

Physics and Mathematics of Sustainable Energy

Homework Five

Due May 10, 2013

1. Suppose you were to heat the water for a typical home using propane. How much would this cost per year? How much carbon dioxide would this emit? Is this amount of carbon dioxide a lot or little? Why? (Useful facts: Propane in ME costs around \$2.75 per gallon. The calorific value of propane is 25.4 MJ/L. There are 3.78 L in one gallon. Burning enough propane to generate one kWh releases 190 grams of carbon dioxide.)
2. The Fukushima I nuclear power plant in Japan that was damaged in the 2011 earthquake and tsunami could produce up to 4.7 GW of electrical power. What is the approximate size of an array of solar PV that produces as much power as the Fukushima plant? Express the area in some understandable way. (Assume a power density of 20 W/m².)