

K-State Campus Dorms Energy Competition: Reducing Energy Consumption on Campus

Student Project Leaders: Seth Heronemus (Mechanical Eng. Grad student) & Rhiana Martin (undergraduate Interior Design student)

Project Advisor: Dr. Julia Day, *Director of the Energy Efficiency & Human Behavior Program* at the Institute of Environmental Research (IER); *Assistant Professor* in Apparel, Textiles, and Interior Design

Introduction

Due to Kansas State's current financial situation, campus administrators are looking for ways to trim the general university budget. While many options are being explored, one cost cutting avenue would be to find a way to decrease the campus utility bill. During the Fiscal Year of 2016, Kansas State spent nearly \$15 million on utilities. The university can find ways to increase building system efficiencies to decrease this significant cost.

Over the past few decades, technology-based energy reduction programs have been developed for both commercial and residential buildings. However, technology can only go so far in reducing system waste. Building occupants must understand how to use the systems efficiently. As such, there has also been much interest in behavior-based energy savings programs in both the residential and commercial building sectors. These behavior change programs are largely based upon employing social-psychological strategies to motivate and change individual and group behaviors. The development of these programs has primarily focused on cultural and subjective norms, attitudes, and perceived behavioral control (among others). Each of these interventions are important elements of behavior change programs. Current behavior-based energy efficiency programs address these human dimensions of behavioral savings through feedback, messaging, motivations, competition, etc. to achieve significant cost savings.

One way to raise awareness and encourage building users to adopt more efficient practices is to implement occupant training and education programs. The goal of these programs is to inform building occupants about building systems and the impact the user's actions have on those building systems. One method for reducing energy consumption that has seen successful implementation at several university campuses is an energy conservation competition between university dorms.

Energy competitions can achieve varied levels of reduction. However, even on the low end, they can still achieve significant savings. For instance, dorms of two different colleges in Maine, Colby College and Bowdoin College, held a three week energy reduction competition against each other to see what savings an intercollege challenge could produce. The dorms achieved reductions of 7 to 8.7 percent energy savings, respectively (Bowdoin sustainability, n.d.). However, savings can be much higher. According to the Emory News Center, one dorm on campus was able to decrease energy use by 36 percent over a two-month period (Emory, 2015). Becker, et al. suggests that a key to competition success is the frequency of feedback and level of engagement that the competition uses (Becker, et al., 2010). The proposed project will incorporate participant engagement and feedback as much as possible.

In addition to the financial, research and educational opportunities a competition would offer, the project would also help to raise awareness of sustainability issues to a wide range of students. The competition would show that environmental and sustainability issues are important to the university. The energy competition would also decrease the amount of greenhouse gases and other pollutants that K-State is responsible for by decreasing energy usage. **The purpose of this project is to implement an energy conservation dormitory competition and education program with the goal of engaging residents and teaching the entire student body and faculty about the benefits of energy reduction and a sustainable lifestyle.** In addition, the project would encourage

students living in the dorms to work together towards a common goal, and reduce the K-State campus's electric bill and carbon footprint.

Project Description

An energy savings competition will be developed (based on proven methods) and will be implemented in each dormitory throughout campus. To develop this program, a survey will be given to all dorm residents to determine resident energy consumption habits and learn more about the dorm environment. Possible questions could include: "do you generally leave the lights on when you leave your room, or an empty bathroom", or "do you have personal control over the temperature in your room and if so, to what temperature do you set your thermostat?"

Once the results of this survey have been received, the project team will examine collected data to determine what energy savings lessons need to be stressed and will have the most impact in the education program. After the results have been analyzed, and the various mediums for energy consumption within the dorms determined, an education program (series of pamphlets, talks, videos, etc.) will be created to inform residents of ways to decrease their energy consumption. In addition to energy conservation information, the education program will also include facts about housing and dining services to better inform students on where their housing fees go and why it is important to conserve the dorms' resources. The competition and education program would begin the first or second full week in March. The competition would then last through the end of April.

The energy consumption for each dorm will be checked and updated on a weekly basis. During these updates the new education information will be released as well. Total energy consumption will be tracked and displayed (via a combination of dashboards, website, posters, etc.) for dorm residents and the rest of the student body, letting students know how much electricity they are consuming and saving as well as the dorm building to building standings. The standings could also be published in the K-State Communications and Marketing emails as well as other campus news sources. This will help make the competition visible campus wide and can be a medium for sharing and disseminating the information provided in the education program with all students and faculty.

The competition will last for 5-7 weeks. The building that has decreased their energy consumption the most from their respective baseline will win a prize. Specific prizes will be determined at a later date, but prizes may include a pizza party or cookout, or the ability to vote on a sustainability-related prize that will benefit the winner's dorm or the campus. Once the competition is completed, monitoring will continue to determine if consumption continues to decrease, stays the same, or rebounds. Additionally, a second post-survey will be given to assess the residents' perceived benefits gained from the competition, any anticipated lifestyle changes and overall feedback.

Note: We have already spoken to Casey Lauer, Assistant VP Engineering Utilities Maintenance, and Gary Weishaar, Controls and Energy Management, as well as Skyler Harper, Associate Director of the Department of Housing and Dining, and all parties are supportive of this competition.

Project Team

Under the guidance of Dr. Julia Day, a nationally and internationally recognized leader in occupant behavior and energy use, the competition will be primarily directed by students in the College of Human Ecology and the College of Engineering. The student leaders (Seth H. and Rhiana M.) will oversee coordinating with housing and dining officials, KSU facilities staff, dorm RA's, and the project team as well as directing data collection and education program efforts. The team will also include two additional undergraduate students who will help with data collection, analysis, media, education program development, and all other project needs. The competition will provide an excellent opportunity to enhance leadership, organizational, and social skills beyond the classroom.

Sustainability and Environmental Benefits to the University

The goal of this project is to conserve as much energy as possible in the campus dorms, which will directly relate to utility cost savings for K-State. Each dorm will be monitored by sub-meters that were previously installed by KSU facilities under a previous grant. Our team has already procured the baseline energy data, and for the competition, dormitory energy use will be compared to baseline amounts. The dorm with the highest amount of energy savings, as compared to their baseline, will win. The energy usage (kWh) will be tracked throughout the competition to determine standings. These behaviors may also translate and diffuse to other buildings on campus.

These energy and cost savings will provide direct economic, environmental, and sustainability benefits to the campus. The project will likely have additional benefits due to the publication of the competition and the educational materials. The goal of publicizing this information is to both inspire the competitors to try their best, but also to make sustainability efforts on campus and their benefits more visible. One of the goals of this project is that others on campus will become more aware of the importance of energy conservation and how they can play a role.

Benefits to the KSU Student Body

All students will have access to the education program that will be created as part of the proposed project. This will provide students with the knowledge required to make more informed decisions about their energy consumption habits and the ability to reduce their usage to decrease their current and future energy bills. They will obtain the knowledge necessary to reduce their personal carbon footprint. Additionally, students will be competing in collaboration with their fellow dorm residents, which could build a sense of teamwork and pride in their joint mission. They will also be able to take pride from their university's efforts to reduce its environmental footprint. The students involved in the planning and implementation of this project will gain valuable experience with project management. They will get the chance to work with administration and students from many different disciplines to make their idea become reality.

Statement of support from K-State department/unit that will administer the project funds

See attached letter on page 5.

Detailed Budget

Budget Items	Justification	Unit Cost	Quantity	Total Cost
student workers	<i>Compensation for student workers & student project leaders (15 hrs/week) – pay will be distributed among (4) student workers at the pay rate of the allowed \$7.25/hr for 17 weeks (Feb - June 1)</i>	\$7.25/hr	15 hrs/week x 17 weeks	\$7395
data monitoring software for energy dashboards	https://www.idashboards.com/pricing/ - Annual enterprise service for 1yr	\$39.95 per month	12 month subscription	\$480
40" display screens for energy use and dashboard	https://www.amazon.com/TCL-40FS3800-40-Inch-1080p-Smart/dp/B00UB9UJFQ/ref=sr_1_2?s=tv&rps=1&ie=U	\$265	4	\$1060

	TF8&qid=1485352477&sr=1-2&keywords=led+tv&refinements=p_85%3A2470955011%2Cp_n_size_browse-bin%3A3578041011			
poster printing	20 informational posters for dorms	\$20	20	\$400
winning prize for distribution	Prizes to be determined based on participant feedback	variable	variable	\$600
Additional misc. supplies and materials	Additional office supplies or materials or mounting hardware for displays may be needed	variable	variable	\$65 max
Budget Total				\$10,000

Proposed Timeline of Activities

Please see the timeline below for proposed activities. All funds received will be spent by 6/1/17.

anticipated project dates: 02/01/17 - 06/01/17

Task	Task /Milestones	2017 month			
		F	M	A	M
1	Education program development				
2	Project planning with housing and dining staff				
3	Announce competition & put up posters				
4	Information session				
5	Competition kickoff!, <i>remind everyone to turn off everything during break</i>				
6	Data Collection: Competition runs in April (until May 1), <i>continue to send out updates and energy saving tips</i>				
7	Data analysis				
8	Announce winners (week before finals)				

References

- Campus energy and recycling winners announced. (2015, December 15). Retrieved January 13, 2017, from http://news.emory.edu/stories/2015/12/er_sustainability_winners/campus.html
- Sustainability. (n.d.). Retrieved January 14, 2017, from <https://www.bowdoin.edu/sustainability/get-involved/energy-dorm-competition.shtml>
- Bekker, M. J., Cumming, T. D., Osborne, N. K., Bruining, A. M., McClean, J. I., & Leland, L. S. (2010). Encouraging Electricity Savings In A University Residential Hall Through A Combination Of Feedback, Visual Prompts, And Incentives. *Journal of Applied Behavior Analysis, 43*(2), 327-331. doi:10.1901/jaba.2010.43-327

K-State Green Action Fund Proposal
Green Action Fund Committee
sustainability@ksu.edu

Re: Statement of support from K-State Department/unit that will administer the funds letter

January 19, 2017

Dear Green Action Fund Committee,

This letter serves as the supporting statement from the department head that the applicants for this proposal are full-time K-State faculty members and full-time K-State students. In addition, if the funds are received, our department, the Institute for Environmental Research (IER), will be administering the funds through our accounting/budgeting office.

The competition will be primarily carried out by students in the College of Human Ecology and the College of Engineering, under the direct guidance of Dr. Julia Day. We will work with the students to ensure the success of the project goals, timeline, and budget.

This project has great potential for both student and campus engagement. In addition to the financial, research and educational opportunities a competition would offer, the project would also help to raise awareness of sustainability issues to a wide range of students. The competition would show that environmental and sustainability issues are important to the university. We are very excited about the opportunity to conduct this work.

Thank you for your time, and please let us know if you have any questions or if you need any clarification.

Steven Eckels



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