

SUSTAINABILITY RELATED ACTIVITIES FOR ELECTRICAL AND COMPUTER ENGINEERING STUDENTS

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Motivation

- ▣ Changes in the world, society, and our environment are forcing changes in engineering education
- ▣ Increased focus on sustainability
- ▣ Desire of today's students to involve themselves in work that benefits society
- ▣ Students are concerned about the environment, but don't generally understand the underpinning technical issues

Motivation

- ▣ Lack of exposure to sustainability in the curriculum
- ▣ Need to prepare new generation of engineers equipped to meet the growing needs of society
- ▣ A shortage of students pursuing electrical and computer engineering
- ▣ Incorporating sustainability principles throughout the electrical and computer engineering curriculum can bolster enrollment

Activities

- ▣ Curricular
 - Introduction to sustainability and hand-on activities in different courses from freshman to senior level
- ▣ Energy Production and Usage
 - Rooftop solar and wind generation
 - Real-time monitoring of energy consumption in lab
- ▣ Outreach
 - Project web site
 - Open House projects

New Student Assembly

- ▣ Two-semester course to provide a friendly atmosphere to students to ease their transition into college life and learn about the department
- ▣ Presentation on sustainability followed by a group assignment to list three things the students can do as electrical or computer engineers to contribute to sustainability

Results for Assignment on Sustainability

	Fall 2009	Fall 2010
Energy Conservation	6	10
Improved Technology	5	12
Transportation	5	0
Recycle Materials	4	4
Reducing Consumption	4	0
Good Citizenship	3	1

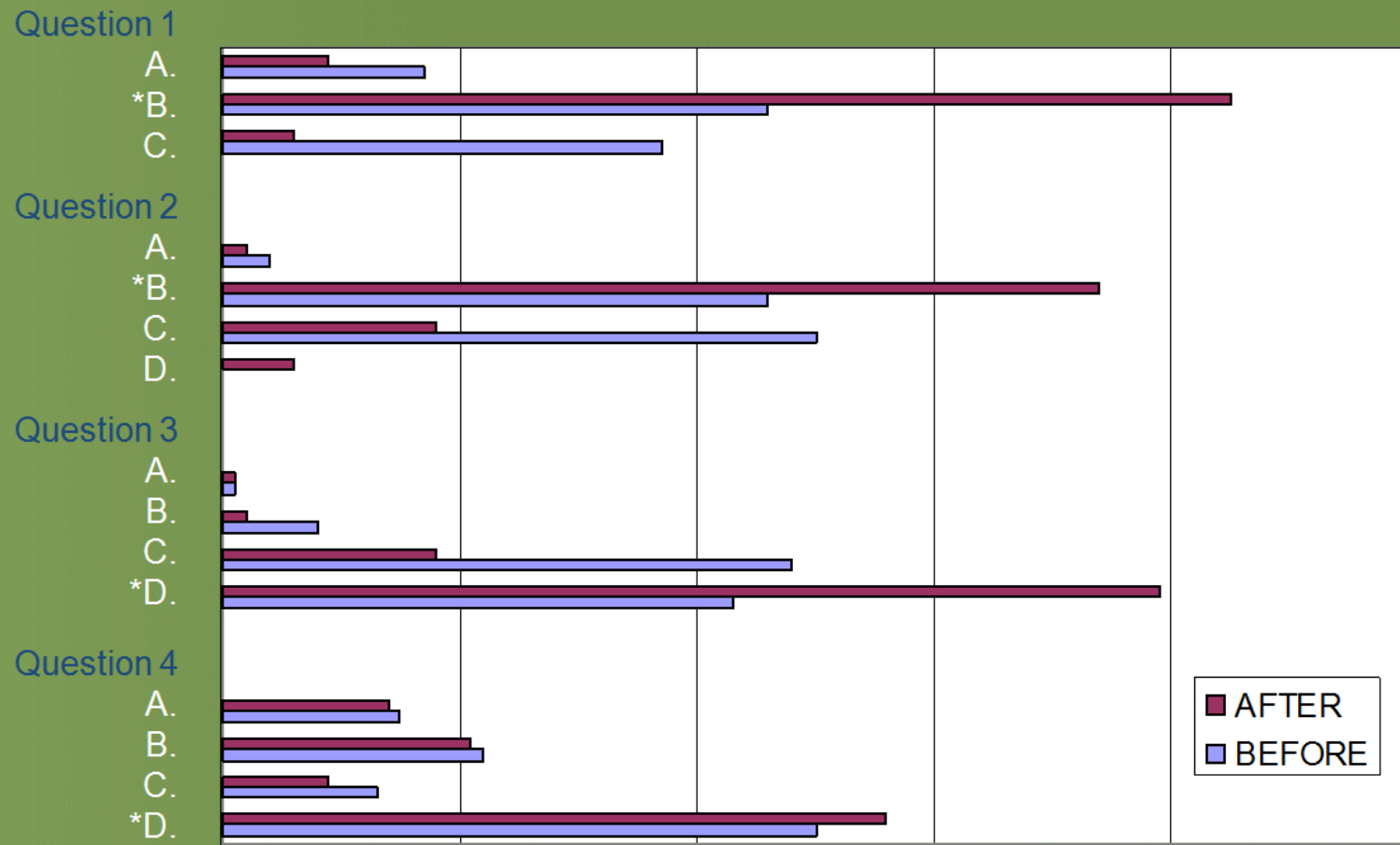
Intro to Electrical Eng

- ▣ Freshman level class to provide provides hands-on introduction to the core EE concepts of voltage, current, power, magnetic fields, semiconductors and devices, and many real-world circuits and systems in which these concepts are used
- ▣ Three part experiment:
 - **Part 1: Light Source, Solar Panel Output and Efficiencies, Construct a DC Load**
 - **Part 2: Battery Charging with the Solar Panel and a Charge Controller**
 - **Part 3: Grid-Tie Inverters, DC-AC Conversion, and Efficiencies**

Students in the lab



Before and After Survey



*Asterisk Indicates Correct Answer

Survey on Retention

1. Was sustainability related issues a factor in your decision to pursue a degree in either electrical or computer engineering?
2. Will focus of ECE department on infusing sustainability into the curriculum be a factor in your decision to stay as a student in the ECE department?

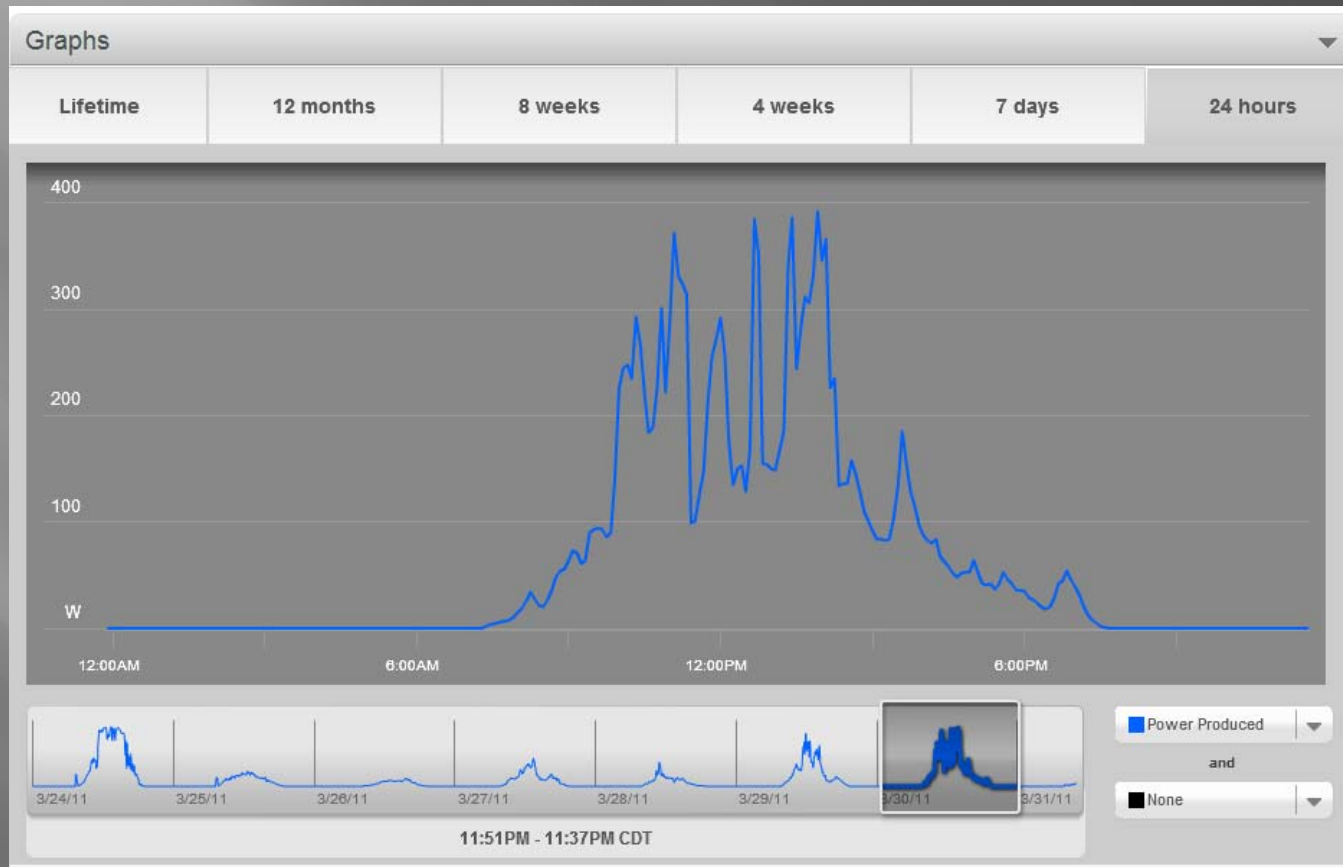
	Question 1		Question 2	
	Yes	No	Yes	No
Male	27	57	37	47
Female	1	10	5	6

Rooftop Generation System

Two 230 Watt silicon PV Panels and a
160 Watt wind turbine



Monitoring Energy Production



Additional Information

Environmental Benefits to Date

Personal Achievements

Energy Produced: 566 KWh
You could power the following for 1 day:



1,715
light bulbs



566
computers

Carbon Offset: 970.526992 Lbs
You have offset the equivalent of:



11
trees planted



50
gallons of gas

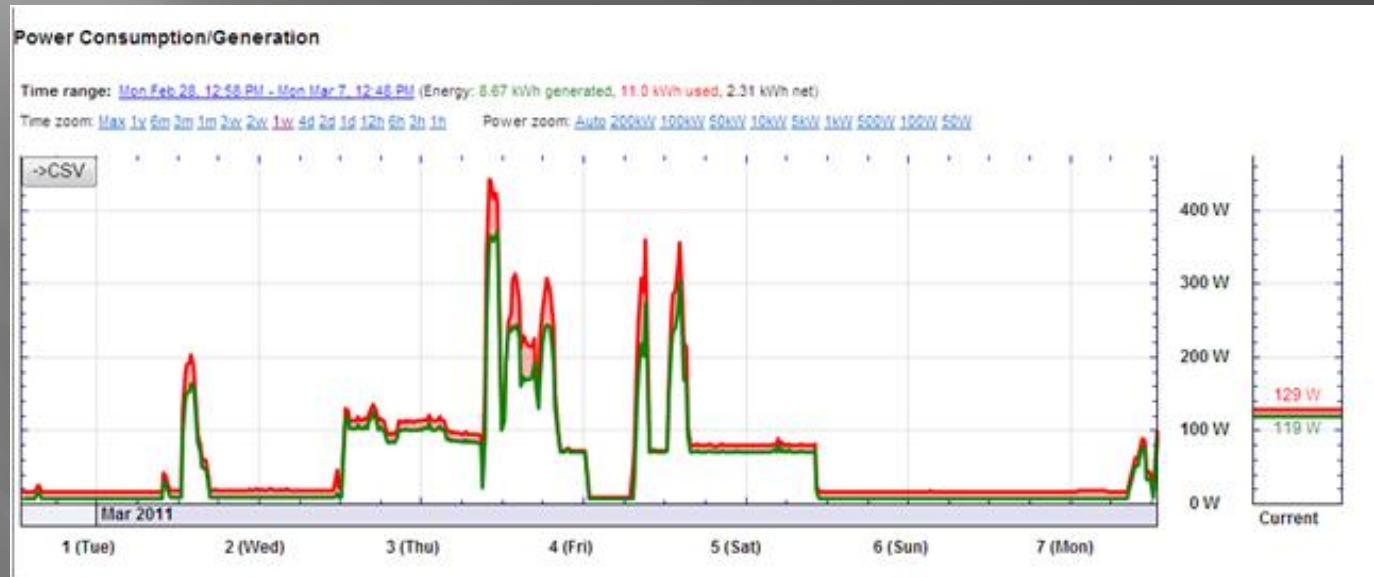
The Enphase Community

Total Energy Generated By All Enphase Systems

57.1 GWh

This is the equivalent of... ►

Energy Consumption Monitoring



Project Web Site

Electrical & Computer Engineering

k-state

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Sustainability in ECE

Changes in the world, society, and our environment are forcing changes in engineering education. As global warming accelerates, it becomes critical that designers of technology understand and apply the principles of sustainability. Creating renewable energy, minimizing waste, reusing scarce resources and carefully managing energy consumption are all important elements of sustainable design.

Today's students are concerned about the environment, but don't generally understand the underpinning technical issues. A shortage of students pursuing electrical and computer engineering, coupled with both the need for sustainability and the desire of today's students to involve themselves in work that benefits society, suggests that incorporating sustainability principles throughout the electrical and computer engineering curriculum can bolster enrollment, while producing engineers equipped to meet the growing needs of society.

Wind and Solar Energy Program

The Kansas State University ECE Department is currently working on wind and solar energy projects. This work is supported by **The National Science Foundation** and the **U.S. Department of Energy**. We plan to report several parameters of our systems, including:

- streaming video feed
- light intensity vs. time via LUX meter
- wind intensity
- Enphase solar data
- home usage monitoring (TED-5000).

Our data will be used in the classroom to assist students in related projects. It will also be available to the public.

Progress



Sponsors



[Click Here to View Latest Construction!](#)

Open House Demonstration



Conclusions

- ▣ The results related to education, learning, and retention of students have been very positive
- ▣ Very Effective tool for outreach
- ▣ Long-term impacts of the project will become visible in the future