

Power

Sometimes in daily conversation, people use the words **energy** and **power** interchangeably. Is this true? Are they the same things?

If not - what is the difference?

What does NB Power sell?
* Energy.

Power

Power is the **rate** of energy transformation.

$$P = \frac{E}{t} \quad \left(\text{power} = \frac{\text{energy}}{\text{time}} \right)$$

So if we are talking about power plants, it would be how much energy the plant produces per second. If we are talking about an electrical device, it's how much it uses per second.

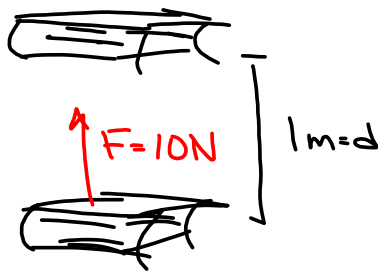


$$E = Pt$$
$$t = \frac{E}{P}$$

Units

The most common SI unit of energy is the Joule (J)

calories (cal), kilocalories (kcal, or Cal) and BTUs (British thermal units - a non metric unit) are other common units of energy.



Work = Force \times distance

$$W = F \times d$$

Work to lift the text book 1 m
is

$$W = F \times d = 10\text{N} \times 1\text{m} = \underline{\underline{10\text{J}}}$$

Units (continued)

Since Power is the rate of energy transformation (Energy / time), the SI unit of power is a Joule/second also call a Watt (W).

$$1W : 1 \frac{J}{s} \quad 1 \text{ Joule of energy each second.}$$

For large amounts of energy (like buying from NB Power), the common unit is the kilowatt-hour, which equals 3.6 million joules, or 3.6 MJ.

$$1 \text{ kW} \cdot \text{h}$$

$$1000 \text{ W} \cdot 3600 \text{ s} = 3,600,000 \text{ J} = 3.6 \text{ MJ}$$

← mega

It will take Joe 3 days 8 h to do 3.6 MJ of work on that book!

NB Power charges about 14¢ for this much energy!

If your hair dryer uses 750 W of power, and you use it for 10 minutes, how many Joules of energy does it use? In New Brunswick, energy costs about 4 cents per megajoule (MJ). How much would this cost?

$$E = P \times t \quad \leftarrow \text{must be in seconds}$$

$$= (750 \text{ W}) (600 \text{ s})$$

$$= 450,000 \text{ J}$$

$$= 0.45 \text{ MJ}$$

$$10 \text{ min} = 10 \times 60 = 600 \text{ s}$$

$$\text{cost} = 0.45 \text{ MJ} \times 4 \text{¢ / MJ}$$

$$= \underline{1.8 \text{¢}}$$

How much energy would a 9 W light bulb use if it were left on for an entire month (30 days)? At 4 cents per MJ, how much would this cost?

$$E = P \times t$$

$$= 9 \text{ W} \times 2592000 \text{ s}$$

$$= 23328000 \text{ J}$$

$$= 23.328 \text{ MJ}$$

$$t = 30 \text{ days} \times \frac{24 \text{ h}}{\text{day}} \times \frac{60 \text{ min}}{\text{h}} \times \frac{60 \text{ s}}{\text{min}}$$

$$= 2592000 \text{ s}$$

$$\text{Cost} = 23.328 \text{ MJ} \times 4 \text{¢/MJ}$$

$$= 93.3 \text{ ¢}$$

Exit questions - to be passed in the bin at the back before you leave:

What is the difference between energy and power?

What is one (practical) way your family could reduce energy use?

Homework:

Do some research: How much energy does the average home in New Brunswick use per year?