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Siemens Challenge

Step One:

LightSmart Conserves Energy: One Traffic Light at a Time

In Michigan, we have many roads, and therefore many intersections. Many intersections mean a lot of traffic lights. Those require tons of energy. The regular traffic lights use energy-consuming bulbs, so why can't we switch to energy efficient bulbs instead? That's what our team, LightSmart wants to fix.

No matter where you go, "red", "yellow", and "green" on a traffic light all mean the same thing. It's universal! Our team uses and sees traffic lights just about every single day, so this is the perfect place to start reducing energy consumption. As we began this project, we actually started with the idea of solar panels helping out operation of the traffic lights, but going through the research we saw the major flaws that came with the plan. It was costly and the money return wouldn't be as beneficial as we hoped. Then we came across LEDs (light emitting diodes) traffic lights and thought, "Hey! This is so much better!" And since the media and government have been throwing out ways to conserve our energy intake around our house, such as by changing out light bulbs, why can't the city do the same with their lights? Thousands of tons of carbon are outputted from our traffic lights every year due to all the energy required to keep our cities and streets functioning. We *have* to find a way to fix this. LEDs are the solution to that very problem. They are relatively inexpensive compared to regular incandescent bulbs, they actually use a lot less wattage (actually about 137 less watts!), reducing the cost of operation. Plus, this will be a great example for businesses and citizens to follow to be a more environmentally aware society. Many cities already use those lights in their traffic systems, so it would most definitely work.

Incandescent light bulbs last approximately 750 hours (about 1 month), and LEDs last about 100,000 hours (or 11 years). So for every LED there is 133 incandescent bulbs used. If each LED costs approximately \$141₁, and each incandescent bulb costs approximately \$4, then your cost of incandescent bulbs over 100,000 hours is \$532. Also, LEDs use approximately 10% of the usual energy that an incandescent bulb uses. There are no conversion costs of the traffic lights, so switching to LEDs is a rather simple way to reduce our carbon footprint. If it costs about \$80₂ to run one traffic signal per year on incandescent bulbs, and you had 6 traffic signals at each intersection, you would be paying about \$480 for a year. But since LEDs only use 10% of the energy that the incandescent use, you'd be paying about 10% of \$480, which is \$48. If

LED traffic lights are implemented across the whole city, there could be a savings of over \$1 million dollars!

Footnote₁ Table based off http://www.cee1.org/gov/led/little_rock.pdf
Prices from <http://www.ledtronics.com/products/ProductsDetails.aspx?WP=C643K626>
Red LED- \$113, Yellow LED- \$125, Green LED- \$185 (\$141 is the average of the three)

Footnote₂ Price base off of the article “Why Are They Replacing All of the Traffic Lights in my Town”, <http://auto.howstuffworks.com/car-driving-safety/safety-regulatory-devices/question178.htm>

Resources:

- http://www.ci.sterling-heights.mi.us/bins/site/templates/default.asp?area_2=pages/contacts/phdir/municipalphdir_429.dat&area_1=pages/nav/contacts/contacts.dat&area_3=0.dat&area_0=0.dat&area_8=0.dat&objectid=BC10C1F0&ml_index=2&NC=4852X
- http://www.cee1.org/gov/led/little_rock.pdf
- <http://www.howstuffworks.com/led.htm>

Contacts:

- 586.446.2580
Sterling Heights Engineering Department

Step Two:

The Plan:

To implement LED traffic lights in our community would be a very costly and huge challenge, so LightSmart wants to start on a smaller scale, doing it at just one intersection. Our plan of attack is to contact officials of Macomb County to see if this mission is possible. We will research tons on costs, efficiency, and location. LightSmart wants to build a miniature prototype

of an LED traffic light and show statistics on its efficiency. We will then create a presentation and gather our peers' outlooks. If all goes well, we will try to present to the city council hoping for an LED traffic light at the Utica and Van Dyke intersection. The city would pay less for energy because the LED's use less electricity, therefore, they would get more money to spend on other resources. This plan could expand the entire city, county, and etcetera. Since traffic lights are everywhere, this could actually work!

The benefits of LEDs:

- 1) They use a lot less energy!
- 2) LEDs last a lot longer than regular incandescent bulbs!
- 3) They are a lot brighter than regular incandescent bulbs!

Step Three:

Results:

Our group, LightSmart, has developed an innovative idea that will incorporate energy efficient lights into our everyday life. By integrating this idea we will save energy, money, and the environment. Our idea will replace common light bulbs with LEDs in traffic signals. Currently the budget is restricting the use of these efficient lights because of initial costs of installment. In contacting the state departments we were able to discover that this idea has already been applied to many of the intersections throughout southeast Michigan. Because many lights have been/are being replaced LightSmart has dedicated its efforts to switching the Utica and Van Dyke intersection traffic lights from incandescent bulbs to LED lights.

Also, we have collected data from numerous websites that prove that the most energy efficient and cost effective way to make traffic signals environmentally friendly would be to use LED's rather than an alternative energy source. To back up the reasoning for our decision we emailed the Macomb County Department of Roads and received data on the wattage of the previous lights used, and the new LEDs along with some savings for general areas. Collectively, we are sure that best alternative to incandescent bulbs are LED lights, aside from alternate energy solutions (such as solar panels).

As a group, we worked together very well and kept each other on track for almost the entire project. We stayed organized and we were able to get a lot done at school and at home. As a team we stayed in contact with each other finishing each and every step needed to move on to the next stage of development. Every member in LightSmart contributed and it helped us finish with a much more professional job in the end.

In order to get this project done we contacted Sue VanSteelandt, a member of the Macomb County Department of Roads, informing her of our idea to innovate traffic signals throughout Michigan; specifically the intersection of Utica and Van Dyke. Getting our needed information was a challenge, due to the fact that the county has a lot to do and sometimes slacks getting information back in a timely manner. If we were to do this again in the future, we would ask for information sooner. In the end, we were contacted by email and advised of the Department of Road's plan to change the light as funding is available.

Through our calculations, we came to the conclusion that our area could save over \$2 million once all the intersections are switched over!

Step Four:

Conclusion:

LightSmart has spent many hours trying to contact the Department of Roads and several other branches in the local government to promote the use of LED's (Light Emitting Diodes). They are a greener alternative to incandescent bulbs that use a lot of energy. Our team went into this challenge wanting to change all the lights in our area. After we realized that officials weren't taking us as serious as we'd hoped, we decided to focus on changing one intersection; that was shot down as well. In all, we promoted the new system of traffic lights rather than changing a specific light at a crossway. Board officials in our city agreed with our ideas, but said that there were low funds in the budget. LightSmart was unable to get an instant change and response to our efforts, but within the next few years it is likely that energy efficient lights will be used all throughout our community, and others that also change with our district.

Step 5:

Share It!

LightSmart created a Facebook and Twitter to get noticed. These are the two most popular social networking websites of March 2011, according to www.ebizmba.com/

LightSmart Facebook link: <http://www.facebook.com/profile.php?id=100002195093529>

LightSmart Twitter link: <http://www.twitter.com/LightSmart>

