Name \_\_\_\_\_ Day/Time \_\_\_\_\_

Date \_\_\_\_\_

* The **grid system** coordinates \_\_\_\_\_sources of energy production so that a particular home may actually receive electricity that came from a

1. List FIVE possible sources of energy production: \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

* **US Grid System**
* **AC Grid System**: what does “AC” stand for? \_\_\_\_\_ \_\_\_\_\_
* **Neighborhood** 🡪 What type of power plant is used in this neighborhood? \_\_\_\_\_
* **European Grid** 🡪 List the SIX sources of energy production: \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_
* **Peakload vs. Baseload**

Demands for power vary greatly during the \_\_\_\_\_ and \_\_\_\_\_. These demands vary considerably from \_\_\_\_\_ to season, as well.

For example, the highest \_\_\_\_\_are usually found during the \_\_\_\_\_daylight hours when \_\_\_\_\_ \_\_\_\_\_ are running.

* **Nuclear & Fossil Fuel Plants**

Nuclear and fossil fuel plants are \_\_\_\_\_ efficient for producing power for the short periods of increased demand during peak periods. Their operational requirements and their long startup times make them more efficient for meeting \_\_\_\_\_ needs.

* **Hydro, Wind & Solar Power**

Since hydroelectric generators can be started or stopped almost \_\_\_\_\_, hydropower is more responsive than most other energy sources for meeting \_\_\_\_\_ demands. Water can be \_\_\_\_\_ overnight in a reservoir until needed during the day, and then released through turbines to generate power to help supply the \_\_\_\_\_ demand. What TWO other power sources work well as PEAKload? \_\_\_\_\_ \_\_\_\_\_

* **Why the Grid?**

\_\_\_\_\_ of power sources offers a utility company the \_\_\_\_\_ to operate steam plants most efficiently as \_\_\_\_\_ plants while meeting peak needs with the help of hydropower. This technique can help ensure \_\_\_\_\_ supplies and may help eliminate brownouts and blackouts caused by partial or total power failures.

* **DEFINE “dropout” 🡪**

“brownout” 🡪

“Blackout” 🡪

* **2003 Blackout**

In August, 2003, a series of \_\_\_\_\_ led to a catastrophic \_\_\_\_\_ in a large portion of the eastern and midwestern United States. That it occurred on a very hot day meant \_\_\_\_\_ discomfort for many who lived through the experience, and was in part \_\_\_\_\_ for the problem itself.

The American continent was electrified, but in electric utility “islands.” EXPLAIN:

Gradually, \_\_\_\_\_ were extended. By the nineteen-sixties, there were many more high-tension transmission lines, and so many more interconnections. The utilities were still \_\_\_\_\_, but even in the East, electricity could be sent \_\_\_\_\_ distances.

Interconnections are good, because they bring \_\_\_\_\_ to the system.

An interconnected system can \_\_\_\_\_ energy where it is needed, protecting against problems when a \_\_\_\_\_ is lost. However, the larger system also brings \_\_\_\_\_. The added complexity makes it \_\_\_\_\_ to respond to catastrophic failures, especially in the times before computers were widely used.

In many developing countries, electricity may fail catastrophically in specific areas because \_\_\_\_\_ exceeds \_\_\_\_\_ or because of trouble with the \_\_\_\_\_ system (these troubles may even be due to sabotage in some cases).

The 2003 East-Midwest blackout affected about \_\_\_ \_\_\_\_\_ people in the northeast, the mid-west, and Canada.

* **Populations Affected** 🡪 according to the table, which blackout has affected the most people? \_\_\_\_\_ Electricity is not easily \_\_\_\_\_ and is \_\_\_\_\_ essentially as it is generated. This implies that there is a constant dance of \_\_\_\_\_ and demand
* **Note** that the August, 2003 blackout was an unprecedented event both in terms of the population \_\_\_\_\_ and the loss of \_\_\_\_\_. The grid was built over a long period of time, and many of the parts of the grid are quite \_\_\_\_\_. \_\_\_\_\_ the grid is needed.
* **So, What Happened?**

The prolonged heat wave was taking its toll. The Task Force examined FirstEnergy records and found that actual measured voltage levels on the transmission system on August 14 were \_\_\_\_\_ 100% starting early in the day.”

* The **loss** of the \_\_\_\_\_ lines as the afternoon progressed led to more and more difficulty in maintenance of reactive power \_\_\_\_\_. Load reserves were \_\_\_\_\_ by 4 o’clock, and the overextended system soon crashed, dragging the rest of the region along with it.
* **Relays** (\_\_\_\_\_ electricity)

Relays sense even small power \_\_\_\_\_ and shut \_\_\_\_\_ automatically in “cascades,” carrying large swaths of the grid along. This is both good and bad; good because it \_\_\_\_\_ the systems’ generators, transmission lines, and substations in small failures; bad because it exacerbates the crash, shutting down even if the relay is far removed from the actual problem, in large ones.