**Physical Science**  Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_

**Energy Unit Review Sheet**

***Possibly useful facts:***

*1 kWh = 3412 BTUs = 860,000 calories (cal) = 3,600,000 Joules (J)*

*1 quad = 1 quadrillion BTUs = 1x1015 BTUs = 1,000,000,000,000,000 BTUs*

*Households: 113,600,000 in the US, 2.5 million in MA*

*Total primary energy used in a year by an average MA household: 160,000 kWh*

*US household electricity is 120V.*

1. Convert:
   1. 750 kcal to BTUs
   2. 4.6 quads to MWh
   3. 22 kW to BTUs / hour
   4. Total energy used by an average MA household in a year in MBTUs
2. John wants to run the 1200W microwave, and Jane wants to use her 1200W hair dryer. Will they blow a 15 Amp fuse? Explain!
3. A 38,000 V power plant line carries 1500 Amps of current. If the voltage is stepped up to 115,000 V for long distance transmission that carries the same power, how many Amps will be carried on the long distance line?
4. Mark which of the following units represent Energy (E), Power (P) or Neither (N):

\_\_\_ W \_\_\_ kWh \_\_\_ BTU \_\_\_ quad

\_\_\_ GW-year \_\_\_ BTU / hour \_\_\_ calories \_\_\_ MW / hour

1. Laurie leaves her 400mW iPhone charger on all day, every day. How much energy in kWh does that consume in a year?
2. The average MA household uses 6,900 kWh of electricity per year. How much is that per day?
3. The US uses 797 kWh/day per household of energy in all forms. Aside from electricity in the home, what are the other four or five major things that make up that 797 kWh/day?
4. If your car gets 22 miles per gallon and gasoline’s heat content is 124,000 BTU/gallon, how many kWh of energy does it take to drive a mile?
5. The BELD power plant is about 40% efficient. How many BTUs of natural gas does it use to produce a MWh of electricity?
6. New York used 0.738 quads of energy at home in 2009. There are 7.2 million households in New York. In kWh, how much did each household use each day?

**Level 1**

1. BELD can produce 112 MW of power. Braintree has about 14,000 households. Assuming they’re average MA households, can BELD supply all of their energy needs? If so, how many MW would be available to serve other customers? If not, how many more would they need?
2. Using his trusty Kill-A-Watt meter, Seamus measures a motor to be using 36W on a 120V circuit delivering 500 mA. What must the power factor be for the motor?

1. How long would you need to leave a 1W appliance on to consume one Joule of energy?
2. The US used 27.5 quads of energy for transportation in 2010, almost none of it electricity. If we were to convert 25% of transportation energy use to electricity, how many MW of new generation capacity would we have to build? Assume that this capacity generates electricity 90% of the time (nuclear, coal, natural gas).
3. Answer #15 if we were to use wind power, which can generate electricity about 35% of the time.