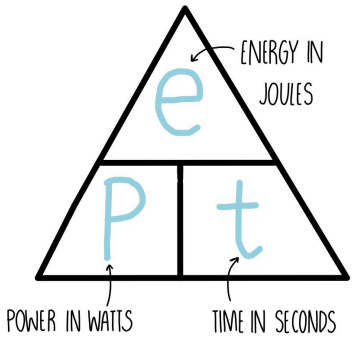
Power of electrical appliances:

They transfer energy in a circuit when current flows (it does work against the resistance)

ENERGY TRANSFERRED = POWER x TIME

Mains AC -> Kettle -> Water
Electrical -> Thermal -> Thermal

Higher current = more energy is transferred to thermal energy stores of the environment = less efficient



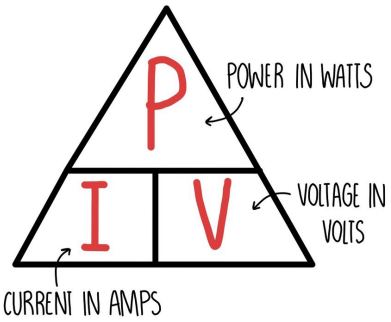
Energy transferred depends on power & duration:

Power = energy transferred/sec

Power rating = max operating power

POWER = CURRENT x VOLTAGE

Higher power does not mean energy is transferred usefully, it might be more powerful but less efficient



Electrical charge goes through a change in PD = energy is transferred
Energy is supplied to the charge at the power source to 'raise' it through a potential

Charge 'gives up' the energy when it goes through a drop in PD in the circuit's components
Battery with bigger PD supplies more energy for every coulomb of charge (charge is 'raised' higher at the start)
Essentially: PD is the energy needed for coulombs to move around the circuit

Useful Equation:

$$P = I^2 R$$

where: P is the power of an electrical component (W)
I is the current flowing through an electrical component (A)
R is the resistance of an electrical component (Ω)

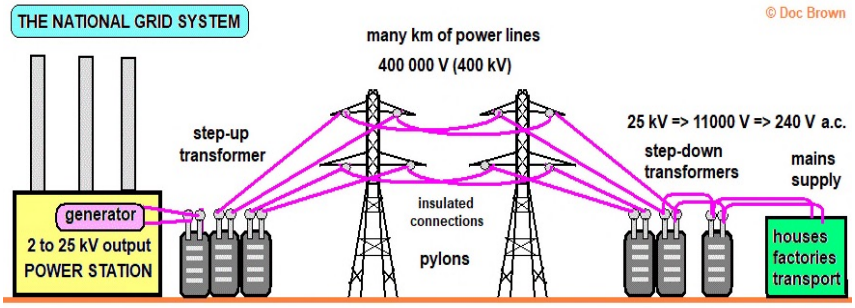
National Grid:

System of cables & transformers across Britain, connecting power stations (the supply) to consumers (the demand)

Throughout the day, demand fluctuates e.g. rises in the morning & evenings prior/post school & work

Power stations run below max power output so have spare capacity to cope with demand surges & shutdowns of other power stations

Base load = minimum demand



To transmit power (P=VI), need current (lots of energy is dissipated by wires) or high PD (cheaper!)

Increasing PD = decreasing current = less energy is lost to the environment so more efficient

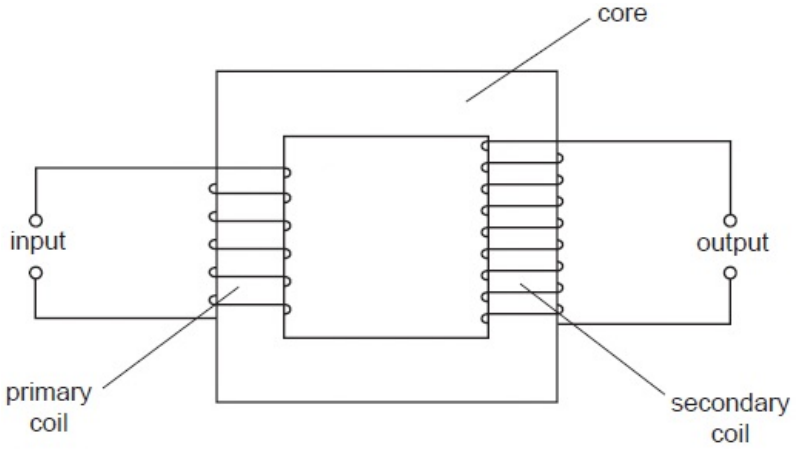
Transformers have 2 coils (primary & secondary) joined with an iron core

Step up transformers: have more turns on the secondary than primary coil so as PD is increased, current is decreased (at power stations)

Step down transformers: have more turns on the primary than secondary coil so PD is decreased so current increases (in homes)

Primary coil: P=VI
Transformers = nearly 100% efficient so power in primary coil = power in secondary coil

PD across secondary coil X current in secondary coil = PD across primary coil X current in primary coil



Static electricity:

Charges not free to move e.g. in insulating materials will build up

1. Insulating materials rubbed together = electrons will transfer from one to the other
2. Materials become electrically charged (positive static charge on 1, equal negative charge on the other)

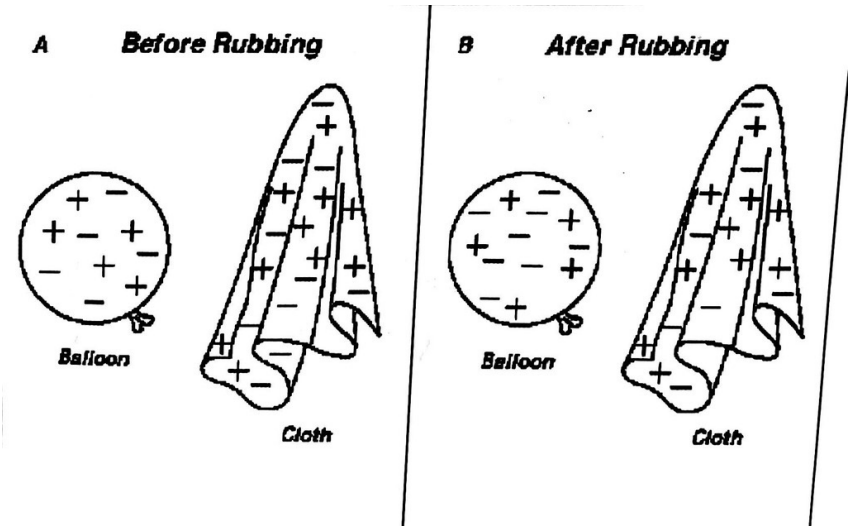
How electrons transfer depends on the 2 materials
E.g. polythene & acetate & a cloth duster

Charges are ONLY produced by the movement of electrons
Material loses electrons = loses negative charge & gains an EQUAL positive charge

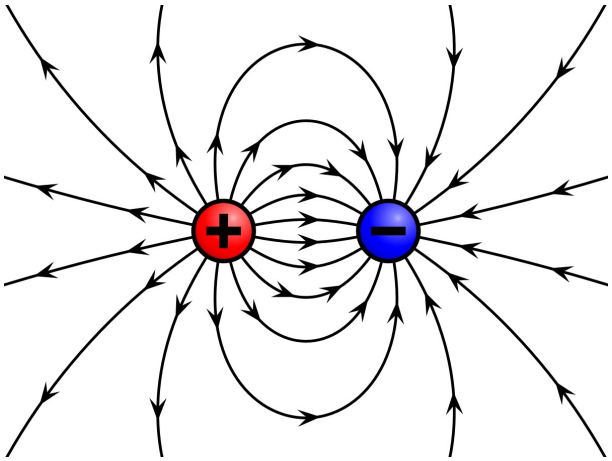
Too much static:
1. Electric charge builds on an object = PD between the object & earth (zero pd) increases
2. Large PD = electrons 'jump' between the object & earth = spark / can 'jump' into earthed conductors (e.g. cars: charge builds on the metal frame & upon touching it, the charge travels through you to the earth)

Opposite charges attract, the closer the objects, the stronger the attraction
Electrostatic attraction/repulsion causes the object to move (these are non contact forces)

1. Suspend rod with a charge from a string
2. Placing an object with the same charge will repel the rod
3. Rod moves away from object
4. Oppositely charged object = rod moves towards the object



Electric fields:



Created around any electrically charged object
Closer to the object = stronger field

Field lines:
Go from positive -> negative at right angles to the surface
Closer lines = stronger field strength

Charged object is placed in the electric field of another object = a force is felt as the electric fields interact (they can attract/repel)
Increasing distance between 2 charged objects = strength of the field decreases so the force decreases

Sparking:

Caused when PD is high enough between a charged object & the earth
High PD = strong electric field between charged object & earthed object
So electrons from air particles are ionised (knocked off)
Air = an insulator so when it's ionised its conductive = a current can flow through it = a spark