



Energy Usage Awareness

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III. EXECUTIVE SUMMARY

People are prone to leaving lights on when they are not in the room. They leave chargers plugged into walls, and let water run when they are not using it. And why shouldn't they? They do not know how much energy they are wasting, let alone how much energy is needed to produce the electricity that they let go to waste. I believe that if these people were educated, and if energy usage was put into terms that they can relate to, then people would be more inclined to conserve electricity. People, when properly informed, will make conscious decisions on energy reducing actions. All that is needed is a creative way to engage people and relate to them.

Looking at this problem, I saw a solution that worked in tandem with the students who were going to the gym. While at the gym, people are outputting lots of energy, and the work that it takes to expel that energy is able to be seen first hand by the participant. I thought that this would be the best place to allow students to really have a hands on learning experience of how much work is required to produce the energy that they expel.

The solution came together in the form of the Energy Usage Awareness Month and Challenge. The idea for this awareness month was to take the first two weeks in April and have people really look at their energy usage and how much it takes to generate all of that energy. The Challenge helps put that into perspective. From April 1-14, people logged their calories that they burned during their workouts. Calories can be converted into kilowatts, and kilowatts

is the unit of energy that describes the energy usage of household items. By showing people the conversion of calories to kilowatts, they can see for themselves just how much energy is required to produce the amount needed to power certain items like light bulbs. I let the Challenge run for two weeks, and after those two weeks I collected the log book and figured out which participants generated the most energy, and the top producers won prizes.

The Energy Usage Awareness Month and Challenge has helped in being the first push for an education initiative of this kind. If Western Michigan University wants to fulfill their Presidents' Climate Commitment of going carbon neutral, then they need to start involving students. Students play a big part of the energy consumption on campus. Dorm rooms in particular are problematic when students leave their rooms and leave lights on when not in use. This just adds to the costs of Western Michigan University and adds up the energy consumption of the campus itself. By educating these students and giving them a hands-on experience, they will make more sustainable choices. It is all in the knowledge, and those that are more aware do more than those that are in the dark.

IV. INTRODUCTION

It is the goal of Western Michigan University to take the necessary steps in order to go carbon neutral in the years to come. This is part of the American College & University Presidents' Climate Commitment that President Dunn signed in 2009. I believe that this is a very important step in the right direction for Western Michigan University for the infrastructure, but I also believe that more can be done in the way of student participation. If the university could start getting students to participate in the sustainable habits that it is trying so hard to promote to the community and nation, then we would see a much bigger change.

The Energy Usage Awareness Month and Challenge does just that. It is a way for students to participate first hand in seeing the amount of energy needed to run certain appliances. When people can participate in a meaningful way, and in a first hand way, they are much more likely to learn and pass that knowledge onto others. This challenge allows them to participate and be a part of that learning process, all while doing something that they enjoy doing: workout out. This challenge mixes the idea of being healthy to your body, with being healthy to the Earth.

V. METHODOLOGY AND DATA

METHODS

To begin my project I had to first institute it into the Student Recreation Center. My first task was setting up a meeting time with the Director of the Recreation Center, Amy Seth. I talked about my idea with her and how I believe that there is a disconnect between people and their energy usage. I laid out my ideas for the Energy Usage Awareness Month and the Challenge and discussed how I could get it implemented. We decided that I would have a table set outside of the turnstiles to the Recreation Center and I could recruit people to join the Challenge. It was going to be much easier to work with the participants if they were registered beforehand and then I could contact them via email if necessary. I did all of this before the first of April because that was when the Challenge was set to start. During my talks with Amy, we decided that we could post the Challenge information on the University Recreation Center's website, and I even got the Students for Sustainable Earth to share the Challenge on their Facebook page as well.

I kept in email contact with my participants and explained the Challenge more in depth to them and what I was hoping they would gain out of it. By sending reminders out to them at the halfway point and again before the end of the Challenge it helped keep them on track and reminded them to keep logging their calories. I set about getting 25 people registered to participate in the Energy Usage Awareness Challenge. Since I was the only person working on

this project, I did not want to have too many people so as to complicate the project any further. Twenty five seemed like a good number to work with.

At the end of the two weeks, all participants were sent an email that explained the results of the Challenge. They were sent the conversions of calories to kilowatts, and just how much of each is needed to run that 40 watt lightbulb for an hour. Each person was told their total number of calories burned, and kilowatts created. After that, each person could see just how much energy they generated, and just how small of an amount that was. This hopefully helps instill a little nugget of knowledge in them, so that they remember this project and practice more sustainable habits. It is my hope that when they leave lights on in rooms they come back and turn them off because they will have had a first hand experience in seeing that there is so much energy need to run that light, and it would be a waste to leave it on when no one needs it.

DATA

One calorie (cal) burned is equivalent to 0.000001163 kilowatt hours (kWh). The average workout for one day typically consists of about 600 calories burned, which converted out equals 0.0006978 kWh. Now this is not very much considering how much energy it takes to run the average 40 watt light bulb. To understand how much energy a bulb uses you must know what the wattage is. "For example, if the rating is 40 watts, and the bulb is on for one hour, it

will consume 0.04 kWh, or if it is off for one hour, you will be saving 0.04 kWh” ([energy.gov](#)). This still may seem like a lot, but we are only looking at a person who performed one workout. With the Energy Usage Awareness Challenge, it gave the students the ability to collect their workouts and look at the total amount of calories burned, and kilowatts created. On average, the students who participated in the challenge burned 2,262 calories, converting out to 0.00263 kWh. This output of energy does not add up to the amount needed to run a light bulb for one hour, but it does equal the amount needed to run that same 40 watt lightbulb for 3.5 minutes. To reach 0.04 kWh you need to burn 34,393 calories ([unit-conversion.info](#)). But that is for one hour. If you divide it out, you can get 17,196 calories needed for a half hour, and 8,598 needed for 15 minutes, and down to 2,149 calories needed for 3.5 minutes. So on average, the participants in the Energy Usage Awareness Challenge burned enough calories in two weeks to run a 40 watt lightbulb for 3.5 minutes. If that does not seem like very much, it is because it isn't. In order to run our every day electronics it takes so much energy and people are not aware of it. The Energy Challenge highlighted that on a first hand level for the participants. It is astounding when you are able to see it played out in front of you and to realize that even with a two week time span it is extremely hard to produce the amount of electricity needed.

VI. DISCUSSION

After the two weeks of the Energy Usage Awareness Challenge, I learned that many people are not aware of just how much energy is needed to run our every day appliances. This puts into perspective that we need more education on the subject. The purpose of the Energy Usage Awareness Month and Challenge was to understand a little better the disconnect between people and their energy consumption. It was also to push the first education initiative that sought to help people see first hand just how much energy is required to perform the everyday tasks that we need. At the end of this, I wanted people to see the big numbers. I wanted them to see that to run a 40 watt lightbulb for an hour would require 34,393 calories. I think that people need to see that even with a two week time span to burn calories and generate kilowatts, they amount that they are outputting only equivalences to running a lightbulb for 3.5 minutes.

Another thing that came out of this project was the need to look at all lightbulbs on campus and their efficiency. A 40 watt lightbulb is the average, but being average is not good enough. The energy efficient bulbs only need 10 kilowatts and those are almost four times as efficient.

40w Lumen Comparison

A side-by-side comparison of a 40-watt incandescent bulb and its replacements shows that you can save energy and money with nearly the same light output.

	standard incandescent	GE energy-efficient soft white	GE energy-efficient crystal clear	GE energy smart® CFL	GE energy smart® LED
					
Watts >>	40	29	29	10	9
Lumens >>	455	430	430	570	450
Life (years) * >>	0.9	0.9	0.9	9.1	22.8
Estimated Annual Energy Cost ** >>	\$4.82	\$3.49	\$3.49	\$1.20	\$1.08
Annual Savings ** >>	\$0	\$1.33	\$1.33	\$3.62	\$3.74

* based on 3 hour per day use

** based on 3 hrs/day, \$0.11 kWh cost depends on rates and use

Figure 1. Comparison of light bulbs. Photo courtesy of GE Lighting.

Compact Fluorescent Lights (CFLs) and the Light Emitting Diodes (LEDs) are the most environmentally efficient bulbs on the market place. Another comparison of bulbs must also be looked at in Figure 2.



		COMPARING TODAY'S AVAILABLE LIGHTING TECHNOLOGIES			
		TRADITIONAL TECHNOLOGY	Halogen	Compact Fluorescent (CFL)	Light Emitting Diode (LED)
		Incandescent			
FEATURES	ENERGY EFFICIENCY	Very Low	Low	High	Very high
	LIGHT COLOR OR "TEMPERATURE"	Warm	Warm	Options range from Warm to Cool	Options range from Warm to Cool
	DIMMABILITY	Full Range	Full Range	Partial Range [special dimming CFLs available]	Partial Range [special dimming LEDs available]
LIGHT OUTPUT * (IN LUMENS)	400-500	40W	28-29W	9W-11W	9W
	800-1000	60W	41- 43W	13W-16W	12.5W
	1100-1300	75W	51- 53W	18W-20W	Currently unavailable
	1600-1800	100W	70- 72W	23W-27W	
ESTIMATED OPERATING COST PER LAMP (BULB)	LIFE SPAN **	1,000 hours [Approx. one year]	3,000 hours [Approx. three years]	8,000 hours [Approx. 8 years]	25,000 hours [Approx. 25 years]
	ANNUAL ENERGY COST ***	Approx. \$5.75	Approx. \$4.25	Approx. \$1.50	Approx. \$1.25

* Generally, the higher the lumens, the brighter the bulb
 ** Assumptions based on 3 hours of use per day
 *** Estimated energy cost: \$0.0878/kWh
 Comparisons based on standard light bulb
 160W incandescent; 43W halogen; 15W CFL; 12.5W LED.

A11-254

Figure 2. A second comparison of light bulbs. Photo courtesy of BC Hydro.

If Western Michigan University were to only use either CFL or LED lighting, it would save thousands of dollars for the campus. Even the lifespan of those bulbs last from 8 to 25 years. That means not only a savings in operation cost, but also in replacement costs as well. There is no need to change those bulbs as often as the traditional incandescent bulb. The amount of waste from used lightbulbs will go down significantly if there is no need to replace them for a decade for more. The cost to run those bulbs is a quarter of what it costs to run the traditional bulbs, and also the energy savings is almost triple. This push for more energy efficient lighting is

a byproduct from the Energy Usage Awareness Challenge. It is an example of how not only are people gaining that first hand participation, but the practices and lessons that they learn during the education initiative can be further pushed in the outside community and on campus.

People learn the most when they have the opportunity to participate in it first hand. This is what I wanted to give to the students. It was an opportunity to learn on their own, and they were not forced in any way. I believe that creating incentives, like prizes, also helps motivate them as well. Even so, the knowledge that they have gained will stick with them through their college careers. Hopefully it will be shown in dorm rooms, in classrooms, on the campus in general, and outside in the community. If each of the participants were to share what they did with one other person, that would be a great example of how I would hope that another one of these Energy Usage Awareness Challenges could help.

At the end of the project, I have helped educate 25 people on the amount of energy needed for running a lightbulb. But if this project were to be implemented into a regular activity, one that would happen every month or at least every semester, imagine the amount of people that could be reached. I was just one person working on this project. If the school got involved, and advertised more, recruited more, and participated more, then the Energy Usage Awareness Challenge could become a regular thing. By doing this project myself, I have show that it is possible. I showed that one person can make a big difference in a very cost effective way. The only money spent was to buy prizes for the winner of the Challenge, a small amount.

The other valuables that went into the creation of this project was time. Much time was needed in order to plan for the Challenge and find the information. This could be remedied with the involvement of more people and then even that would not be so much a burden.

VII. LIMITATIONS/ RECOMMENDATIONS

It is important to note the limitations that were present in this project. The biggest limitation that I found in my implementation of this project was the lack of support by students. It was a bit of a trouble getting the twenty five participants to be registered. This lack of motivation and caring for this type of education is only fueled by the lack of that type of promotion on campus. Most students do not care about small efforts and are too busy with their everyday lives. If the campus as a whole could somehow promote more community participation and involvement I think the university could benefit.

Working on this project solo created the limitation on the project that I could not make it too big. Since this was the very first project of its kind I had a disadvantage and could not make it as big as I would have liked. I think that if the participation group had been twice as large, about 50 people, it would be had better results. To have it be that big though would require

more people to jointly work on this project together. That way, you could register more people and have more of an opportunity to spread around and get more variety in the participants. The registration of participants should also span on for multiple days, and at different times in the day as well. When I recruited, I did so right outside of the turnstiles for the gym. This ensured that the people I was signing up were gym goers and those people were bound to be back multiple times. If you were to go at different times in the day, early morning, mid afternoon, and evening, then you could get regulars from all the time slots in the day. This would be very beneficial, and I think that in my project I did not do that well enough.

Another recommendation would be to post more flyers early on in the project to get the word out more. I would recommend that putting up the flyers the month before the Challenge would be the best idea. When I put up the flyers it was only a few weeks before the Challenge and I think that that was too short of a time period. I did get my event information posted on the Recreation Center's website and also from RSO groups on Facebook. This was great in spreading the word and awareness for the Challenge and this should definitely be done again in the future.

If this project were to get picked up in a later semester, I believe that I have laid out solid ground work for that to happen. I hope that this idea of an education initiative on energy consumption and awareness can be picked up and happen again. With more people come more ideas, and I think that would be necessary for future trials. A single person can do this as

well if they are dedicated and work diligently. I made proof of that when I decided to continue with this project regardless of group support or not. It is my recommendation that more people work on this though, so that way the project can be tweaked and perfected without the constraint of the workload being too much.

VIII. CONCLUSION

Overall, the Energy Usage Awareness Month and Challenge was a success. Twenty five people participated in the challenge, the first of its kind, and they learned of the energy that is needed to run the things that we take for granted, like light bulbs. Short term goals from the Energy Usage Awareness Month include: students practicing more sustainable habits (turning off lights when not in use), realizing the disconnect between people and energy, and using everyday health habits like working out to promote community healthy habits like sustainability. There are long term goals as well: to continue the Energy Usage Awareness Month and Challenge at least every year and preferably once a semester, the increased habit of turning off lights in dorms and homes, the campus wide attitude of energy conservation, a lowering of the electrical costs for the university by the shutting off of not needed electrical devices, and an involvement of students in the energy conservation thoughts of the university.

IX. REFERENCES

BCHydro. "Want to lower your electricity bill? Tips on how to save". *BCHydro, for Generations*, 2013. Web. 18 April 2014 <<http://www.bchydro.com/news/conservation/2013/ways-to-save.html>>

"Energy and Work Unit Conversion". *Advameg, Inc.* Web. 17 April 2014
<<http://www.unit-conversion.info/energy.html>>

GE Lighting. "Home Lighting Tools and Resources". *GE Lighting*. Web. 20 April 2014
<<http://www.gelighting.com/LightingWeb/na/consumer/inspire-and-learn/index.jsp>>

Glasser, Harold. Personal Interview. March, April 2014.

Seth, Amy. Personal Interview. March 2014.

U.S. Department of Energy. "When to Turn Off Your Lights". *U.S. Department of Energy*, 2012.
Web. 17 April 2014 <<http://energy.gov/energysaver/articles/when-turn-your-lights>>

X. APPENDICES

Appendix I.

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Appendix II.

Office of Sustainability

-Harold Glasser, Executive Director of Campus Sustainability and Professor of
Environmental Studies

University Recreation Center

-Amy Seth, Director of the University Recreation Center