BBC BITESIZE

Alternating current and the National Grid

James Stewart: Our lives are powered by alternating current from the National Grid.

The National Grid is the system of cables and transformers that connects power stations to our homes and businesses.

Alternating current is also called AC.

With AC, as we can see on this graph, the green line shows the current constantly reverses direction as the potential difference changes from positive to negative, and then back again over time.

In Direct Current, or DC, current only flows in one direction because the potential difference doesn't change between positive and negative.

The National Grid uses alternating currents so it can use transformers.

Here, we have a diagram of a step up transformer.

Step up transformers increase the potential difference from the power stations to thousands of volts.

A higher potential difference means a lower current in the cable, so cables don't get as hot as less energy transfers to the surroundings by heating.

We can calculate power loss with the equation P equals I squared times R, where P is Power, I is Current, and R is Resistance of the wire.

Power loss is proportional to the square of the current.

For example, if a current of 40 amps flows in a cable which has a resistance of 10 ohms, the power loss is 40 amps squared multiplied by 10 ohms, giving 16,000 watts.

But, if the current is halved from 40 amps to 20 amps, the power loss reduces to 4000 Watts - a quarter of what it was before.

A step down transformer then reduces the potential difference to a much safer 230 volts, for use in our homes and businesses.

Remember that step up transformers increase the potential difference to reduce the current and minimise energy transfers to the surroundings by heating, so the National Grid can efficiently supply our electricity.

(MUSIC)