



Power Consumption Report

SLURP Project 2010

A summary of our findings with regard to discretionary vs.
fixed energy use in residence halls on campus

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6/11/2010

Purpose: To determine the amount of energy consumption that students have control over and refocus conservation efforts accordingly.

At Santa Clara, there are numerous efforts aiming at saving electricity in our various buildings. Energy competitions and informational posters encourage students to turn off lights and reduce use of electronics. In this year's energy competition, dorms competed to reduce their total energy use from the year prior.

Yet, what was being measured was total energy use, not discretionary energy use in the dormitories. Given the immense fixed energy usage of dormitories like Swig, it was difficult to reduce overall consumption significantly. In our project we wanted to break down this measurement into two parts:

- **Discretionary energy use**, use that students have control over
- **Fixed energy use**, use that the building equipment consumes regardless of student activity (common lights, climate control, water heaters).

Methodology

In order to find out the discretionary component, we surveyed students to find out what devices they used using a list including laptop computers, lights, refrigerators, etc. The survey also asked about quantity and frequency of use.

Then, we multiplied the amount of power that a device consumed times the amount of time it is used per day, times the number of devices:

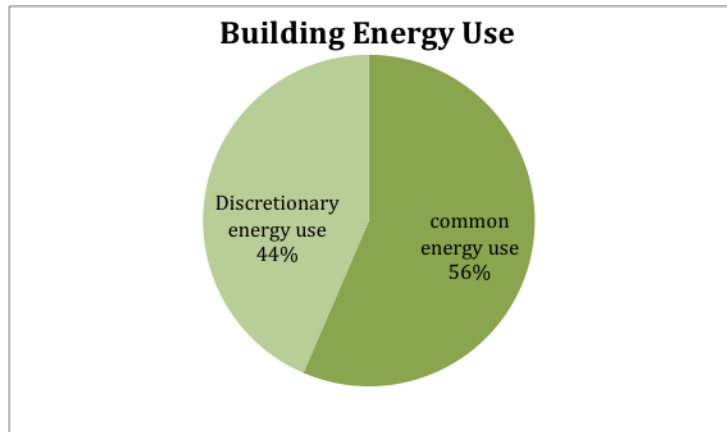
Watt-Hours Consumed = # of Devices * Power Use (Watts) * Time (hrs)

We determined how much power each device uses by plugging them into a Kill-a-Watt meter. The device measures how many Watts are consumed. In the case of a refrigerator which has two distinct states (compressor on vs. compressor off), we left the appliance plugged in over a period of 24 hours and used watt hours consumed / 24.

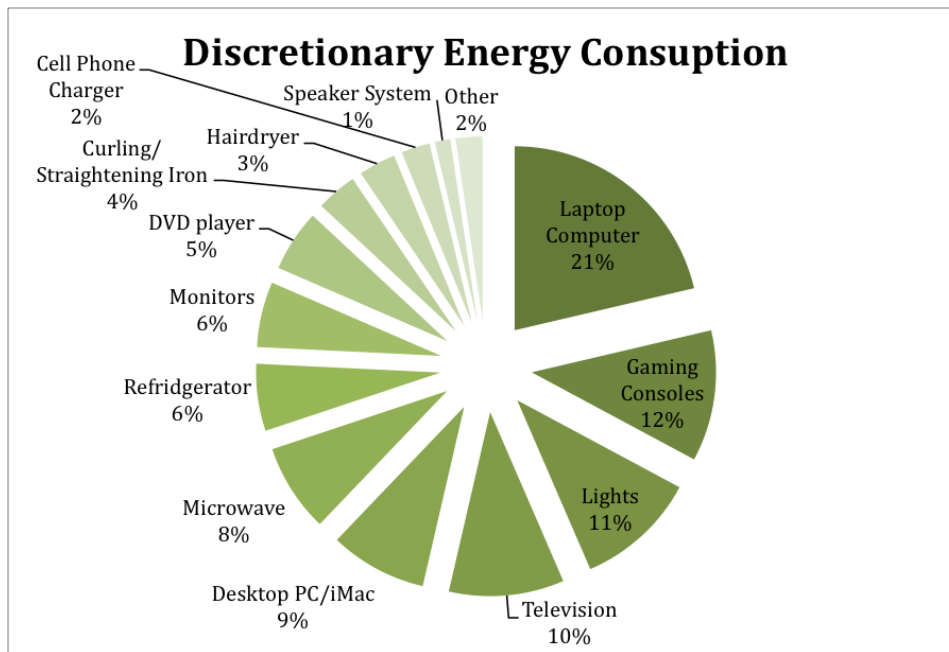
Findings

- Discretionary energy use is 44% of total consumption in Swig
- Total energy use in Swig per day = ~2,186.7 kWh
- 2.49 kWh * 383 students = 951.9 kWh per day

Our project found how much energy individual devices used. Using this data, we combined data of hours used, quantity used, and watt-hours consumed per day for a given appliance on average to generate an estimate of how much energy is consumed through discretionary activities.



With 44% used through discretionary activities, it is clear they play a major role in total building energy use. However, the fixed component still remains higher than the discretionary component.

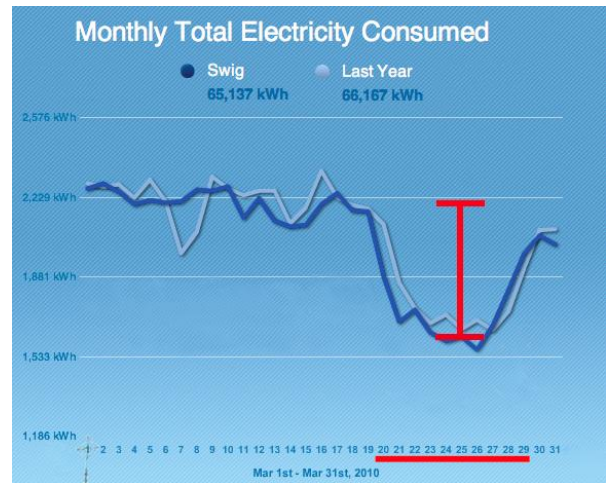


Top Uses

- The biggest use of energy by far was personal computers with a total of 36% of total energy use. (21% laptops and 15% desktops/computer monitors)
- Entertainment devices such as gaming consoles, TV's, and DVD players together represented 27% of energy use.
- Of the discretionary component, lights were smaller than expected at only 11% of use.
- Microwaves and refrigerators represented 14% of consumption.

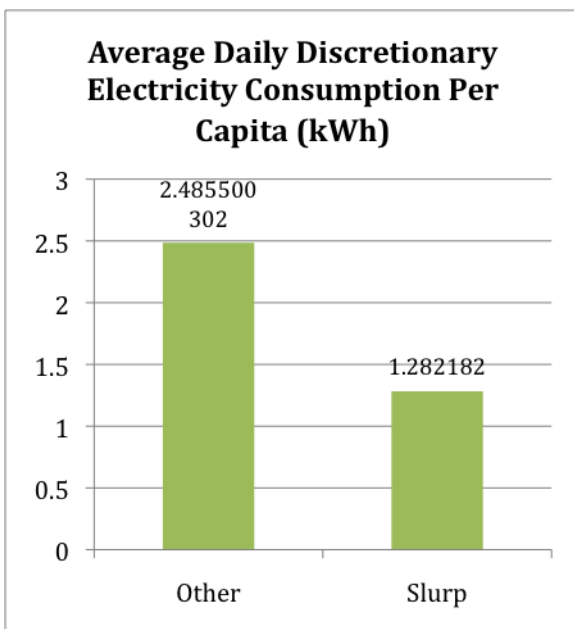
Confirming our results

During Spring break, many students left Swig hall. The resulting drop in energy use was very similar to our findings through our survey and model. The red bar on the right represents a drop of 600 kWh per day, which shows that we created a good estimate of how much discretionary energy use exists in the dormitories.



Consider that during that time, lights, climate control, and water heaters were still on. Hence, the drop in power use is mainly attributable to student behavior. Though a majority of the students went home for vacation, fixed use remained constant. Discretionary use such as electronics and lights fell.

Even though the gap does not represent a drop of ~900 kWh per day, not all students left. Those that did may not have unplugged appliances such as refrigerators and/or certain electronics that still draw power even when not directly in use.



SLURP vs Campus

- 2.49 kWh per student vs. 1.28 kWh in SLURP

In addition to breaking down discretionary/fixed energy use, we took a separate survey of the SLURP floor that focuses on more ecologically-sensitive living.

Our survey results indicate that students on the SLURP floor uses significantly less energy than other residents on campus. In fact, SLURP uses just over half as much energy as the average population in Swig.

We believe this is because SLURP's communal kitchen (including refrigerator, microwave,

and study area) encouraged shared use of appliances. For example, 97.7% of non-SLURP residents have a refrigerator in their room, while only 60% of the SLURP residents have one. This supports the conclusion that communal kitchens and active common areas reduce individual energy use. Additionally, we found that SLURP residents have smaller televisions, use computers less, and use lights less frequently than the rest of the population.

Conclusion and Next Steps

- Though discretionary energy use is a significant component, we believe new efforts should be made to be made to reduce fixed energy consumption in on-campus buildings (56% of energy use is fixed)
- Use SLURP as a model for conservation: community refrigerators, kitchens, and study areas reduce personal consumption
- Renovate buildings with increased common spaces and more efficient appliances

Swig Hall is undergoing major renovations for the next year, including the installation of a new laundry facility and common areas in the basement, community kitchens on two more floors, and heat control. We hope to see reduced energy consumption in the future, with CyPhi (Swig) making major improvements next year.

Next year, we believe it would be prudent to audit Swig's energy use again mid-year to determine whether discretionary energy use has changed as a total figure. It would be interesting to see whether students take advantage of the common areas and how this may affect discretionary energy use in their own rooms.

If you have any questions about the report or if you would like the data/Excel model that we used to generate our findings, please feel free to contact us:

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