

Physics and Mathematics of Sustainable Energy

Homework Seven

Due June 7, 2013

1. Take a look at the US energy flowchart at <http://tinyurl.com/ld9zctq>. Convert the following quantities into kWh per person per day.
 - (a) Total energy use.
 - (b) Total solar energy.
 - (c) Solar electricity generation.
 - (d) Total electricity generation. (This is 12.6 Quads—the orange flow.)
 - (e) Total residential energy use.
 - (f) total commercial energy use.
 - (g) Total industrial energy use.
 - (h) Total transportation energy use.
 - One Quad is one quadrillion BTU.
 - One kWh = 3412 BTU.
 - One quadrillion = 1,000,000,000,000,000 or 10^{15} .
2.
 - (a) Suppose you decide to eat red meat at two less meals each week. Instead, you eat grains. How much less CO₂e is emitted into the atmosphere each year as a result of this decision.
 - (b) You drive 10,000 miles a year in an SUV that gets 20 mpg. Suppose you were to instead drive a compact car that gets 40 mpg. How much less CO₂e is emitted into the atmosphere each year as a result of this decision?¹
3. According to Weber and Matthews, the average CO₂e footprint associated with the food system for a U.S. household is 8t/CO₂e per year. Use this fact to make a very rough estimate of the CO₂ emissions associated with COA's food services. How much would it cost to offset this at the rate of \$7.50/t?

¹Ignore the emissions associated with making each of the cars, and also ignore the fact that if you sell your SUV someone else will be driving it and causing emissions instead of you.