

Physics and Mathematics of Sustainable Energy

Homework Two

Due April 8, 2011

Area:

In addition to getting a feel for energy units, we also need to get a feel for areas. The reason for this is that many renewable technologies—especially solar and wind—require large areas to produce a meaningful amount of energy.

1. Look up the size of COA's campus. Do not include Beech Hill Farm or any other "off-campus" land—just consider the main campus. Do some conversions and express this area in the following units:
 - (a) Square meters
 - (b) Square kilometers
 - (c) Square miles
 - (d) Acres
 - (e) Hectares
2. Repeat the above exercise but with some other small-ish area that you are very familiar with: perhaps a football field, the size of your neighborhood or your grandparents farm, or a city block, etc.
3. Repeat the above exercise but now use a large area, perhaps a province or a small country. Choose something that is familiar and meaningful to you.

Electrical Power:

1. Two amps of current flow through a circuit across a voltage difference of ten volts. What power is dissipated in the circuit?
2. Consider a typical medium-sized electric heater plugged into a wall socket in North America. How much current do you think flows through the heater?

The BHF Wind Turbine:

The Beech Hill Farm wind turbine over the last year has generated around 2000 kWh of electricity.

1. Is this a lot or a little? Explain. There are many ways to answer this question. Perhaps calculate how many months this would keep a 40W light bulb on. Or the wattage of a lightbulb that this keep light for an entire year.
2. How much money is 2000kWh of electricity worth in Maine?