

COLUMBUS STATE COMMUNITY COLLEGE

ESSH 1101 - Introduction to Environmental Science, Safety & Health

Name: David Kershner

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Homework 6 – Energy

Environmental Science, 16th Ed. by Tyler and Spoolman – Section 2.3, Chapter 13

1. What fuels account for the majority of energy used in the U.S.? What are some concerns of the long-term use of those fuels?
 - 16% Coal, 36% Oil, 29% Natural Gas, 9% Nuclear, 3% Hydropower (renewable), 7% Geothermal, Solar, Wind, Biomass (renewable).
 - Concerns surrounding non-renewable energy sources range from total exhaustion (no more left) to major ecological disasters from spills. Aside from the apocalyptic scenarios there is a general concern regarding the heavy use of petroleum products due to pollution generated during each phase of the collection and refining processes.

2. What is *net energy* and why is it important for evaluating energy resources?
 - Net Energy is the amount of high-quality energy available from an energy resource minus the high-quality energy needed to make the energy available
 - Net Energy = energy output – energy input

3. What is crude oil? Identify five different products that are obtained from crude oil.
 - Crude oil is a liquid containing a mixture of combustible hydrocarbons along with small amounts of sulfur, oxygen, and nitrogen impurities.
 - Products derived from crude oil are:
 - Gasoline
 - Aviation Fuel
 - Heating Oil
 - Diesel Gas
 - Grease and Wax
 - Asphalt

4. Explain the technology that is being used to obtain natural gas and petroleum from black shale units in Pennsylvania and Ohio.
 - There are two technologies at play when it comes to obtaining natural gas and petroleum from black shale in PA and OH. The first is horizontal drilling and the second is hydraulic fracturing.
 - Horizontal drilling employs a vertical shaft like a normal well but a flexible shaft is used to turn the drill head 90-degrees thereby enabling the driller to continue drilling horizontally.
 - Hydraulic fracturing is then used to pump water, sand, and a cocktail of undisclosed chemicals (all ingredients referred to collectively as slurry) into the well under intense pressure. When the pressure is reduced, the natural gas, petroleum, and some of the slurry mixture flows out of the cracks and is pumped to the surface through the well pipe.

5. What are two reasons coal is a good fuel for generating electricity? Identify four environmental concerns with the use of coal to produce electricity.
 - Two reasons that coal is a good fuel for electricity are that it is plentiful and inexpensive
 - Four environmental concerns associated with burning coal are:
 - Mining degrades the land
 - Burning it releases sulfur dioxide, carbon particulates (soot), and fine particles of toxic mercury
 - Sulfur dioxide produces acid rain
 - Prolonged exposure to burned coal particulates can cause emphysema

6. What percentage of the electricity in the U.S. is generated using nuclear power? Identify four concerns of using nuclear energy.
 - Nuclear power accounts for 9% of the energy use in the United States
 - Four concerns associated with nuclear energy are:
 - Massive tax subsidies to make it worthwhile and affordable
 - Incredibly low net energy
 - Highly complex and expensive systems required to operate a reactor
 - Constant fear of accidents resulting in a meltdown
 - Issues associated with waste storage and transportation [bonus]

7. If you were given a choice to generate electricity from coal *or* by using nuclear sources, which would you choose and why?
 - I would choose coal every day of the week and twice on Sunday. Nuclear energy is incredibly expensive and insanely dangerous to work with and store. Coal is more of a known commodity and steps can be taken during the extraction and energy production processes to limit the environmental impacts.

8. What is the difference between *passive solar energy* and *active solar energy* use in buildings?
 - Passive solar energy is a system that absorbs and stores energy from the sun directly. This energy can be stored as heat within a well-insulated and airtight structure. Water tanks, walls, and floors of concrete, adobe, brick, and stone can store the solar energy as heat and slowly disperse it.
 - Active solar energy is captured in collectors using a fluid and the heat is used directly. Excess energy can be used to power electrical systems or stored as heat in insulated containers.

9. Identify two advantages and two disadvantages of using wind energy.
 - Two advantages to wind energy are that it is renewable and pollution free
 - Two disadvantages to wind energy are that it depends on nature (environment) and that it can be detrimental to birds

10. Identify two advantages and two disadvantages of using hydropower to generate electricity.
 - Two advantages to hydropower are that it is low cost electricity and has a high net energy
 - Two disadvantages to hydropower are that it can disturb downstream aquatic ecosystems and has the potential for large land disturbance

11. Provide three reasons why the U.S. could not easily switch to using all renewable energy in the next five years.
 - The United States cannot easily switch to all renewable energy in the next five years because:
 - The infrastructure could not be available in that time frame
 - Electrical systems would require major overhaul
 - Not widely supported by the citizenry

12. Identify four ways that you could conserve energy in your life.

- Four ways I can conserve energy are:
 - Walk, bike, or use mass transit instead of driving
 - If I have to drive, only drive vehicles that get at least 40mpg
 - Superinsulate my home
 - Turn off lights when not in use
 - Use passive solar heating
 - Use a programmable thermostat