ENERGY EFFICIENCY FINAL REPORT

ESLP Energy Efficiency Action Research Team 2013

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Abstract

The goal of UCLA's Energy Efficiency Action Research Team over Winter and Spring Quarter was to promote sustainable energy usage on campus. Our projects focused on campaigning and outreaching to students and faculty on campus in order to spread awareness and encourage the adoption of energy efficient behavior. To accomplish this, we piloted a project to display energy saving tips on display monitors in Ackerman Union and across campus. We furthered our outreach by running a booth at the Earth Day Fair, where we raised awareness of alternative energy options with solar powered smoothies and trivia. We then expanded our base of alternative energy by assisting in the planning and analysis of using bike-powered energy at Ecochella.

Executive Summary

The Energy Efficiency Action Research Team set out at the beginning of Winter Quarter to decrease energy usage on campus by both spreading awareness about green energy production and providing resources to help students make better decisions regarding their daily energy usage. We decided to divide our efforts into three separate projects, all involving different forms of energy use and conservation. This included our display monitor project, our participation in the Earth Day Fair, and our assistance in the preparation and analysis of Ecochella.

For our display monitor project, we compiled and designed content in an infographic directed at informing students about ways that they can be more energy efficient. Our poster targeted vampire draw, which occurs when electronic appliances and devices "suck" power from power outlets even when off or in standby mode. We chose vampire draw because a surprising number of people are not aware of this component of their energy usage, and the solution only requires a change in the mindset of the user to generate actual savings. After the infographic had been on display around campus for over a month, we surveyed people to determine the success of the pilot and the feasibility of using this mode of communication for future energy campaigns.

The Earth Day Fair was a great opportunity for us to demonstrate the effectiveness of solar power by making solar-powered smoothies for students and engaging them with energy-related trivia questions. This year we relied on energy generated by the solar panel earlier that week, as the day of the fair was overcast and not conducive to solar power generation. We reached out to a large number of students at the fair, and were able to provide attendees with new knowledge about energy usage and conservation.

We were also given a unique opportunity to spread awareness about green energy production through Ecochella. The centerpiece of the concert was a stage powered entirely by people pedaling on bike generators. Our team acted as a resource for the planning of the concert and later as an analytical group to measure the total energy output. We found that the energy output by the bikes and input for powering the instruments was directly related to the number of instruments and tempo of the song.

Project Goals

Display Monitor Project

Our team sought to create an outreach and awareness project which would place some of the responsibility of energy efficiency on the individual students and faculty members at UCLA, and encourage them to make a difference in their own lives. While projects that decrease the energy requirements of the campus are undoubtedly effective, in order to achieve long lasting savings we need to change the mindset of the campus. Once each and every person who sets foot on campus at UCLA becomes conscious of his or her carbon footprint, change will begin to occur on its own.

With these thoughts in mind, we planned out our Display Monitor project. Our goal was to tackle various issues regarding energy efficiency at an individual level, and to reach out to as many students as possible. Once we had identified the issues we wanted to target, we researched and developed content in the form of an infographic to be displayed on TV monitors and bulletin boards across campus.

Earth Day Fair

As we looked at the previous Energy Efficiency team's work, we wanted a way to make use of the solar panel they had made. E3 invited us to their annual Earth Day Fair where we were able to table publicly along with other like-minded groups and organizations. We thought a solar panel would be a great way to entice people to come to us to learn more about alternative energy and to see it in action. Our goal for the end of the day was to have as many people to come over to our table as possible in order for us to spread the word about our various projects.

Ecochella

After the success of our Display Monitor Project, we wanted to work on a project where we could apply our knowledge to further educate the public. We were approached and asked to help with the planning of Ecochella, and were to assist them with collecting data on the event. This gave us the opportunity to engage in a project where we could apply our practical knowledge of energy use. Our goal for Ecochella was to record as much data as we could on the energy usage in relation to the bikes and the stage. Using the data we collect, we could then extrapolate the ideal conditions for holding a bike-powered concert or similar events in the future. We also wanted to use the data to see what type of event would effectively encourage people to learn and think differently about energy usage.

Background

Energy usage on a campus as big as UCLA can be incredibly high, but it also has the potential to generate just as high savings. Past Action Research Teams have targeted areas such as lighting

and renewable energy, with impressive results and high savings. Our team sought out to continue the success of past energy teams and their efforts, in order to encourage energy conservation and efficiency on campus and to promote more sustainable behavior.

Initial Conditions

Display Monitor Project

The display monitors around campus, particularly in Ackerman, have always offered up the use of their display monitors, often for a fee. They display everything from advertisements to menus to daily schedules, and rotate through all the slides one at a time at a set interval. This made it a simple task to determine how to display our information; we only needed to research and compile the necessary information. Infographics regarding vampire draw had been previously prepared, so we were able to gather much of the data for our graph from a similar source. We compiled the rest of the infographic's information from reports and other sources.

Earth Day Fair

Every year, UCLA's E3 holds an Earth Day fair to promote awareness of environmental issues, sustainability, and groups that work to make UCLA an environment-friendly campus, and the Action Research Teams are always invited. We teamed up with the Sustainable Food Systems Team to host a solar-powered smoothie maker to keep fair attendees cool and hydrated, as well as to educate them about renewable energy by using the solar panel that had already been purchased and assembled by the previous Energy Action Research Team.

Ecochella

During the Spring Quarter, E3 came to us asking for assistance with their new program dubbed Ecochella. Ecochella was a 4-hour event hosted on May 24th, 2013 that encompassed many environmental and sustainability related organizations. The main attraction of the event was a manually powered stage set-up run entirely by eleven bicycles. During the event, volunteers pedaled these stationary bicycles, and when they didn't pedal hard enough, the stage equipment would black out.

E3 came to us for assistance in obtaining information about the energy needed by the stage, and also the energy created by the cyclists. The stage required different amounts of power from the various amps musicians would have on stage, microphones, and speaker set-ups. 11 bicycles were set-up and rigged to a central power collector that also displayed the amount of watts the bikes was currently generating.

Computer Lab Efficiency

From the beginning of Winter Quarter, one of the projects we prioritized was the computer lab efficiency project, in which we sought to install power management and printer software in computer labs that would generate quantitative savings we could analyze. However, the Green IT Taskforce had already taken their hand at installing this software around campus, and to no avail. We received some assistance and advice from a member of the Green IT Taskforce, Ravi Shah, but even with his help we ran into several major roadblocks along the way. Hopefully next year's team or teams farther in the future will have better luck!

Research Methodology

Display Monitors

The first step of this project was to determine the subject matter of the content to be displayed. In order to do so, we identified several factors that would measure the effectiveness of our content. The first factor was the audience. Who would be seeing our content? The second was the location, which contributed to the first factor; where would our content be displayed, and therefore who would see it? The third factor was the applicability of the content; would our audience be able to apply this knowledge within a few hours? Or would they forget what they learned before they were able to use the knowledge they gained? The fourth and final factor was how common the knowledge seems to be, or rather what percentage of people would already know about what we were spreading?

Based on these factors, we came up with the following attributes. This information would be put up on display monitors (and later billboards) around campus, so students seemed to be the primary audience. Faculty and staff would be the secondary audience. Therefore, this content should be applicable either on campus, or at home in an apartment or a dorm. Finally, it needed to be a novel concept that people would not think of on their own; telling people to turn off the lights just didn't seem novel enough.

We finally settled on vampire draw. Vampire draw is when electronic devices that are either off or in standby mode continue to draw power because they are still plugged into an outlet. This seemed to perfectly fit the criteria we set up: it would be effective for students in their dorms and apartments, as well as for faculty and staff both in the office and at home. Furthermore, many

people have not heard of the concept of vampire draw, therefore making it an ideal target for our campaign.

The next step was to design an attractive and informative slide, which contained enough information to be effective but not so much information that it became crowded. We needed a slide that would allow students to briefly glance at the content, and then come away with some basic knowledge about vampire draw. It was also important that the content look attractive to garner attention from passers by.

In order to make the content interesting, while still being brief, we attempted to allot one sentence to each main point. First we wanted to present the viewers with a title that would be catchy and convey the subject of the content. Next we needed to create a problem; in order to catch the attention of viewers, we needed to describe a pressing issue that they did not have prior knowledge about. Next, in order to quantify the magnitude of the problem, we wanted to give them a global fact that would emphasize the environmental impacts of the problem. We then decided to further emphasize the problem at a personal level by appealing directly to the viewer of our content with a graphic of how vampire draw affects their lives. Finally, the most important component of the content; it was vital that we then provide the solution to the problem. In the end, this took up a few sentences, but with good reason.

Once this was completed, we handed the data over to a graphic designer. We decided to leave the entirety of the design up to her creative license, as none of our team members had much of a background in aesthetics. This turned out to be a great decision, as she created a very attractive slide.

This left just the placement of our content around the campus! We began by asking around to figure out who was in charge of the display monitors around campus. We quickly discovered that there is no centralized controller who manages the content of every display monitor, so we chose to target Ackerman Union, a location where one controller, Patty Zimmerman, manages all eight of the monitors within the union. We then sought to widen our reach by moving from the digital front to bulletin boards. This allowed us to spread our campaign to areas without display monitors.

Along the way we also encountered a few minor challenges in the actual development of the content. First, it was difficult to obtain any recent data from studies on vampire draw. The most recent study we could find was from 2005, and much of our electronic technology has changed since then. However, considering many people do still use older electronic devices and appliances, the 2005 study is not as outdated as it might first seem. The next challenge was determining appropriate facts to include in the content. How do we convey this subject as a problem for both the environment and the viewer in just a couple sentences? We ended up finding appropriate facts about global impacts and personal impacts of vampire draw, but it was a time consuming process. The final challenge in the development process was to present the information in an attractive manner. Fortunately, we were not forced to deal with this issue as we employed the help of a graphic designer to create an original and presentable slide.

We also encountered difficulties in locating display monitors around campus. The only way we could find the display monitors was to walk through each building on campus, and actively look for them. Some of the buildings didn't have any display monitors, and other buildings had poorly

situated display monitors that would not provide us with much exposure. This was difficult because it forced us to skip over many buildings that we knew would be frequented by many students.

The bulk of our challenges, however, presented themselves in the area of correspondence. Once we had developed the content, we incorrectly assumed that getting the content put up on monitors would be relatively straightforward. In theory, we could contact one person who was in charge of the content that goes up on display monitors, and spread our content across the entire campus in one fell swoop! In practice, we ended up needing to visit each and every department with a display monitor in order to discuss the content with them. There is no single person who controls all of the display monitors around campus, and there is no established database for contacts of department heads that have display monitors.

To exacerbate this problem, many people we contacted were very unresponsive even once we had located their contact information and gotten a hold of them. For some department heads, they were merely slow to respond because they were reluctant to display the content. For others, we simply could not get a hold of them via email, and even visiting them in person was not sufficient to seal the deal. Furthermore, once we met with them the first time, some provided conditions that our team could not meet immediately. We would then need to leave the meeting, and restart the correspondence process once we had addressed the issue.

At the end of the project we aimed to refine and perhaps revamp our content. We surveyed students in Ackerman Union to determine the effectiveness of our content. The questions we asked (Appendix B) were intended to determine whether our slide was successful at getting our

intended message across, and whether using the display monitors was an effective way to reach out to students with pertinent sustainability-related information. We also hoped to gain feedback that could be used for any future related projects.

Earth Day Fair

Our team hosted a trivia questionnaire, and the purpose of that was to further engage attendees and educate them about energy while they waited for their smoothies. One of our main goals was to change the energy-consuming habit of students, so our trivia questions were constructed with relevant facts to college students living in residential dorms or in apartments. We had twenty energy-related questions each printed on a card with a number on it (Appendix C). The format of each of the questions differed, and included multiple choice, fill in the blank, and true-or-false questions. Attendees who approached our table were asked to choose a card or number, and were then asked the question on the chosen card. Trivia questions covered the three topics of renewable energy, energy efficiency and savings, and energy vampires. Those who participated in trivia received candy and participation stamps on their passport, which if completed could be exchanged for free food.

We also had a solar panel prepared for the fair, which we hooked up to a battery and also to two blenders for smoothies. We planned for the fair by setting up and charging the solar panel several days ahead of time. The solar panel showed students a practical application of renewable energy, while also producing consumable items that students could enjoy.

Our greatest challenge was the usage of the solar panel, as it required both transportation preparation and specific weather conditions. Due to the large size of the solar panel, we had to

allot a larger amount of time to transport the panel from the Institute of the Environment and Sustainability to the intramural field where the fair was held, along with the heavy battery. Our solar panel was also hindered by cloudy weather on the day of the fair, which resulted in minimal solar electricity generation. Luckily, since the battery had been charged several days prior using the solar panel, we were still able to power the blender for the initial two hours of the fair.

Ecochella

To get the correct information for how much the stage generated, we split up the tasks among the group. Together, we came up with the amount of electricity used by the stage using the watt rating on the speakers, and the average price of kilowatt-hours in Los Angeles at the time. During the event we also manually recorded the watts the bikes generated in one-minute intervals throughout the 4 hours of the event. We also recorded notes on the volunteer's efforts on the bike, music being played, and any special circumstances that might have occurred at any given time. After the event was over, we compiled our information and were able to create a chart depicting energy usage throughout the event.

We did face a few problems with collecting information. As there are many other organizations working with E3, it was difficult to determine where best our efforts could serve. When we arrived at the event to collect our readings, the only source of data was the wattage display screen, which showed a live reading of the energy being used by the stage. At first, it was unclear whether the wattmeter displayed the energy needed by the stage or the energy generated by the cyclists. This however did not affect our measurements as we could still take down readings, and we were able to figure out which was displayed later. In addition, during moments

when the bicycles either generated too little or too much energy for the stage to use, the wattage number was not displayed, and was replaced with a “Pedal” or “Chill” notice, respectively. However, as the majority of readings could still be taken, we were able to infer what the missing data was.

Data Analysis

Display Monitor

[still in progress]

Ecochella

Energy usage typically sat just over 500 watts during performances. Some performances used as low as about 380 watts, and energy usage peaked just after 8:00 PM at just under 900 watts. During interim periods between bands’ performances, wattage dropped as low as 150. The two standout peaks in wattage were from 7:45 to 8:15 PM and from 9:10 to 9:50 PM. The low point for energy usage occurred between 9:00 and 9:10 PM. As far as operating capacity was concerned, typically one or two bicycles out of the eleven there were out of commission at all times, either due to rider swaps or malfunctions/repairs. Additionally, the number of performers differed for many of the bands, as did the number of electrical instruments.

Key Findings

Display Monitor Project

The end result of our development process was an attractive and informative infographic discussing vampire draw (Appendix A). We have had it displayed in Ackerman Union for most of Spring Quarter. One of our more successful contact attempts turned out to be when we emailed Patty Zimmerman of ASUCLA. She replied to our inquiry rapidly, and upon the submission of our content she was able to have it displayed in Ackerman for free. Many of the buildings around campus have very few display monitors, if any at all. In these buildings, in order to display our content it is integral that we switch to hard copies.

[survey findings still in progress]

Earth Day Fair

Many of those who participated in trivia responded that they had learned something new by answering one or more questions, and many individuals learned about energy vampires for the first time. Some people were so interested in the questions that they stayed and volunteered to answer multiple questions. From this experience, we conclude that trivia questions are an effective way of engaging fair attendees and educating people about energy. We also found that people responded positively to the solar panel being used to power smoothies, and that many people were interested in hearing how it worked. We found that having the solar panel sitting in front of the table and blending the smoothies in front of the attendees also provided a more interactive way for them to learn about solar power and its potential uses.

Ecochella

The results of our recording can be seen in Appendix D, in the form of a chart of energy generated at every minute for 4 hours from the start of the event 6pm to the end of the event at 10pm. We also compiled notes for the entire event, as seen in Appendix E.

From the data, we can see that during the beginning of the event, not much energy was being generated. This is mainly due to the stage ramping up and starting out with sound checks before their opening acts began performing. As there was not as big of a crowd at the beginning of the event, it meant there were also fewer volunteers to pedal on the bikes. The energy generated from the bikes fluctuated from 400 to 500 depending on when musicians were playing, while rarely exceeding a threshold of 700. We found that songs that were more upbeat or bands that had more members, and as a result more instruments, required a lot more energy input and as a result required the bikers to pedal faster. Slower songs and bands with fewer instruments used less energy, and did not require as strenuous pedaling. In terms of the success of using renewable energy as the main source of energy for an event, the bikes were able to keep the stage running for the entirety of the concert, with malfunctions and power outages lasting no more than a couple minutes at a time.

Recommendations

Display Monitor Project

Communication has been the most crucial and the most challenging part of our projects, particularly our display monitor project. For future teams, we would like to emphasize the

importance of reaching out and contacting people early on in the quarter. Because communicating through email tends to give way to lag time, and because teams do not have a lot of time to get their projects done, responses should be sent out within two days. We have learned that it is very easy to lose contact with people through email, as messages get lost or forgotten. Many people we contacted required multiple emails to elicit a response, and these responses came as late as two weeks after our initial email.

Because of this, it is important that we respond quickly to cut down on the intervals between communications, as well as to be persistent in sending follow-up emails. If we were to write an email, wait two weeks to receive a response, and then take a week on our own to write a response to that email, we would have wasted three weeks for one round of correspondence! You cannot always control how rapidly the person on the other end responds, but it is integral that you control the response time on your end.

We would also like to recommend the development of new content. While our vampire draw content has captured interest and been effective in educating students about saving energy, there needs to be multiple slides to rotate through the displays so that the content does not become stale. Additionally, refinement of existing content is an option that should not be overlooked. According to the feedback that we received through our surveys regarding the display monitor content, the layout that we used was clear, and information was presented in a succinct manner. Visuals are especially helpful, so future groups should consider including charts and visual aids, as well as having a graphic designer produce the slides.

Earth Day Fair

We recommend that future action research groups continue to host trivia questionnaires at the Earth Day Fair to spread the word about their causes, as our experience with trivia was very successful. We found that people are very willing to participate in games, especially if the setup of the table looks interesting and colorful, and if rewards are given. We also found that providing a way for people to see and interact directly with forms of alternative energy like solar power promotes interest and further discussion on the topic, and we recommend that this should continue to be used as a way to encourage the acceptance and use of alternative forms of energy in various cases.

Ecochella

The success of Ecochella showed that large-scale events can be powered by alternative energy sources, and we recommend that future groups also look into using bikes to convert human energy into usable power for entertainment events. Since our data from the concert showed that bikers generally generated more electricity to music with higher tempo, we recommend that bands try to perform more high-energy songs, if possible, as it helps motivate bikers to continue pedaling. Our method of data collection at Ecochella gave us important insight into the correlation between activity (instruments, music, crowd, etc.) and power generation, but future teams should also consider logging down the beats-per-minute (BPM) and decibel level of the music for the entirety of the event. This will provide more detailed information on how sound level and music type affect biker activity, and may help concert-planners maximize electricity generation by bikers.

Conclusion

While our team did not complete any quantitative projects from which we could directly derive recommendations for the campus, we completed several qualitative projects that could influence the mindset of the faculty and student body at UCLA. Our projects increased the campus' exposure to several different green energy alternatives. We also provided a campaign that raised student and faculty awareness of energy saving tips for use both at home and in the workplace.

Overall, the projects were a huge success for our team. For a team that was struggling to find a direction to go, we needed a main project to focus our efforts on. While we initially wanted to have a quantitative project that resulted in actual energy savings on campus, our qualitative projects proved to be worthwhile and rewarding, and will provide valuable information for future outreach efforts to promote a more sustainable and energy efficient campus.

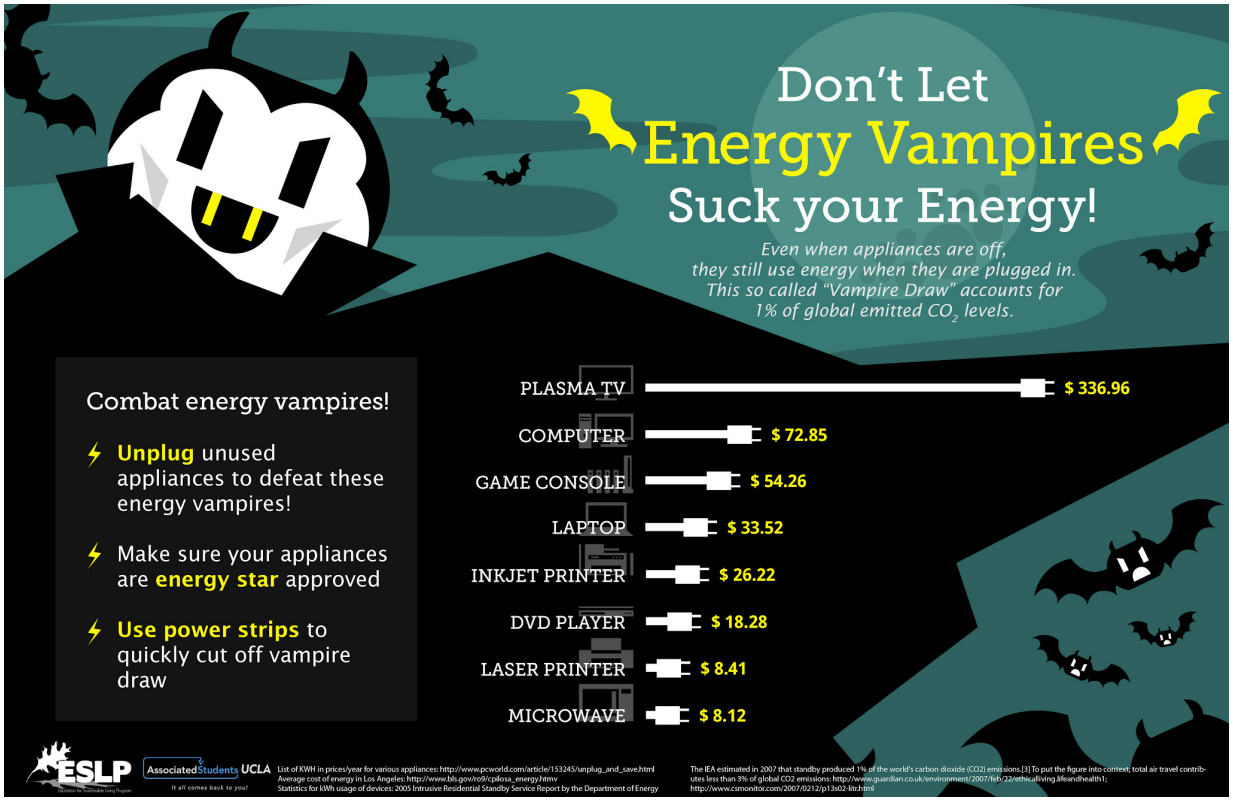
References

Energy Efficient Strategies. (2005). Intrusive Residential Standby Survey Report. *Report for the Australia Ministerial Council on Energy*.

United States Department of Labor (2013). Average Energy Prices, Los Angeles-Riverside-Orange County – April 2013. *Bureau of Labor Statistics.* Retrieved from http://www.bls.gov/ro9/cpilosa_energy.htm.

Appendix

A. Vampire Draw Infographic



B. Display Monitor Survey Questions

Do you pay attention to the display monitors on campus?

- Yes
- No

Do you know what vampire draw/phantom load is?

- Yes
- No

Have you seen this infographic for vampire draw displayed on monitors around campus?

- Yes
- No

If you have seen this before, can you recall one thing you learned from seeing the infographic on campus?

If not, what did you learn from looking at the slide above?

Do you have any suggestions for our content that would make it more effective?

Would you like to join the UCLA Sustainability email list to learn about exciting events and more tips for going green? If yes, write you email below.

C. Earth Day Fair Trivia Questions

The U.S. uses nearly **a million** dollars worth of energy each minute.

There's a gym in Hong Kong where the exercise machines activate a generator that creates electricity. How much electricity can the average person produce?

a. 25 wph
b. **50 wph**
c. 100 wph

What country is planning a floating wind farm off its shores?

a. Japan
b. **Norway**
c. Brazil

One company is experimenting with so-called "Oil 2.0," crude oil made from the droppings of what kind of organism?

a. Algae
b. **Yeast**
c. Microscopic insects

What's biogas digestion?

a. Methane released by cow flatulence can be harnessed into electricity.
b. Bird excrement is processed into energy.
c. **When the methane released by decaying waste can be turned into electricity.**

What's one of the easiest ways to use alternative energy in your home?

a. Converting to solar power
b. Powering your toaster with electricity generated from a stationary bike
c. **Using renewable energy if your energy company offers it**

What's one way to use passive solar energy in your home?

a. **Plant trees around your house**
   (Trees block the sun in the summer and let in light in the winter – it's a way to use the sun's energy without having to deal with a solar power system.)
b. Always keep your windows open
c. Make sure your home gets as much direct sunlight as possible

How much of a decrease can you expect in your power bill if you switch to wind power?

a. **90%**
b. 60%
c. 30%

9. What's one of the main drawbacks of biodiesel as car fuel?

a. It decreases your car's gas mileage.
b. It smells bad.
c. **It can be used only for cars with diesel engines.**

What's the fastest-growing renewable energy technology in the world?

a. Solar power
b. **Wind power**
   (Wind power generation quadrupled between 2000 and 2008.)
c. Hydroelectricity

What does most of our electricity in our homes go to?

a. **Heating**
b. Cooling
c. Appliances

What are energy vampires?

The appliance that uses up the most energy when it's off but still plugged in is:

a. Game Console
b. **Plasma TV**
c. Computer

Power strips can help quickly cut off energy draw in powered-off appliances that are still plugged in.

True or false.

When a house is occupied, the thermostat should be set at **68** °F for maximum energy efficiency.

What does LEED stand for?

Leadership in Energy and Environmental Design.

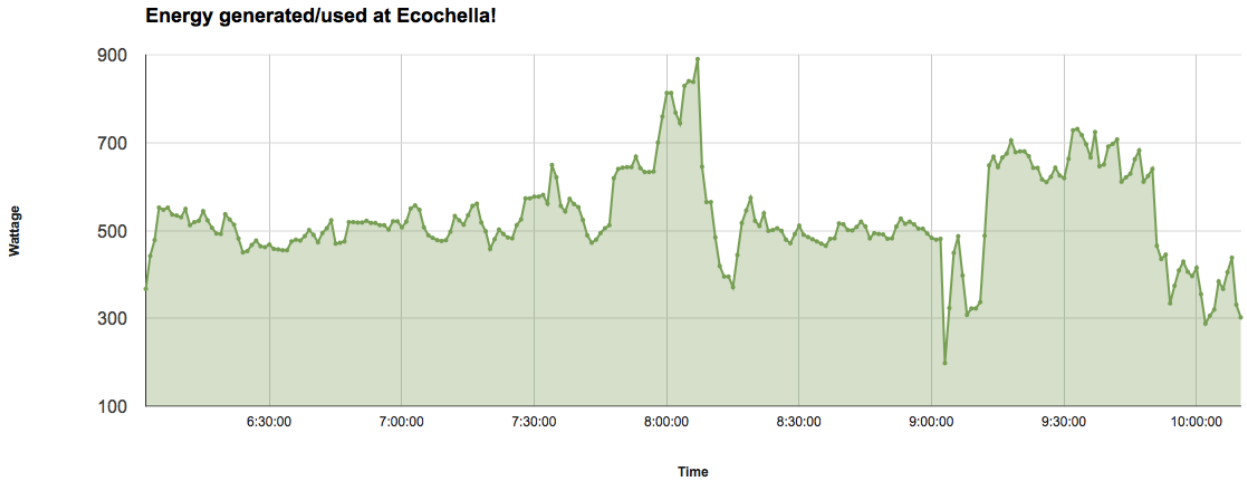
Maintain refrigerator at _____ and freezer section at _____.
a. 35 to 40 °F, 10 to 15 °F
b. **35 to 40 °F, 0 to 5 °F**
c. 25 to 30 °F, 0 to 5 °F

What is caulking?
The sealing of air leaks around the home, usually in the walls, floors, and ceilings.

On average, how much could you save a year by unplugging your plasma TV whenever it's off?
a. $100
b. $200
c. $300

"Vampire draw" accounts for 1% of global emitted CO2.
True or false.

C. Ecochella Data Graph



D. Ecochella Data Chart

Time	Wattage	Bike Notes	Band Notes	Decibels
6:00:00		2 person swap	**Primaries: 3 guitars, 1 drum, 1 trumpet, 1 sax, 1 trombone**	
6:01:00				
6:02:00	367			
6:03:00	442	2 person swap		
6:04:00	478	1 person stops/malfunction		
6:05:00	552			

6:06:00	547	Person resumes	No sax, no trombone	
6:07:00	552	1 person swap	Only guitars and drum	
6:08:00	536	1 person stops/abandons		
6:09:00	534		Drum Solo	
6:10:00	530	1 person swap	No sax, no trombone	
6:11:00	549		Vocals begin for 30s	
6:12:00	512		1 bike broken, fixed quickly	
6:13:00	519	1 person swap		
6:14:00	522		Trumpet solo	
6:15:00	544		Saxophone solo	
6:16:00	523		Vocals restart	
6:17:00	506		1 bike broken, fixed quickly	
6:18:00	493			
6:19:00	492			
6:20:00	537	4 person swap		80-90
6:21:00	PEDAL		Trombone solo, sax solo	60-70
6:22:00	513	4 person swap		
6:23:00	PEDAL			
6:24:00	450			
6:25:00	453	1 person swap	Intermission music/stereo	70-80
6:26:00	467	1 person swap	Mic stopped	
6:27:00	477	1 person swap	No usage of equipment	
6:28:00	464			
6:29:00	462		Rock the Bike speaking	
6:30:00	468			
6:31:00	458			
6:32:00	457			
6:33:00	455		Blind Willies Testing	
6:34:00	455	4 person swap		
6:35:00	475	1 person swap		
6:36:00	479	1 bike changes seat height		
6:37:00	477	More bike seat height changes	Minor cello tuning	
6:38:00	487			
6:39:00	501		Guitar tuning	
6:40:00	490	1 person swap		
6:41:00	473			
6:42:00	494		Stereo testing	
6:43:00	505	1 person swap		
6:44:00	523			
6:45:00	470	5 person swap		80-90
6:46:00	472	1 person swap		
6:47:00	475		**Blind WIllies: 2 guitars, 1 cello, 1 drum**	80-90
6:48:00	519			
6:49:00	PEDAL	1 person swap		
6:50:00	PEDAL	2 person swap		
6:51:00	518	1 bike seat height change, 1 person swap	Cello solo, song ends	70-80
6:52:00	522	1 person swap	No more power temporarily	
6:53:00	PEDAL	1 person stop to stretch	New song	80-90
6:54:00	PEDAL	2 person swap	Vocal solos	

6:55:00	512	5 person swap	End of song/power stops?	
6:56:00	512		New song: no drums, bass guitar	
6:57:00	502	1 person swap	No more power, acoustic temporary	
6:58:00	521	2 person swap		
6:59:00	521	1 person swap	Cello colo	80-90
7:00:00	507			
7:01:00	520		Break before next song	
7:02:00	550		New song	80-90
7:03:00	557			
7:04:00	547			
7:05:00	507	1 person swap	End of song	
7:06:00	489			
7:07:00	483			
7:08:00	478	1 person swap	Intermission	70-80
7:09:00	476			
7:10:00	478			
7:11:00	497	1 person swap		
7:12:00	533	4 person swap	**Juliet Piper: 1 guitar**	70-80
7:13:00	523	5 person swap		
7:14:00	513	1 bike seat height change		70-80
7:15:00	CHILL	1 person swap	End of song, new song begins	
7:16:00	556			
7:17:00	561	1 person swap		80-90
7:18:00	518	2 person swap	End of song	
7:19:00	498			
7:20:00	458		New song	80-90
7:21:00	CHILL	1 person swap		80-90
7:22:00	502	4 person swap	No power	
7:23:00	492	1 person swap	End of song	70-80
7:24:00	484		Intermission	
7:25:00	482			
7:26:00	512			
7:27:00	525			80-90
7:28:00	573	1 person swap	**Manzanita: 1 guitar, 1 keyboard, 1 bass**	
7:29:00	573			
7:30:00	PEDAL			
7:31:00	PEDAL			
7:32:00	581	1 person swap		
7:33:00	561	1 person swap		
7:34:00	649	1 person swap		
7:35:00	621	1 bike adjustment	Added a keyboard	
7:36:00	556	1 bike under repair		
7:37:00	543	Another bike under repair (2 now)		
7:38:00	572	Both bikes fixed		
7:39:00	560	2 person swap		
7:40:00	553			
7:41:00	524			
7:42:00	489	2 person swap		
7:43:00	472			

7:44:00	479	4 person swap		
7:45:00	494			
7:46:00	505	2 person swap		
7:47:00	512	1 person swap	Intermission?	
7:48:00	619			
7:49:00	640			
7:50:00	643			
7:51:00	644			
7:52:00	644			
7:53:00	668			
7:54:00	642			
7:55:00	633			
7:56:00	633			
7:57:00	634		**Free Food: full stage**	
7:58:00	700			
7:59:00	759			
8:00:00	813			
8:01:00	813	1 person swap		
8:02:00	768	4 person swap, 1 broken bike	Lights begin?	
8:03:00	744	Bike fixed		
8:04:00	829	2 person swap. 1 broken bike		
8:05:00	840	Bike fixed, 1 person swap		
8:06:00	838			
8:07:00	890	1 person swap		
8:08:00	645	4 person swap		
8:09:00	PEDAL			
8:10:00	PEDAL			
8:11:00	484			
8:12:00	419			
8:13:00	PEDAL			
8:14:00	PEDAL	1 bike down	Lights off, turn on again	
8:15:00	371	Bike back up		
8:16:00	PEDAL	2 person swap		
8:17:00	517	1 person swap		
8:18:00	PEDAL			
8:19:00	574			
8:20:00	522	2 person swap	Intermission	
8:21:00	510			
8:22:00	539			
8:23:00	499			
8:24:00	501			
8:25:00	505			
8:26:00	499		**India Carney: 1 acoustic guitar, mics, lights**	
8:27:00	479			
8:28:00	471			
8:29:00	492			
8:30:00	511			
8:31:00	490			
8:32:00	PEDAL	1 bike broken, fixed quickly		
8:33:00	PEDAL			

8:34:00	PEDAL				
8:35:00	PEDAL	1 person swap			
8:36:00	465	1 person swap			
8:37:00	481				
8:38:00	482	1 bike broken, fixed quickly			
8:39:00	516	1 bike broken, fixed quickly			
8:40:00	514				
8:41:00	501	2 person swap			
8:42:00	500	2 person swap, 1 bike seat adjustment			
8:43:00	508				
8:44:00	520		Intermission		
8:45:00	509				
8:46:00	482	1 bike broken, fixed quickly			
8:47:00	494				
8:48:00	492	2 person swap			
8:49:00	491	2 person swap			
8:50:00	481				
8:51:00	482	2 bikes broken, fixed quickly			
8:52:00	509				
8:53:00	527				
8:54:00	515				
8:55:00	520				
8:56:00	514	3 person swap	Intermission		
8:57:00	504				
8:58:00	504				
8:59:00	493				
9:00:00	483				
9:01:00	479				
9:02:00	481	1 bike broken, fixed quickly			
9:03:00	198				
9:04:00	CHILL				
9:05:00	449				
9:06:00	487				
9:07:00	CHILL				
9:08:00	308				
9:09:00	CHILL				
9:10:00	CHILL	1 bike down, fixed quickly	**Dustbowl Revival: full stage**		
9:11:00	337				
9:12:00	488	bikes no longer visible (due to large crowd)			
9:13:00	648				
9:14:00	668		Song ends, new song: bass/violin?		
9:15:00	644				
9:16:00	666		Song ends, new song: upbeat		
9:17:00	675				
9:18:00	705	1 person swap	Song ends, new song: upbeat		
9:19:00	678				
9:20:00	680				
9:21:00	680				
9:22:00	669				

9:23:00	PEDAL		Song ends, new song: slower	
9:24:00	PEDAL			
9:25:00	616			
9:26:00	610			
9:27:00	622		Song picks up	
9:28:00	643		Voice only	
9:29:00	625			
9:30:00	619		Song ends, new song	
9:31:00	663		Upbeat hoedown	
9:32:00	728			
9:33:00	731		Singer speaking to crowd during song, song slows	
9:34:00	717		Instrument solos	
9:35:00	696		Song picks up, all instruments at full force	
9:36:00	666		Song quiets down for violin solo	
9:37:00	724		Song picks back up	
9:38:00	646	1 person swap	New song: Whiskey in the Well	
9:39:00	650			
9:40:00	691		Instrumental - drum solo	
9:41:00	697		Tempo picks up	
9:42:00	707		New song: "Le Bataillon", slower tempo	
9:43:00	611	1 person		
9:44:00	621			
9:45:00	629			
9:46:00	662		Song slows down	
9:47:00	682		New song: "Folsom Prison Blues", very fast tempo	
9:48:00	611			
9:49:00	624			
9:50:00	640	2 people swap		
9:51:00	465		Song ends	
9:52:00	435		New song beings	
9:53:00	445			
9:54:00	334			
9:55:00	374			
9:56:00	409		A lot of speaking during song	
9:57:00	429			
9:58:00	406			
9:59:00	396			
10:00:00	415		New song, slow tempo	
10:01:00	355	1 person swap		
10:02:00	288			
10:03:00	306			
10:04:00	320			
10:05:00	384			
10:06:00	367			
10:07:00	405			
10:08:00	438			
10:09:00	331			
10:10:00	302		Concert Ends!	