Name: _____ ECE 3600 Homework 1 Due: Wed, 1/8/25 e

Base your answers on class lecture & discussion, books and/or internet research. Some possible sources:
http://www.nerc.com/
http://en.wikipedia.org/wiki/Electricity_generation
http://www.energy.gov/energysources/electricpower.htm
http://en.wikipedia.org/wiki/Relative_cost_of_electricity_generated_by_different_sources

1. What is the name of the organization which ensures the reliability of power in North America?

2. Electric Utilities have been forced to break up into two separate companies responsible for:
   a.
   b.

3. What does deregulation provide for independent power producers (IPPs)?

4. The current bottleneck to overall system capacity.

5. What are the advantages of a highly interconnected system? (List at least 2). Also give a disadvantage.

6. Rank the sources of electrical energy in the US (highest to lowest %)
   1.
   2.
   3.
   4.
   5. Other

7. List 3 of the "Other" sources. 1.
   2.
   3.

8. Rank the sources of electrical energy in the US by environmental and social negatives (worst to best). Assume "Other" is all the 3 you listed above. Consider petroleum just a little worse than natural gas (due to the danger of spills). Also give (in your opinion) the worst environment or social negative of each. Your answers here may be subjective.
   1.
   2.
   3.
   4.

9. Rank the sources of electrical energy in the US cost per kWh.

   List Nat gas twice, once for single cycle and once for combined-cycle. Choose one of the "Other" that you listed above. Initial costs are amortized over the life of the generation facility. You will have to make some guesses and may qualify your answers.

   1. (cheapest)
   2.
   3.
   4.
   5.
   6. (most expensive).

10. Give the approximate efficiencies of each type of power plant:
    a. Hydroelectric
    b. Rankine-cycle steam turbine plants, regardless of the source of heat. (coal, oil, gas-steam, nuclear, solar-steam, geothermal)
    c. Single-cycle (Brayton-cycle) gas turbine
    d. Combined-cycle (Brayton-cycle flowed by Rankine-cycle)

11. In nuclear fission reactions, what is particle is crucial to the chain reaction and is used to control the reaction rate?

12. a) Why can't a wind turbine's coefficient of performance (conversion of wind energy to rotational mechanical energy) be 100%?

    b) What two things can be controlled to maximize the coefficient of performance?

    c) What is the biggest single problem of wind power?

13. a) Do photovoltaic cells produce AC or DC power?

    b) What are the 2 biggest problems of photovoltaic cells?

14. What is cogeneration?

15. Some power sources are used to supply base loads and some are used to supply peak loads. Give some reasons to differentiate the sources in this way.

    <u>Base loads</u> <u>Peak loads</u>

16. Requirements of the power system
    1.
    2.
    3.
    4.
    5.

17. What two things are constantly monitored by the power company to assure that they meeting the demand.
    1.
    2.

18. Sensors placed around the network can let operators know if these requirements are being met What is the name of this system: