

Problem Set 8

Intro to Sustainable Energy 2.650/10.291/22.081

&

Sustainable Energy 1.818/2.65/10.391/11.371/22.811/ESD.166

For each of the problems you work out provide a list of sources for any data you used, as well as your assumptions. Be sure to mark which course number you are registered for on your solution. You can turn in the homework online (via Stellar) or in class.

Intro to SE Students: Pick any 2 of the 4 problems to solve.

1. Petroleum savings via ethanol use: The production of ethanol for use in liquid fuels has been heavily subsidized in recent years. In assessing the success of these programs, it's important to keep the entire life cycle of ethanol fuels in mind.
 - a. Up to 10% by volume of gasoline in the U.S. may consist of corn-based ethanol. Using this information, calculate the amount of crude oil that the U.S. saves per year via the displacement of gasoline by ethanol.
 - b. Burning of ethanol is also more favorable than burning of gasoline from a carbon-emissions standpoint. Calculate the tonnage of CO₂ saved per year by displacement of gasoline with ethanol in the U.S.
 - c. Find the amount of oil consumed in the conversion of corn to ethanol. Compare this to the amount consumed during the oil refining process which supplies us with gasoline
 - d. What factors have been left out of this calculation so far? Find references for the magnitudes of these factors, and sum up the total amount of petroleum saved in a year, and total amount of CO₂ saved in a year.
2. Energy savings of plug-in vehicles: Pick a small passenger car. If this car were to be powered by battery, calculate what percentage of its fuel requirements and carbon emissions could be eliminated. Take into account each step in the production of energy to power the car via coal power, and comment on how these would change if the car's battery were charged using a nuclear power station.
3. Textbook problem 10.1
4. Textbook problem 18.2

MIT OpenCourseWare
<http://ocw.mit.edu>

22.081J / 2.650J / 10.291J / 1.818J / 2.65J / 10.391J / 11.371J / 22.811J / ESD.166J
Introduction to Sustainable Energy
Fall 2010

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.