

Dr. Harris

Phys 105

Solar Power Assignment (Due Wed 3/27)

1. On a summer day at noon in Rock Hill, the solar intensity is  $600\text{W}/\text{m}^2$ . Now, imagine you have a photovoltaic material (i.e. doped silicon). The conversion efficiency of this material is 15%. You would like to build a single panel that operates at 1000W. What would the area of your solar panel need to be (in  $\text{m}^2$ ) ?
2. Refer back to the solar lecture. There, you will find the insolation map of the U.S. (slide 9). This map provides a range of solar intensity measurements in units of  $\text{kWh}/\text{m}^2$  for the hottest 8 hours of the day. Find SC on the map. Then, guesstimate an insolation value (the best choice is to just assume the median value). Now, look up the square mileage of SC on the internet. Finally, calculate the total solar energy, in joules, that strikes the state of SC during this 8 hour period.
3. You recently purchased a rooftop solar panel for your home (in SC). Your average power consumption is 22.3  $\text{kWh}/\text{day}$ . Your panels, on average, produce 36  $\text{kWh}/\text{day}$ . How much of a credit (\$) would you receive each month from the power company? Use the data provided in the lecture.
4. Explain how a solar power tower operates. Be very detailed. Do you believe that these towers are a good idea? Justify your response with information provided in lecture.
5. What are the advantages of solar power? Disadvantages? Should the U.S. invest more in solar energy?
6. For an individual, are solar panels a good investment?
7. Look up two government incentives (one federal, one state) that exist for the expanded use of solar power. What is your opinion of these incentives?