

## Section 10.1.7 – Power

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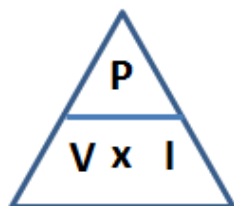
### Power

The unit of power, the **Watt**, is named after the Scottish Engineer James Watt

#### 1 Watt = 1 Joule/Second

Power is the rate at which energy is converted or consumed.

∴ a 60 Watt globe, converts 60 Joules of energy every second



Where P represents power (Watts)

V represents voltage (Volts)

I represents current (Amps)

**Example1.** What current would a 2000 Watt hair dryer draw when connected to a 240 Volt power socket?

$$I = ?$$

$$P = 2000 \text{ W}$$

$$V = 240 \text{ V}$$

$$I = \frac{P}{V}$$

$$\therefore I = \frac{2000}{240}$$

$$I = \underline{8.33 \text{ Amps}}$$

**Example2.** An electric toy train runs from a 12V battery and draws 5 Amp of current.  
What is its power rating?

$$P = ?$$

$$V = 12 \text{ V}$$

$$I = 5 \text{ A}$$

$$P = VI$$

$$= 12 \times 5$$

$$= 60 \text{ Watts}$$

**Task.** Complete the following table:

Power	Voltage	Current
2000 W	240 V	
	12 V	25 A
2.8 kW	36 V	
4 W	12 V	
	6 V	5 mA
5.0 mW	2 mV	
	10 $\mu$ V	2.5 kA

## Power Bills

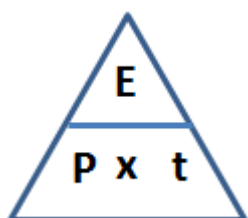
The **SI** (International Standard) unit for energy is the **Joule**. More commonly this is described as the **kilojoule (kJ)**.

However, due to the large amounts of energy consumed everyday within the typical Australian home the unit Joule is simply too small to be used as a standard unit of household energy consumption

Instead, the unit **kilowatt hour (kWh)** is used to measure household energy consumption

$$\begin{aligned} 1 \text{ kWh} &= 1 \text{ kW} \times 1 \text{ h} \\ &= 1000\text{W} \times 3600\text{sec} \\ &= 3,600,000 \text{ J or } 3.6 \times 10^6 \text{ J or } 3.6 \text{ MJ} \end{aligned}$$

***1 kWh represents the "amount of energy consumed by a 1000 W device allowed to run for 1 hour"***



Where E represents energy (kWh)  
P represents power (kW)  
t represents time (hours)

**Example 1.** How much energy (kWh) is consumed by a 2kW hair dryer running for 30 mins?

$$E = ?$$

$$P = 2\text{kW}$$

$$t = 30 \text{ min} = 0.5 \text{ hr}$$

$$\begin{aligned} E &= P \times t \\ &= 2 \times 0.5 \\ &= \underline{1\text{kWh}} \end{aligned}$$

**Example 2.** How many hours of constant running will it take for a 1500 W stereo to consume 9kWh of energy?

$$t = ?$$

$$P = 1.5\text{kW}$$

$$E = 9\text{kWh}$$

$$\begin{aligned} t &= \frac{E}{P} \\ &= \frac{9}{1.5} \\ &= \underline{6 \text{ hours}} \end{aligned}$$

## Understanding your smart meter interval electricity invoice

### Account name and billing address

Registered account holders and postal address.

### Average daily use

Graph of your consumption pattern compared to same time last year and average cost per day.

### Greenhouse gas emissions graph

Shows greenhouse gas emissions from your electricity usage this bill period.



### Enquiry / contact numbers

Telephone numbers and web address.

### Account number

Please have this number ready when contacting us.

### Amount due and due date

### Account summary

Summary of your account as at the date issued.

**Issue date:** You will usually have 12 business days to pay.

**Charges, payment and adjustments:** Summary of the details on the back of your bill.

**Total amount and GST:** This shows the total amount owing and the GST charges included.



<https://www.youtube.com/watch?v=UYWO2tKGzWs>

**Example 3.** If a family watches a 500W television for 5 hours every day of the week for 1 year, how much will it cost to run, given the cost per kWh is 25¢?

$$P = 500W = 0.5kW$$

$$t = 5 \times 7 \times 52 = 1,820 \text{ hrs}$$

$$E = ?$$

$$\text{Cost} = ?$$

### Step.1

$$E = P \times t$$

$$= .5 \times 1820$$

$$= \underline{910 \text{ kWh}}$$

### Step.2

$$\text{Cost} = \text{Energy} \times \text{Rate}$$

$$= 910 \times 0.25$$

$$= \underline{\$227.50}$$