

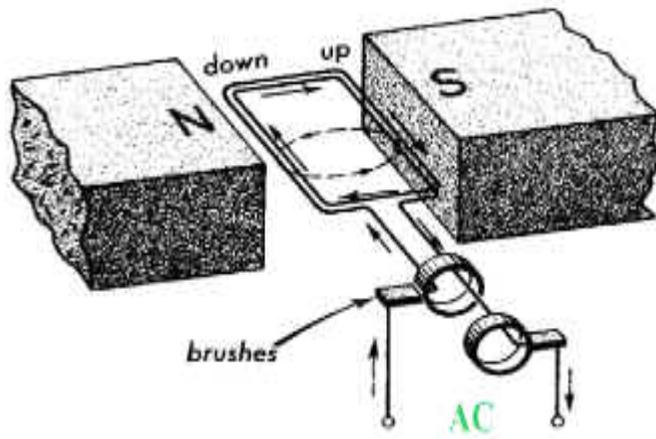
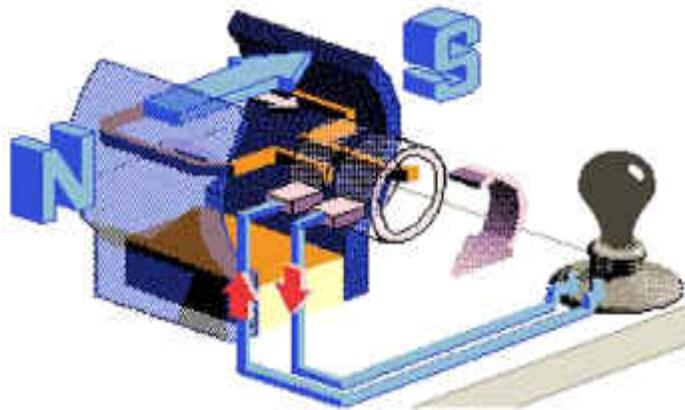
Power Stations

Electrical part of power stations

Generator

- Spinning coils of wire within magnetic fields
- Property of electromagnetism that a changing magnetic field through a loop of wire produces a voltage along the loop
- This voltage can drive a current and provide energy to an external circuit

The Generator Principle

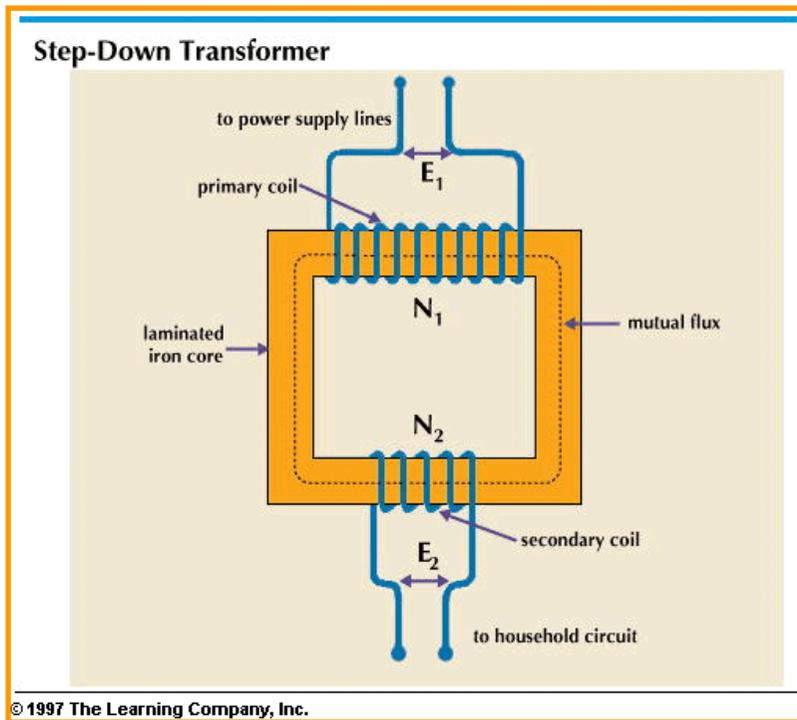


- Loop of wire (conductor) rotates within stationary magnetic field
 - this produces *changing* field requirement
- Brush contacts connect to rotating loops and carry current to external circuit
- In practice, wire makes many (thousands of) loops to get a larger voltage
 - each loop adds to voltage
- Simplest arrangement leads to alternating current (AC)

Synchronous speed

- The relation between speed and frequency is $N=120f/P$, where f is the frequency in Hz (cycles per second). P is the number of poles (2,4,6...) and N is the rotational speed in revolutions per minute (RPM).

The Transformer Principle



- Current through loop produces magnetic field along axis of loop
- Alternating current produces *changing* magnetic field
- Magnetic field carried along iron core
- Secondary coil sees changing magnetic field and develops alternating voltage
- Ratio of voltages is just ratio of turns in the two coils: $V_2 = (N_2/N_1) V_1$
- Allows transmission at high voltage, household at low voltage