

EE 351: HW 1

1. What other evidence would you need to confirm or reject the hypothesis that the Northern hemisphere is warming up more than the southern hemisphere? Show me the data.
2. What data would you need to confirm that soot is indeed absorbing more sunlight than ice, and that this is a widespread problem in the Arctic regions and Greenland? Show me the data.
3. Do a first principles calculation of emissions of particles, assuming they are all as bad as typical Chinese plants, from all the coal burning power plants and steel mills in the northern hemisphere. If all this soot deposited daily uniformly over the Arctic, what area would it cover every day compared to the area of Greenland and Arctic Ocean? Show the calculations.
4. Pumped storage: What would be the volume of water required in gallons to store energy equivalent to a 1000 Megawatt power plant producing power for 12 hours? Assume the height of the mountain is 1000 feet. If the reservoir was 100 feet deep, what area does this amount to in hectares?
5. Each new GE Evolution locomotive produces 4400 HP. How many locomotives are needed to pull a fully loaded coal train, weighing 1000 metric tons, up a grade of 2% at 30 mph?
6. If the coefficient of friction on this train is 0.3, and only the brakes on the locomotives were required to make the train stand still on the 2% grade, what must be the weight of each of the locomotives?
7. Calculate how much natural gas/day (in terms of cubic meters per day) is required to heat 1 million barrel per day of oil in tar sands to 0 C from -30 C? Assume 50% efficiency in producing steam that will then heat the oil. You have to find out the specific heat of oil and density of crude oil at 0C etc.
8. How much gasoline (in gallons) is required to transport a man weighing 200lbs. to the top of Mt. Everest from sea level, assuming 100% efficiency? You have to find out about the heat value of gasoline (J/liter or J/gallon).