

PSC-320 S15 PS #4 *My preference is you use no calculators*

Due at the beginning of class, Tuesday, April 28

You're at a cocktail party, and someone screams, "we'll be out of oil by the end of the decade!" Pandemonium ensues. There's no access to internet, so you'll have to be swift with your memory and "back of the envelope" calculations if you're going to save this party. Luckily, you've memorized a few things and are on your way. Of course, you're allowed to look up anything for this problem. However, for the calculations, start with only this information: there are 42 gallons in a barrel of oil. You remember from the video that humanity has used about 1 Trillion barrels of crude so far, and 1 Trillion barrels of *conventionally accessible* oil remain. If you haven't memorized it, you can look up the total energy used by USA annually, and the total average world primary power use as well as the average miles driven per person for someone in the USA. You may need to estimate what portion of our primary energy use goes to petroleum, and what portion of world energy goes to the USA.

- 1) How close to "running out of oil" are we?
 - a) Estimate the total US annual petroleum consumption per day and per year in gallons and barrels. Do this by estimating the average USA annual driving distance and mileage for the average car.
 - b) Estimate the total US annual petroleum consumption in barrels per year. Do this by knowing what portion of USA primary energy use goes to petroleum.
 - c) Estimate the total world annual consumption in barrels per year based on your knowledge of the portion of world energy the USA uses.
 - d) Check your answers on the internet (maybe the EIA website). Please note the correct numbers for world petroleum use for the rest of the problem.
 - e) How long will the remaining trillion barrels last the world at the rate the world presently uses petroleum?
 - f) Look at a graph of time evolution of world petroleum consumption, energy use, CO₂ emissions, toxic concentrations in breast milk (I'm guessing here), etc... we can see more or less a linear increase over time that extrapolates back to zero around 1930.... Please look up and copy two graphs that might support or conflict with this statement. Bring them to class, ready to discuss.
 - g) Given a continuation of this linear increase from 1930, how long would the 1 Trillion barrels last us?
 - h) Remember the "Earth Energy Flows" diagram from the first lecture? How much remaining oil does it claim we have locked up in the earth? Please put this number in Trillions of Barrels. Remember this isn't *accessible* oil.
 - i) Using the answer for h) recalculate for g) above, how many more years of petroleum would we have?

- 2) Again at the cocktail party, Mike screams, "when we empty the wells, ***BAM***, no more oil!" The economists despair, the environmentalists rejoice. Using your numbers from e) and h), nicely explain that it's a little more complicated than what Mike says, and describe what it means to "run out of oil", and describe what it will be like. Please include all following considerations:
 - a) technological
 - b) Upstream energy use, and emissions
 - c) environmental,
 - d) economic
 - e) political, and
 - f) Environmental Justice. Are any groups disproportionately harmed?

- 3) Investigating Change. Think of and document times when you:
 - a) were posed with a challenge/opportunity/necessity to change something about your life that you had previously regarded as unquestionable – inherently a part of who you are. Please describe your response.
 - b) ran into institutional resistance because what you wanted to do was different. This “institution” could be your family, friends, the government, where you worked, etc. Document your process.
 - c) Don’t throw anything away for a week: remember to document the experience on our webpage.

- 4) In my video, I quote the full cost of a gallon of gas to be \$15.
 - a) have you ever heard this before? What costs do you come up with when you research the full cost of a gallon of gas.
 - b) Where do you see yourself paying the external costs for others to use petroleum cheaply?
 - c) Where do you see yourself benefiting from others paying your petroleum external costs?
 - d) In your opinion, is it OK the way it is, or it should be changed? If your answer is “no it’s OK as it is” then please state why it’s OK. If your answer is “yes”, then what would you propose?

Interesting related readings could include below... but you could look up some yourself if you like:

<http://www.washingtonpost.com/wp-dyn/content/article/2010/06/12/AR2010061200167.html>

<http://www.spur.org/publications/library/article/estimatingtheexternalcostsofdrivinginsf09012005>

<http://www.hybridcars.com/news/real-cost-gallon-gas-835.html>