*Complete the following worksheet using the Applications of Energy Power Point, presenting electrical energy usage in the United States.* [Page #s in the PPT are indicated to the right of each question]

1. Give two reasons why we should consider the issue of energy in the United States. [p 3]

1)

2)

2. How long does it take for the U.S. population to increase by one person? \_\_\_\_\_ [p 4]

3. Record the amount of energy used per person for the year 2005 \_\_\_\_\_ as compared to the year 1975\_\_\_\_\_ in the United States. [p 5]

4. Complete the following table showing energy consumed versus US population: [p 6]

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 |
| Electric Energy (10 billion kWh) |  |  |  |  |  |  |  |  |
| US Population (Millions) |  |  |  |  |  |  |  |  |

* Write a sentence summarizing the electric energy consumption versus population over the past 30 years.
* Write a sentence evaluating the effectiveness of energy conservation over that time.

5. How many new power plants may need to be built to supply the electric energy need of our country if the population and energy consumption trend continues as it is presently? [p 7]

6. What percentage of our electricity came from each of the following sources in 1999? [p 8]

Coal \_\_\_ Natural Gas \_\_\_ Nuclear \_\_\_

Oil \_\_\_ Hydroelectric \_\_\_ Alternative \_\_\_

7. List ways we can meet the increasing electric demands of the future. Briefly explain each.

1) [p 9]

2) [p 10-11]

3) [p 12-13]

4) [p 14-19]

8. List 4 alternative energy production sources besides coal, oil, natural gas, nuclear and hydropower. [p 14-19]

9. **Electric Power** is measured in \_\_\_\_\_ (metric unit), and is abbreviated by \_\_\_\_\_. Write down the word equation and symbol equation used to determine electric power when one knows the work (kilojoules) and the time (seconds): [p 28]

10. **Electric energy** is measured in \_\_\_\_\_ (metric unit) is abbreviated by \_\_\_\_\_. Write down the word equation and symbol equation used to determine electric energy when one knows the power (kilowatts) and the time (hours): [p 28]

11. Using the equation from question 9, if you leave a 100-watt light bulb on for an hour at home, how much electrical energy is used? (*Show Work and circle your answer.*) [p 29]

12. Using the equation from question 9, if use a 1500-watt hair dryer for fifteen minutes, how much electrical energy is used? (*Show Work and circle your answer.*) [p 30]

13. What is the average cost of 1 Kilowatt-hour of electricity to the residential consumer? [p 33]

14. For larger customers (*commercial and industrial users*), one kilowatt-hour can cost as little as $ \_\_\_\_\_ or \_\_\_\_ cents if used “off-peak” (*\_\_\_\_\_*) or as much as $ \_\_\_\_\_ if it increases the maximum annual demand (*\_\_\_\_ or \_\_\_\_*). [pp 34 - 35]

15. Using your answer from question 11, if you leave a 100-watt light bulb on for an hour at home, how much will it increase your residential bill? (*Show Work and circle your answer*) [p 36]



16. If you leave a 100-watt light bulb on in a school building for one hour during the coldest day of winter, how much would it increase the school’s bill for that one light? (*Show Work and circle your answer*) [p 37]

17. What is the reading of each dial on the meter shown in slide 43? [p 43-46]

\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

units

Total Reading

Homework Sheet

Record Your Electric Meter’s Reading 🡪

\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

units

Total Reading

Practical

1. Locate the nearest electrical pole (“telephone pole”) to your house. Follow the large electrical wire from the pole to the outside of your home.

The electricity that comes directly into your home has three wires. Notice that two of them are insulated (*covered by some material*) while one is bare metal. Why isn't one of them insulated?

2. List the three days of Electric Meter Readings 🡪

\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

units

Total Reading

\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

units

Total Reading

\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

units

Total Reading

3. Calculate the total electrical energy (in kWh) used in your home over those days (*show work*).

4. Calculate the total electrical cost per kilowatt-hour used in your home over those days (*show work*).

5. Name the three items in your home which you believe contribute most to the electricity cost.

a.

b.

c.

Answer Key for Applications of Energy (Overview)

1. Give two reasons why we should consider the issue of energy in the United States. [p 3]

1) **population increase, energy use by individuals is increasing**

2) **pollution is increasing with energy use, foreign dependence for energy, trade deficit**

2. How long does it take for the U.S. population to increase by one person? **11 seconds.** [p 4]

3. Record the amount of energy used per person for the year 2005 **14,100 kWh** as compared to the year 1975 **8,500 kWh** in the United States. [p 5]

4. Complete the following table showing energy consumed versus US population: [p 6]

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 |
| Electric Energy (10 billion kWh) | **175** | **220** | **250** | **275** | **300** | **375** | **410** | **450** |
| US Population (Millions) | **210** | **220** | **240** | **250** | **260** | **275** | **300** | **310** |

* Write a sentence summarizing the electric energy consumption versus population over the past 30 years.

**Energy consumption has increased dramatically compared to population**

* Write a sentence evaluating the effectiveness of energy conservation over that time.

**Energy conservation has been ineffective over the past 30 years**

5. How many new power plants may need to be built to supply the electric energy need of our country if the population and energy consumption trend continues as it is presently? [p 7]

**1300**

6. What percentage of our electricity came from each of the following sources in 1999? [p 8]

Coal **52%** Natural Gas **15%** Nuclear **20%**

Oil **3%** Hydroelectric **8%** Alternative **2%**

7. List ways we can meet the increasing electric demands of the future. Briefly explain each.

1) [p 9] **reduce energy consumption**

2) [p 10-11] **increase storage potential**

3) [p 12-13] **interconnect utilities**

4) [p 14-19] **use alternative energy supplies**

8. List 4 alternative energy production sources besides coal, oil, natural gas, nuclear and hydropower. [p 14-19]

**Wind, solar, geothermal, tides, biomass, fuel cells**

9. **Electric Power** is measured in **kilowatts** (metric unit), and is abbreviated by **kW**. Write down the word equation and symbol equation used to determine electric power when one knows the work (kilojoules) and the time (seconds): [p 28]

**Power = Work/time**

**kW = kilojoules/second**

10. **Electric energy** is measured in **kilowatt-hours** (metric unit) is abbreviated by **kWh**. Write down the word equation and symbol equation used to determine electric energy when one knows the power (kiloWatts) and the time (hours): [p 28]

**Energy = Power x Time**

**kWh = kW x hours**

11. Using the equation from question 9, if you leave a 100-watt light bulb on for an hour at home, how much electrical energy is used? (*Show Work and circle your answer.*) [p 29]

**kWh = kW x hours 100 Watts = 0.1 kW**

**kWh = 0.1 kW x 1 hr 0.10 kWh**

12. Using the equation from question 9, if use a 1500-watt hair dryer for fifteen minutes, how much electrical energy is used? (*Show Work and circle your answer.*) [p 30]

**kWh = kW x hours 1500 Watts x 1 kW/ 1000 Watts = 1.5 kW**

**15 minutes x 1 hour/60 minutes = 0.25 hours**

**kWh = 1.5 kW x 0.25 hr 0.375 kWh**

13. What is the average cost of 1 Kilowatt-hour of electricity to the residential consumer? [p 33]

**~ 10 cents**

14. For larger customers (*commercial and industrial users*), one kilowatt-hour can cost as little as $ **0.03** or **3** cents if used “off-peak” (**at night**) or as much as $ **40**  if it increases the maximum annual demand (**hottest part of the summer for A/C** *or* **coldest part of the winter for heat**). [pp 34 - 35]

15. Using your answer from question 11, if you leave a 100-watt light bulb on for an hour at home, how much will it increase your residential bill? (*Show Work and circle your answer*) [p 36]

**Residential Cost = $ 0.10 / kWh kWh = 0.1 kW x 1 hr = 0.10 kWh**

**0.10 kWh x $ 0.10 / kWh would cost $ 0.01**

16. If you leave a 100-watt light bulb on in a school building for one hour during the coldest day of winter, how much would it increase the school’s bill for that one light? (*Show Work and circle your answer*) [p 37]

**Industrial Cost = $ 40 / kWh kWh = 0.1 kW x 1 hr = 0.10 kWh**

**0.10 kWh x $ 40 / kWh would cost $ 4.00**

17. What is the reading of each dial on the meter shown in slide 43? [p 43-46]

**\_\_9\_\_ \_\_0\_\_ \_\_5\_\_ \_\_6\_\_ \_\_7\_\_ = \_\_\_\_\_90567\_\_\_\_\_\_\_\_\_\_ \_\_\_kWh\_\_\_**

units

Total Reading