Circle your lab day and time.

Your name:	**Tue**	**Tue**	**Tue**	**Wed**	**Thu**	**Thu**	**Fri**
TA name:	**10-12**	**12-2**	**2-4**	**12-2**	**10-12**	**12-2**	**2-2**

Written HW 6: Sun and power
(due Friday, Nov 16 at 2 PM)

Turn in this written homework in the appropriate slot in the brown Homework Cabinet at the entrance of the HelpRoom, Duane G2B90. Please STAPLE pages together, and **put your name and TA name at the top of every page!**

In all written homework, you will be graded on the clarity and completeness of your answer. ***No credit*** *will be given for an answer in a calculation without a derivation, even if the answer is correct. A calculation without units is also incorrect.*

Sun light

At noon on a nice summer day in Boulder, each 1 cm^2 of surface is exposed to perhaps 150 mW (milliWatts) of visible radiation.

a) You are considering adding solar panels to your house and want to see whether they will provide enough energy for your household needs. If your solar panels cover an area of 2 meter by 8 meters (that's about a dozen typical solar panels) how much solar power would be hitting the surface of the panels at noon on a clear day? And, does 2 m x 8 m seem like a reasonable size, by which we mean, would it fit on a typical household roof?

b) If the solar panels were 10% efficient at converting the solar energy into electrical energy, how much electrical energy would have been harnessed in 1 hour? (Assume that the exposure is pretty steady for that hour at 150 mW/ cm^2). For how many hours could this amount of energy power a 60 W bulb?

c) The above problems considered peak solar intensity at noon on a nice summer day. Of course, that doesn't last all day, nor all year. Make some reasonable "guesstimates" to predict how much electrical energy these panels would likely produce over the course of a (Boulder) year.

An average American home uses about 500-1000 kW hrs of electrical energy each month. Will these panels be sufficient for "average Americans"?

d) The US uses about 4000 TW*hours each year (TW is for terawatt where tera means 10^{12}). How much surface area would need to be covered with comparable solar panels to provide this? Given your numbers, (and considering how Boulder sunshine compares to other US cities) what can you conclude about the role of solar energy in the US' future energy balance?