Physics and Mathematics of Sustainable Energy
Homework Two
Due April 9, 2010

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 the size of your neighborhood or your grandparents farm, or a city block, a football field, 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 meantingful 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:

1. The Beech Hill Farm wind turbine over the last year has been generating roughly fifty cents worth of electrity per day.

   (a) How many kWhs per day does the turbine generate?
   (b) What could you power with this amount of daily kWh?

Cars:

1. How much energy is used if you drive 50 miles? Explain any approximations you make.