

Address: _____

Phone Number: _____

E-mail: _____

Website: _____

For completing this project, would you like recognition on an environmental website/blog?

- Yes
- No

Cleveland Metroparks Zoo

Appendix C- Businesses who leave their lights on after hours. Strongsville, OH.

DaVita Dialysis Center	Hudec	Illusion Unlimited	Alterations Express
Parkview Savings Bank	Big Lots!	Cleveland Lazer Spa	Men's Warehouse
Tommy's Pizza Chicken	Charter One	Psychic Reader	AAA
Royalpark Fine Wine	Sallys	European Design	Audio Visions
De Sol Tanning	Hoopla	Alterations	Borders (empty, lights on)
Hershey's	Cute Little Cake Shop	Black Metal Tattoos	The Eye Place
Conrads	Breuggers Bagels	Goldies Deli	Barber shop
Cech's Barber	Subway	Nationwide	Star Nails
Stages Child Care	Wendy's	Royal Taloring	Verizon
Shinto	Riterug Flooring	Mr. hero	Panera
State Farm	Hobbytown USA	Embroider Me	Key Bank
Sky Salon	Emerald Fitness	Staples	Red Lobster
Nail Fusion	DDS	Tuesday Morning	5 Guys Burgers and Fries
Sheiban Jewelers	TNT Tanning	Ground Zero Comics	Chipotle
Taste of Excellence	Alphagraphics	UPS Store	Champs
Kast Orthodontics	King Nails	H&R Block	Target
Middle East Market	We Buy Gold!!!	Dentists	Pier 1 Imports
Hair Concepts	Penn Station	Catan Fashions	Great Clips
Nail Studio	J&R Flowers	Burger King	Game Stop
Jerky n Spice	Liberty Tax	Marcos Pizza	Expres Nail and Spa
Italian Village Restaurant & Cater	Mattress Warehouse	Strongsville Estate	Famous Footwear
Skin Deep	Wig Studio	Jewelry and Coin	Posh
Strongsville Auto Service	Dollar Bank	AOK Fitness	Pat Catans
Clearview Glass Company	Gina's Pizza	Wild Birds Unlimited	Aldis
Honey Hut	Integrity Salon	Verizon	Rolypoly
Minutemen press	Dynamic Fitness	Honey Baked Ham	Sandwiches
Super cleaners	Hirt's Flowers	Howard Hannah	Fifth 3rd Bank
NAPA Auto Parts	Day Break Lavander	Neverending Child	ColdStone
RiteAid	Minka's Taloring	Third Federal	Antonio's Pizza
Starbucks	Gymboree	Hallmark	Play it again Sports
Scottrade	McDonalds	Salon- Today's	Chicos
Pearle Vision	Sweet Mango's	Headline	Coldwater Creek
Oreck Outlet	Boston Market	Heinen's	Massage Envy
Robecks	All Tattoos	First Federal	Motherhood
T-Mobile	Bruno Brother's Music	Auto Parts	Holihans
Crossroads Animal Hospital	Auto parts Center	T.J.Maxx	Foot Solutions
House of Wilhelm	Target Cleaners	Dollar tree	Family Christian Stores
Strongsville Vacuum	Super Tan	Old Navy	Giant Eagle
Great Lakes Flooring Company	Best Cuts	Payless	JoS A Bank
Dick's Sandblasting	Sprint	Bspot	Plato's Closet
French Creek Breads	America's Best Mattress Matters	Strongsville Dodge	Firestone
Michaud's Catering	Lion Martial Arts	Marc's	Lemonberry
Zig's Pub and Grill	About Face Permanent Cosmetics	Jardine Funeral Home	Bucci's J Bella
Education Alternatives	Abba Religious Store	PNC Bank	
	Heights Driving School	Corporate Sales Micro Center	

Cleveland Metroparks Zoo

Appendix D- Businesses Responses

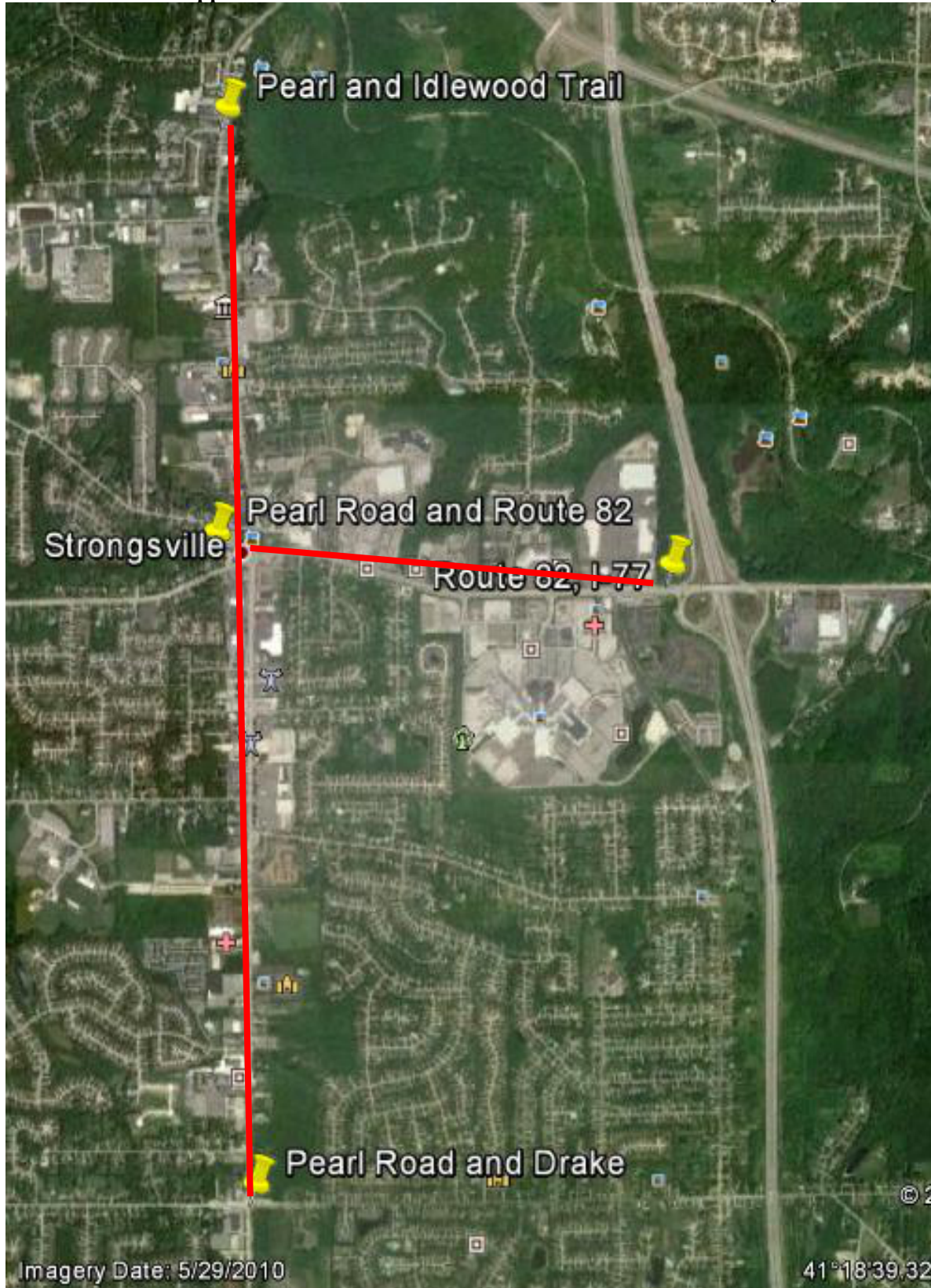
Business Structure	Know about light pollution?	Leave lights on for a purpose?	Mandated to have them on?	Would you save money if you turned them off?	Participate in project/audit?	Would you like recognition?
Small business	Yes, but don't know what it is	at the salons we leave on a little because of break ins	No	No	No	No
Corporate	yes, I know what it is	no, only safety lights	No	Maybe	No	No
franchise	yes, I know what it is	security lights	Yes	Yes	No	Yes
Corporate	No, have not heard of it.	Yes, protection from robberies. Light outside for cameras	Yes	Yes	No	No
Small business	No, have not heard of it.	Outside we leave our "Sky Salon" light on and a small light in our break room to deter theft (we have been robbed before at night)	No	Maybe	No (currently doing do with an electrical contractor)	No
Small business	yes, I know what it is	Yes. Safety, security and visibility	No	Yes	No	No
Small business	No, have not heard of it.	Security (one light)	No	Don't care (written in)	No	no "I am NOT a tree hugger and DO NOT believe in global warming or any other liberal B.S.!!!"
Small business	No, have not heard of it.	No	no	yes, No interior lights but exterior for safety	No	no
Corporate	Yes, but don't know what it is	no	no	yes	no	No

Cleveland Metroparks Zoo

Small business	yes, I know what it is	yes, required by owner because of any shipping, repairs, and the machines running	Yes	maybe	Yes- Gave info.	Yes
Corporate-We are a corporation and we as employees do not have any control over our lighting system. Enclosed is a statement from our company regarding our commitment to reduce our impact on the environment. Hope this helps! (See Appendix F)	Yes, but don't know what it is	no	No	We do use a timer; only emergency lights are left on.	No	N/A
franchise	yes, I know what it is	Yes, advertising and safety	yes	yes	Yes- gave info.	Yes

Cleveland Metroparks Zoo

Appendix E- Red lines indicate where businesses were surveyed.



Cleveland Metroparks Zoo

Appendix F- Memo sent from Cold Water Creek

Recently I've noticed a lot of companies touting their commitment to reduce their impact on the environment. I share this concern, moreover, I'm pleased to say that since Ann and I founded Coldwater Creek, protecting the environment has always been one of our fundamental values.

In 1998, the United States Green Building Council adopted the LEED (Leadership in Energy and Environment Design) certification to reduce the impact of building design on the environment. In our store fleet, we have 20 LEED stores. LEED certification means we have taken extra care and money to design and build these stores to reduce the impact on our environment, from both a consumption and waste standpoint.

LEED stores are equipped with energy efficient lighting and fixtures. Additionally, sustainable and recycled products are used throughout the store. The building of LEED stores requires us to follow stringent construction protocols. For example, in contrast to a traditional construction project, a LEED project focuses on recycling and reducing the amount of waste generated.

But our focus on environmental stewardship extends beyond our LEED certified stores. Within the rest of our fleet, we have employed many improvements which minimize our impact, improve the quality of the indoor experience, and ultimately save us money. Allen Sandish, DVP Store Construction shares "As an inaugural member of the United States Green Building Council's LEED pilot program, Coldwater Creek helped pioneer "green" standards that are now used in "all" of our new stores. This includes our Energy Management System, energy efficient lighting design and used lamp recycling program, and environmentally friendly HVAC systems."

We've also added energy star appliances and lavatory faucet and occupancy sensors, which reduce the amount of electricity and water we use. When possible, we use recycled content in our millwork, wall paper, drywall, steel studs, and fixtures. As an example, our woodworking vendor is designated as Forestry Stewardship Certified (FSC). This means the wood sourced for us comes from certified, well-managed forests which maintain their regeneration capacity and vitality.

We are also focused on improving the indoor air quality of our stores. We use Low-VOC (Volatile Organic Compounds) paint and carpet to reduce pollution. Additionally, we have retrofitted some of our existing stores with the most efficient HVAC systems. Not only does this dramatically improve the efficiency of our heating and cooling, these state of the art systems talk to our computers in the Home Office and allow us to efficiently troubleshoot temperature issues. Kim Kliewer, Design Manager Retail Design & Architecture, describes the impact of our efforts. "There are over 14 billion square feet of retail space in the United States, so the implementation of sustainable practices in the retail environment can go a long way to reduce the damaging impact development can have on the environment. We see ourselves on the forefront of the green retail movement and as environmental awareness goes up, and the price of green building products goes down, I anticipate more retailers joining in."

When we relocate, resize or close one of our stores, we recycle as many items as possible. We are able to reuse chairs, fixtures, props, and other visual elements. Rob Herrera, Sr. Director Retail Store Design, shares "When we move into a new space, we try to incorporate existing architectural elements and building systems into our design plans. This not only reduces our building costs, but is also better for the environment."

Going forward we will be migrating our existing lighting package to utilize Light Emitting Diodes (LED). Although LED light bulbs are more expensive, they consume much less energy and last longer. Nearly 80% of the electrical energy is converted to light energy with 20% lost as heat, compared with 20% of energy converted to light energy and 80% heat loss of a traditional incandescent bulb.

Jeffrey Parisian, SVP Chief Strategy Officer talks about his vision for the future of Store Design, "Continuing our efforts to be a leader in green building design, construction and operations makes good environmental and business sense. Not only do our customers fully support our efforts, we also have the satisfaction of knowing that we are good environmental stewards." Even in a difficult business and economic climate we will continue to find the proper balance between the costs we spend on our store design and construction and our desire to reduce the size of our carbon footprint. I believe it is our continued responsibility to safeguard the environment for our future generations.