Assignment #8 Physics 346

Due 4:30 PM **Friday** March 30, 2012

Use Phys 346 drop box located at entrance to Physics Dept. off main floor of AQ.

1. (a) A nuclear reactor produces 500 MW of electric power. Assuming 30% thermal efficiency in the steam turbines, estimate the number of kg of natural uranium required to fuel the nuclear reactor per day. Natural uranium contains 0.7% $^{235}_{92}$U and 99.3% $^{238}_{92}$U by mass. Assume 200 MeV per $^{235}_{92}$U fission.

   (b) How many tons of coal would be required to achieve the same power output per day?

2. BC annual electricity consumption is approximately 54,000 GWh/year. Your goal is to calculate how many wind turbines you would need to replace all of this power. Assume an average wind speed of 8 m/s, a turbine blade length of 36 m and an overall efficiency of 30%.

   (a) What is the power output of each turbine?

   (b) Assume that the minimum spacing between turbines is 5 times the turbine diameter. What is the total land area covered by the turbines?

   (c) How does your answer in (b) change if the average wind speed drops by a factor of 2?

3. Questions from your text:
   Ch 12 Problems #4,5,8
   Ch 14 Problem #4