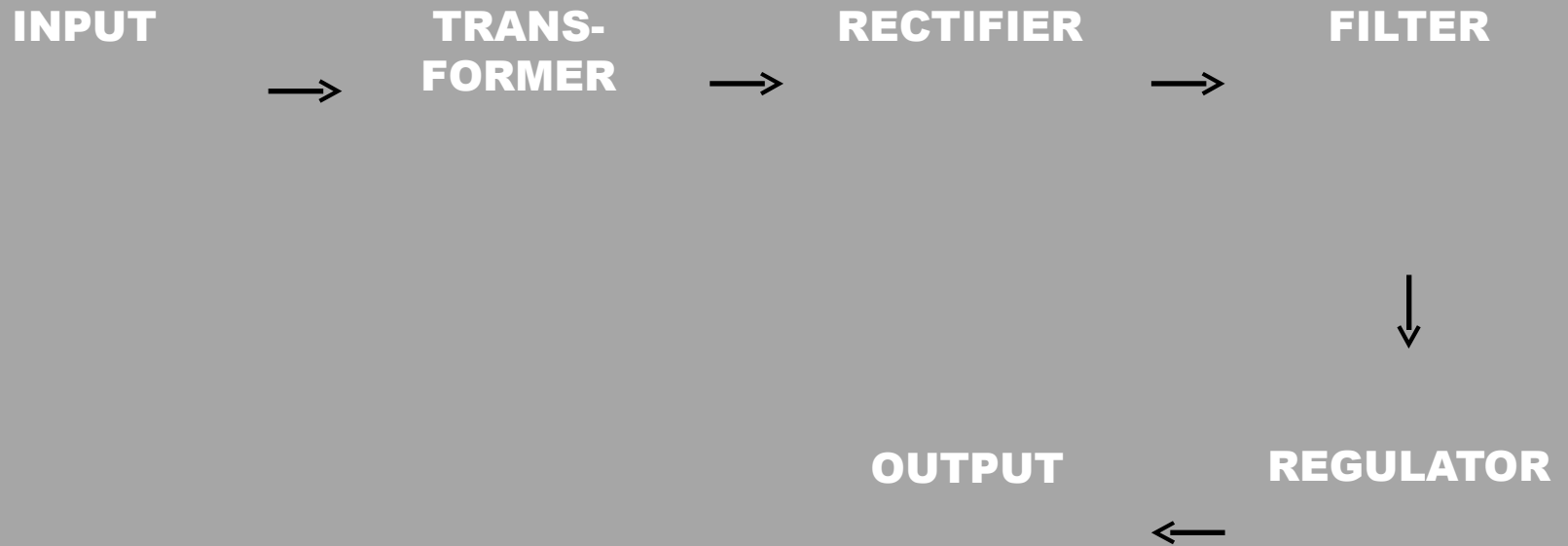
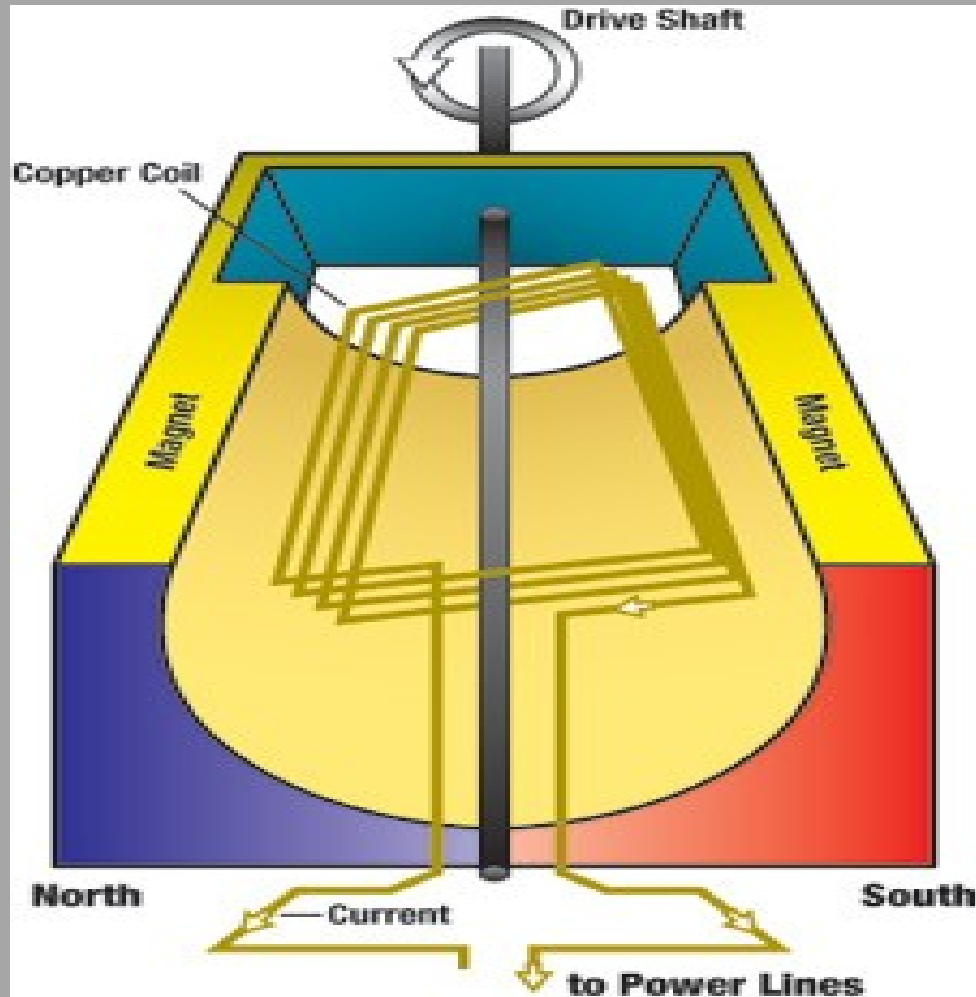


Power supplies

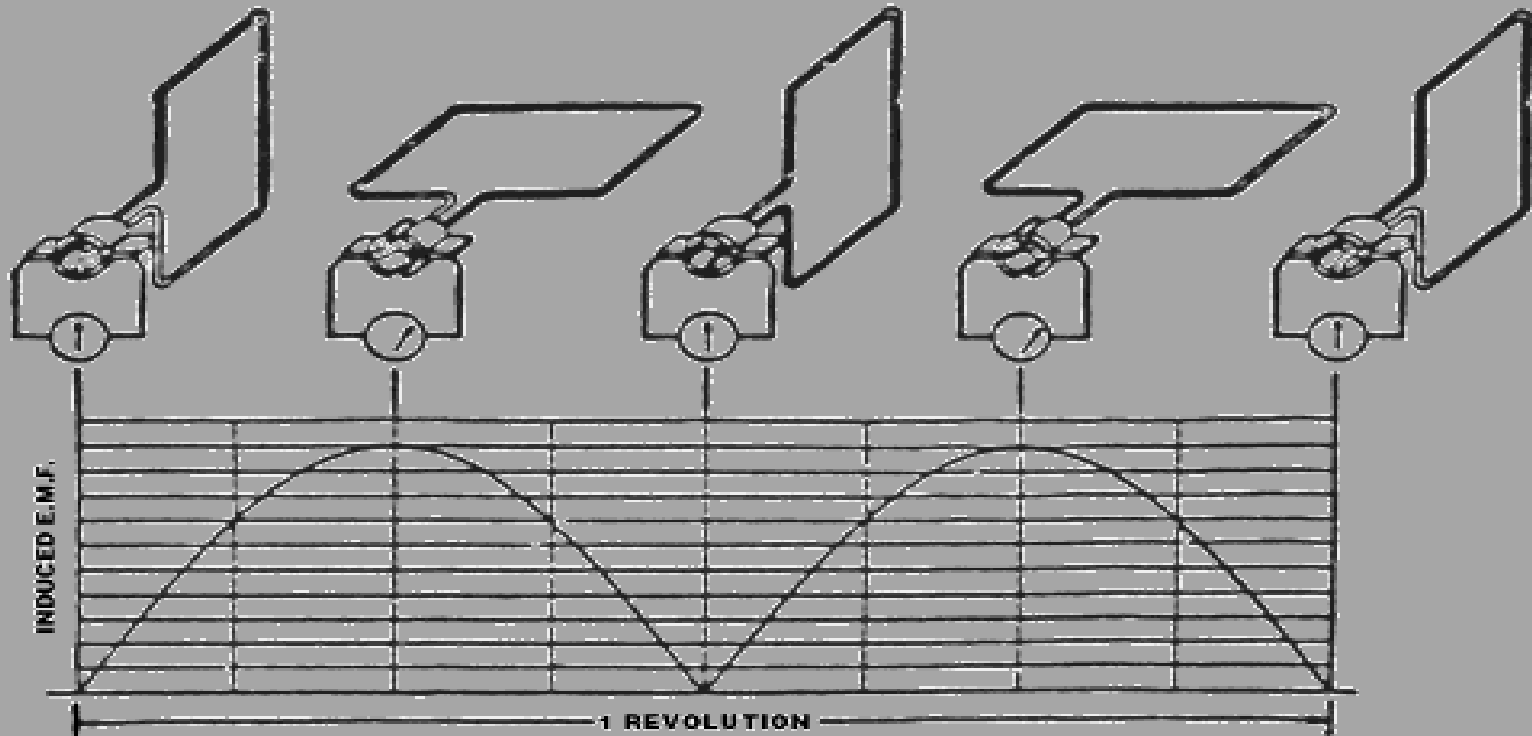


- **Power stations generate alternating current because it is easy to raise and lower the voltage of such current using transformers; thus the voltage can be raised very high for transmission (high voltages lose less power as heat than do low voltages), and lowered to safe levels for domestic and industrial use. In North America, the frequency of ac is 60 Hz, or 60 cycles per second. 120 VAC**

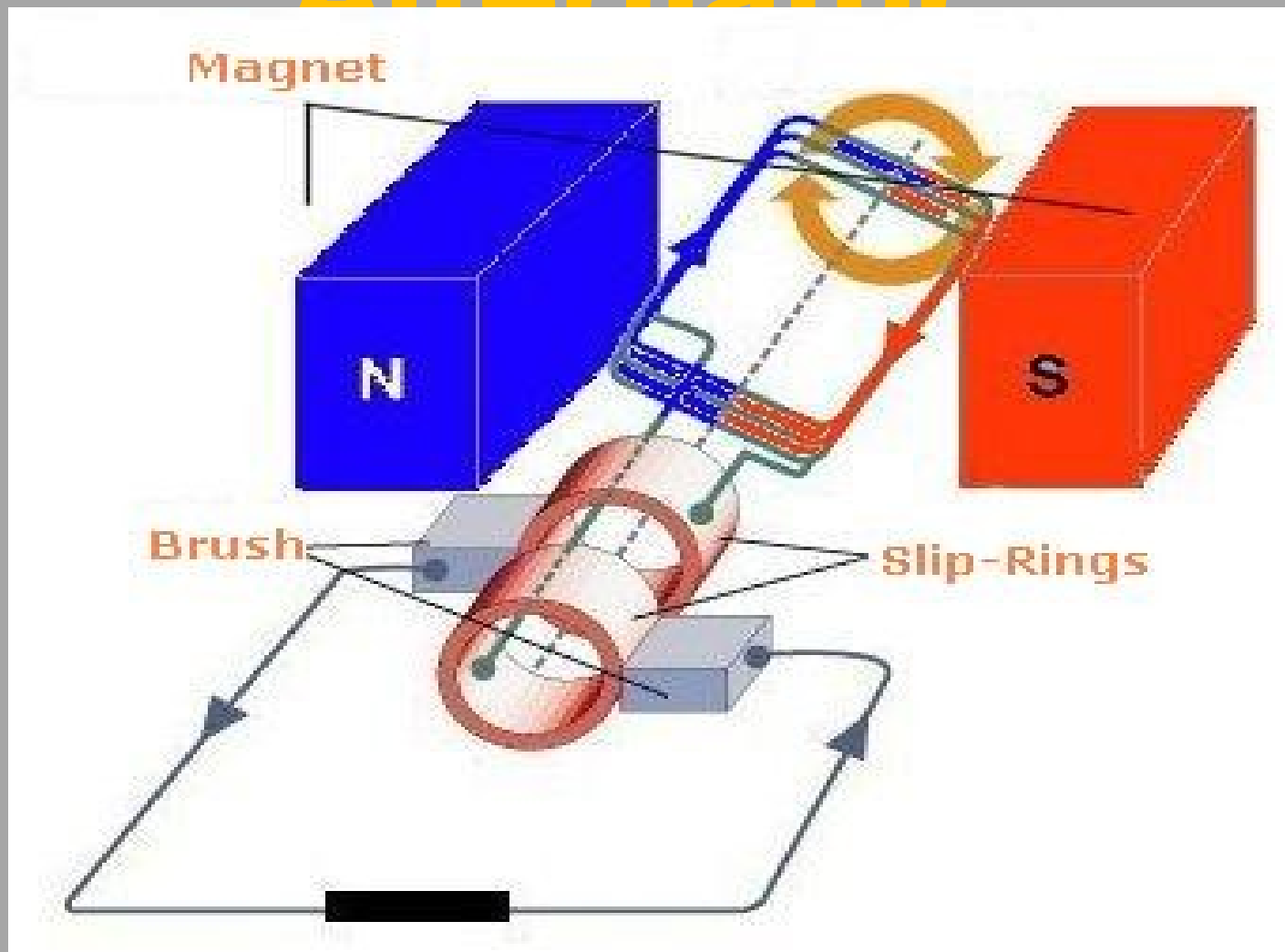
Electrical generator



Dc generator



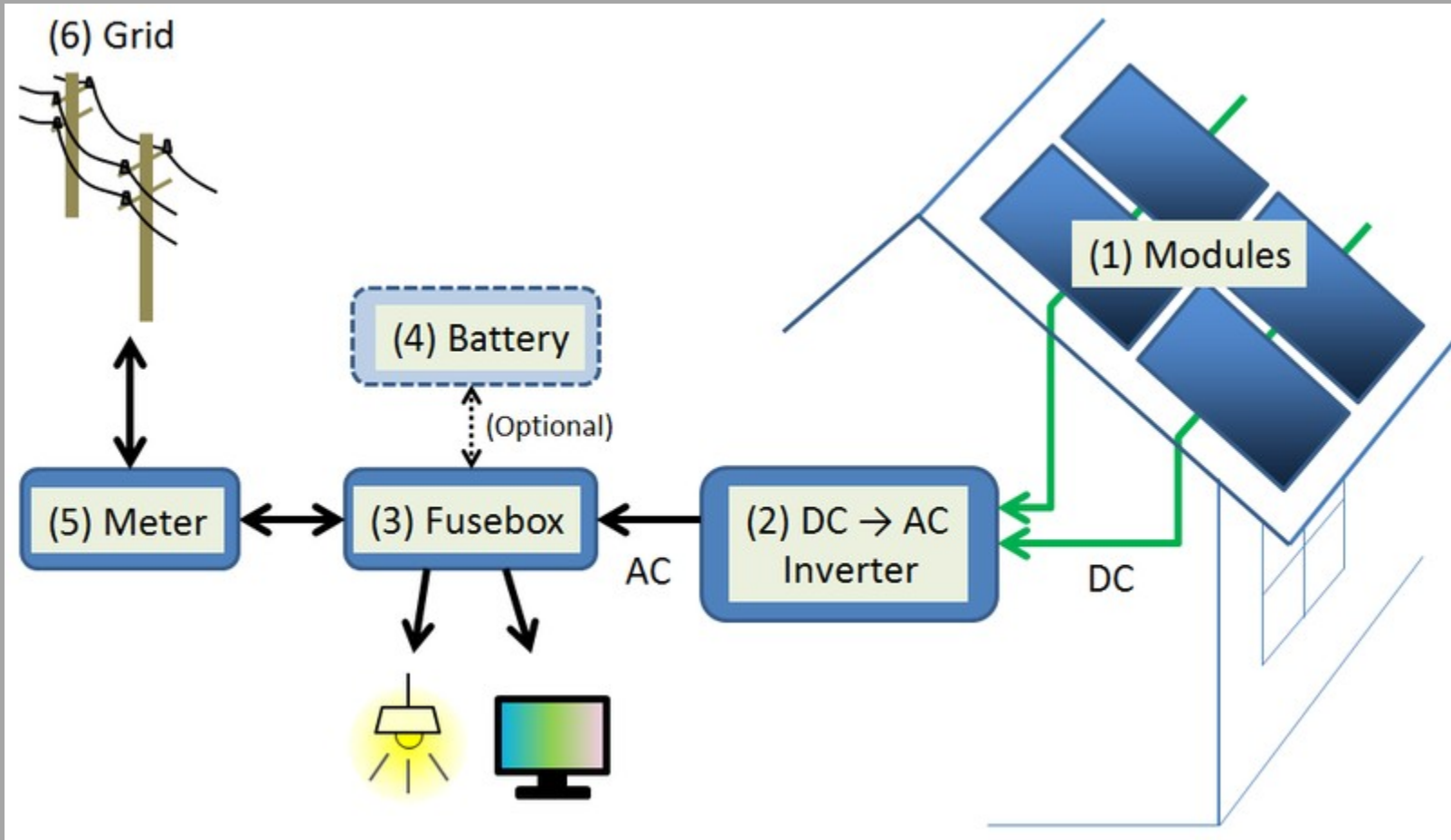
Ac generator- Alternator



solar POWER SUPPLIES

- ▣ **Photovoltaic cells emit electrons when hit with light**
- ▣ **The flow of electrons is DC, direct current**
- ▣ **The current fluctuates with sun position and intensity making varying DC (it does not go negative)**
- ▣ **Inverters turn the DC to AC**

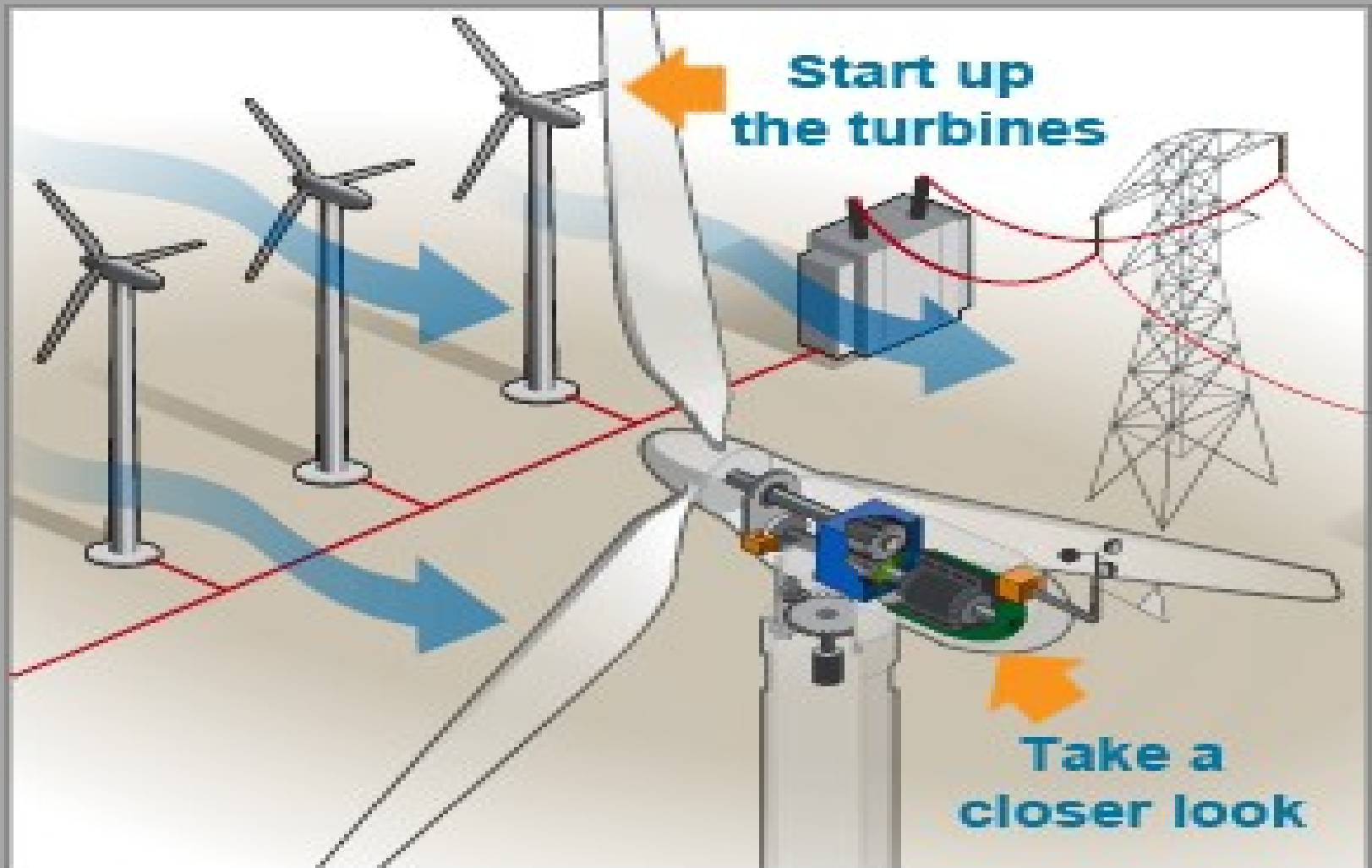
Solar power supply



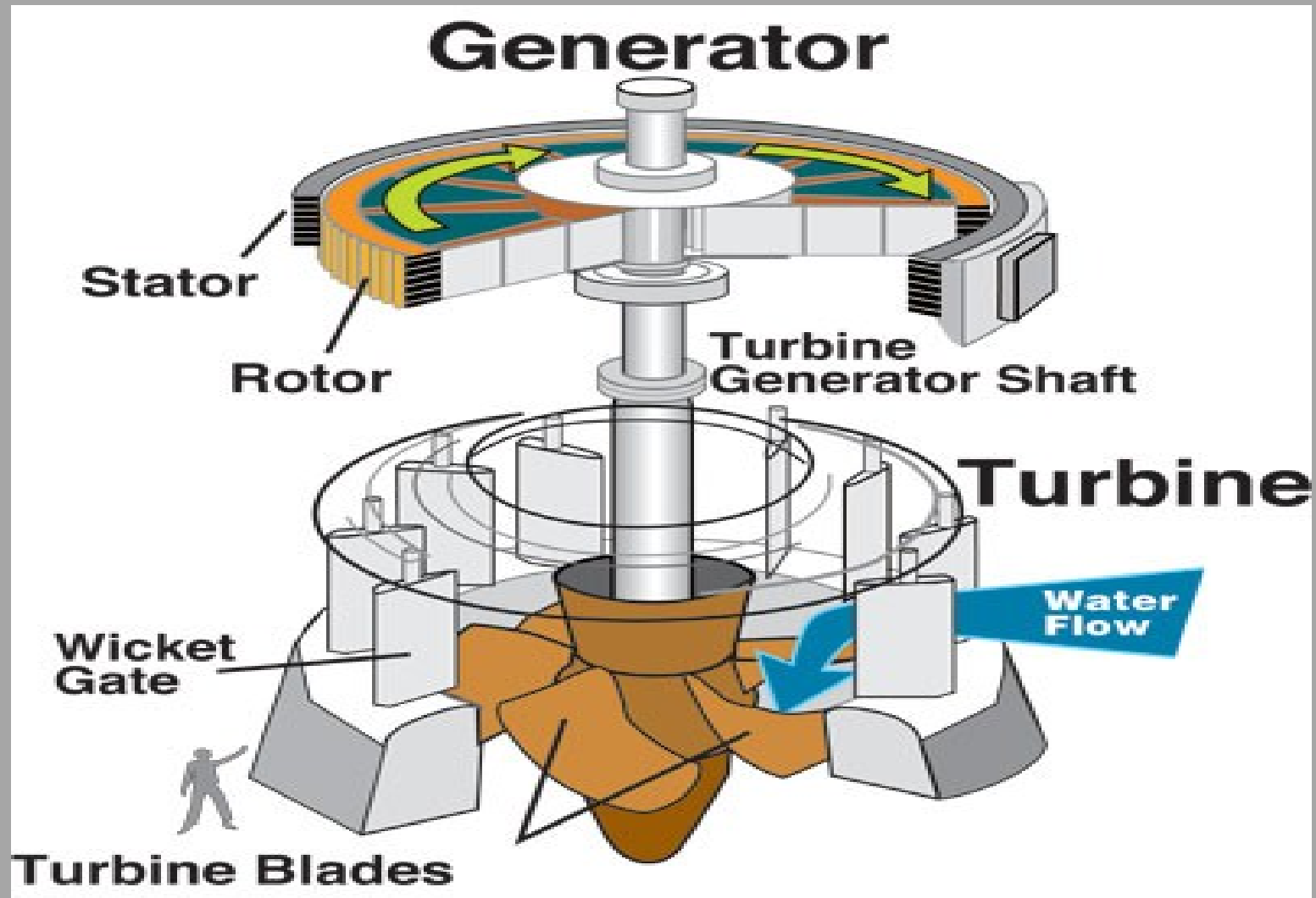
Wind farm



windmill



Water turbine



power supply considerations

- ▣ **Input Voltage** regular 120 VAC, 240 VAC etc
- ▣ **Output Voltage** will it be higher or lower than input
- ▣ **Rectification** changing AC to DC
- ▣ **Filtering** getting rid of the 60-120 hertz ripple
- ▣ **Output Current** double the voltage half's the current required
- ▣ **Voltage Regulation** constant voltage under varying loads

Basic power supply

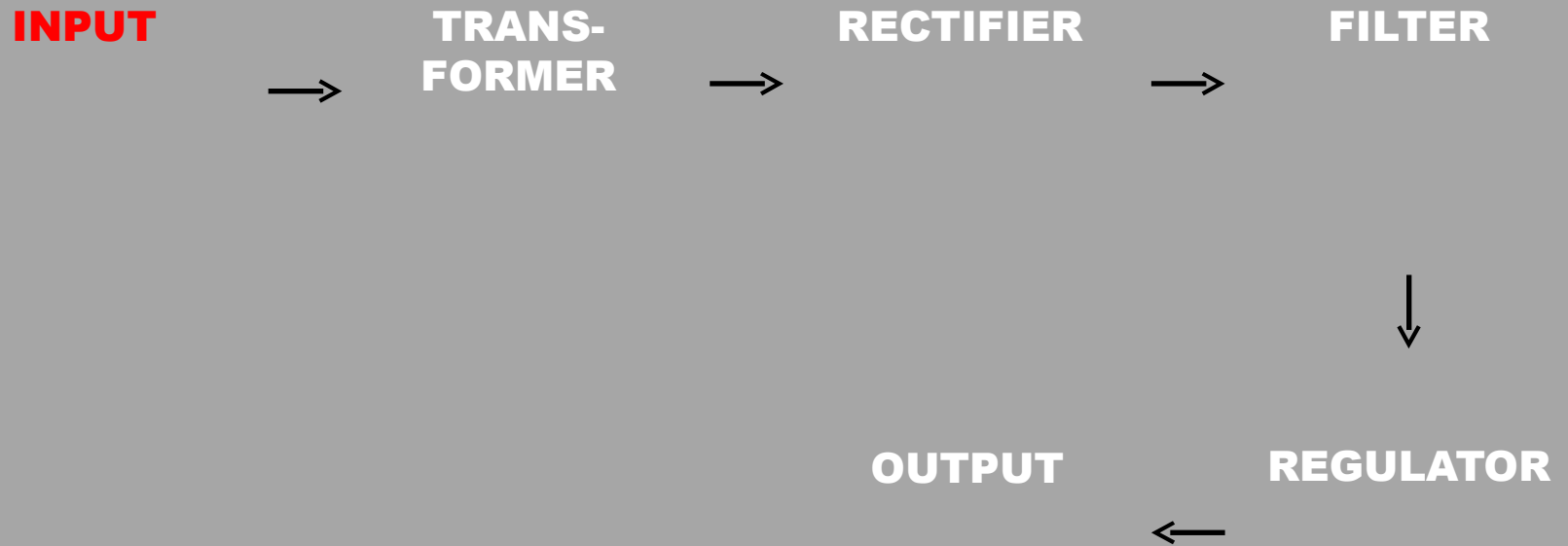
▣ 1. INPUT -AC

▣ 2. TRANSFORMER-
Converts to lower AC

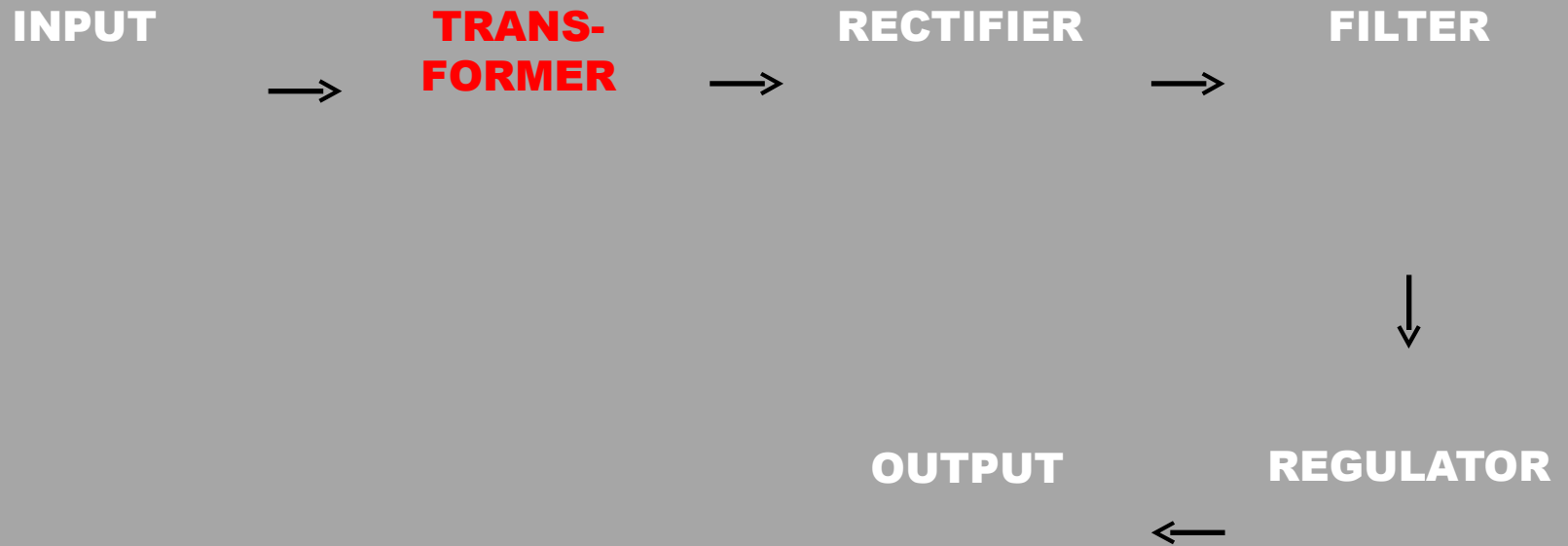
▣

3. RECTIFIER-

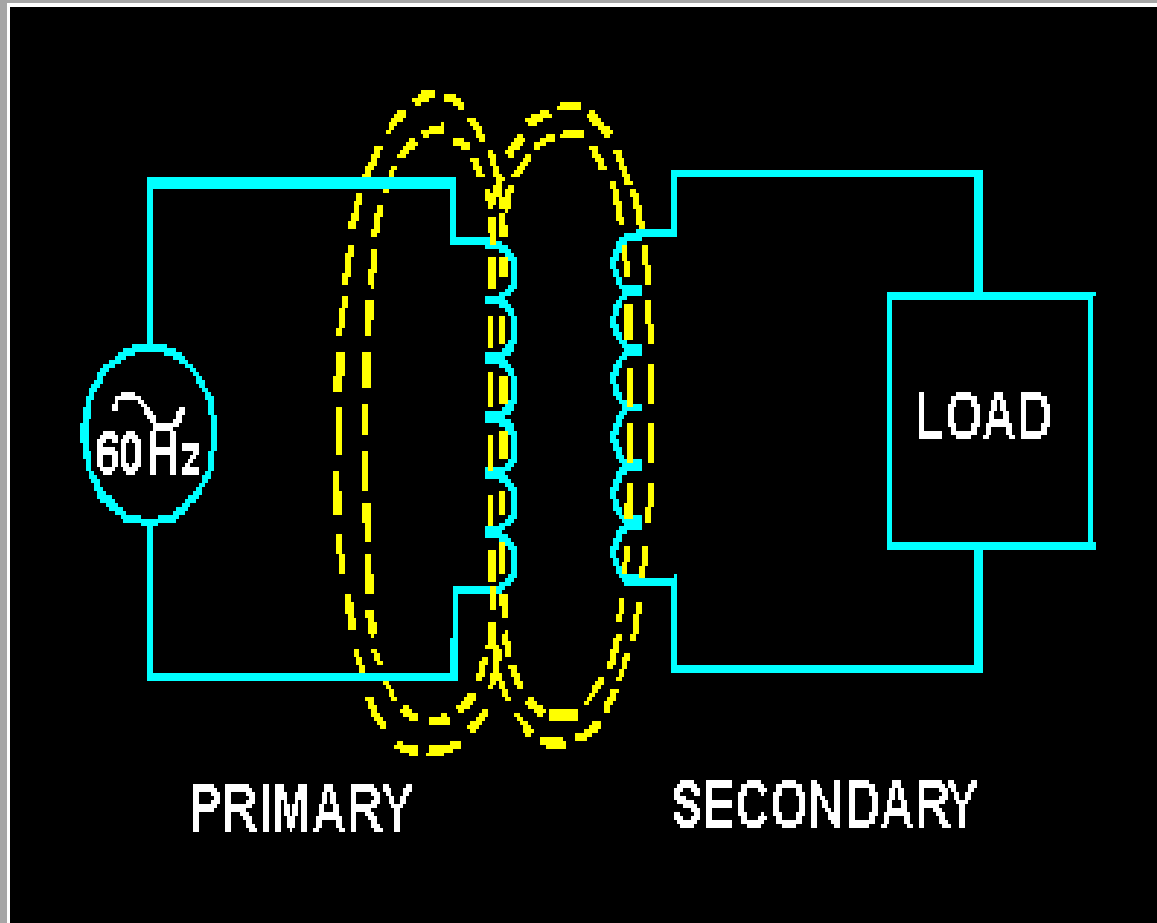
Power supplies



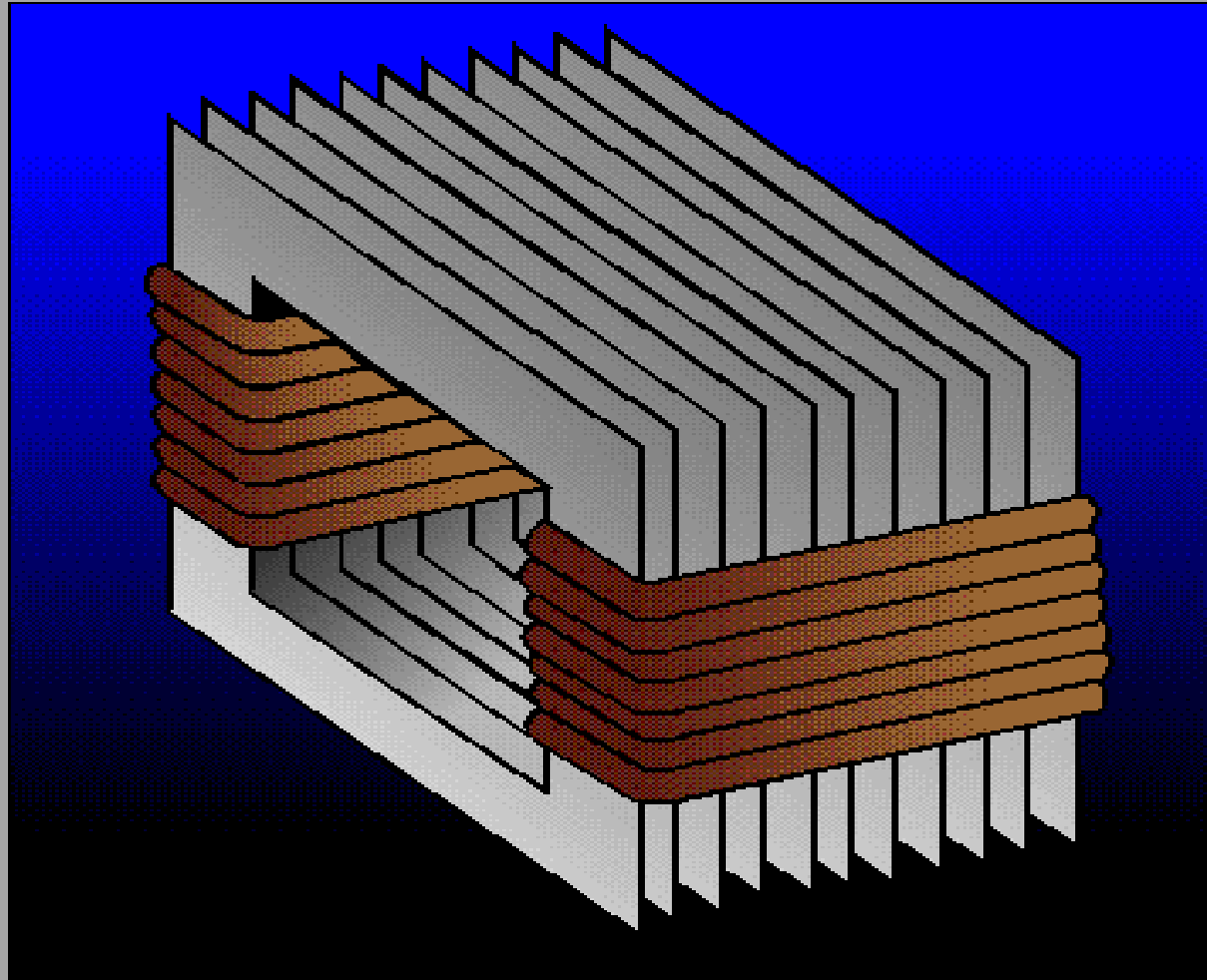
Power supplies



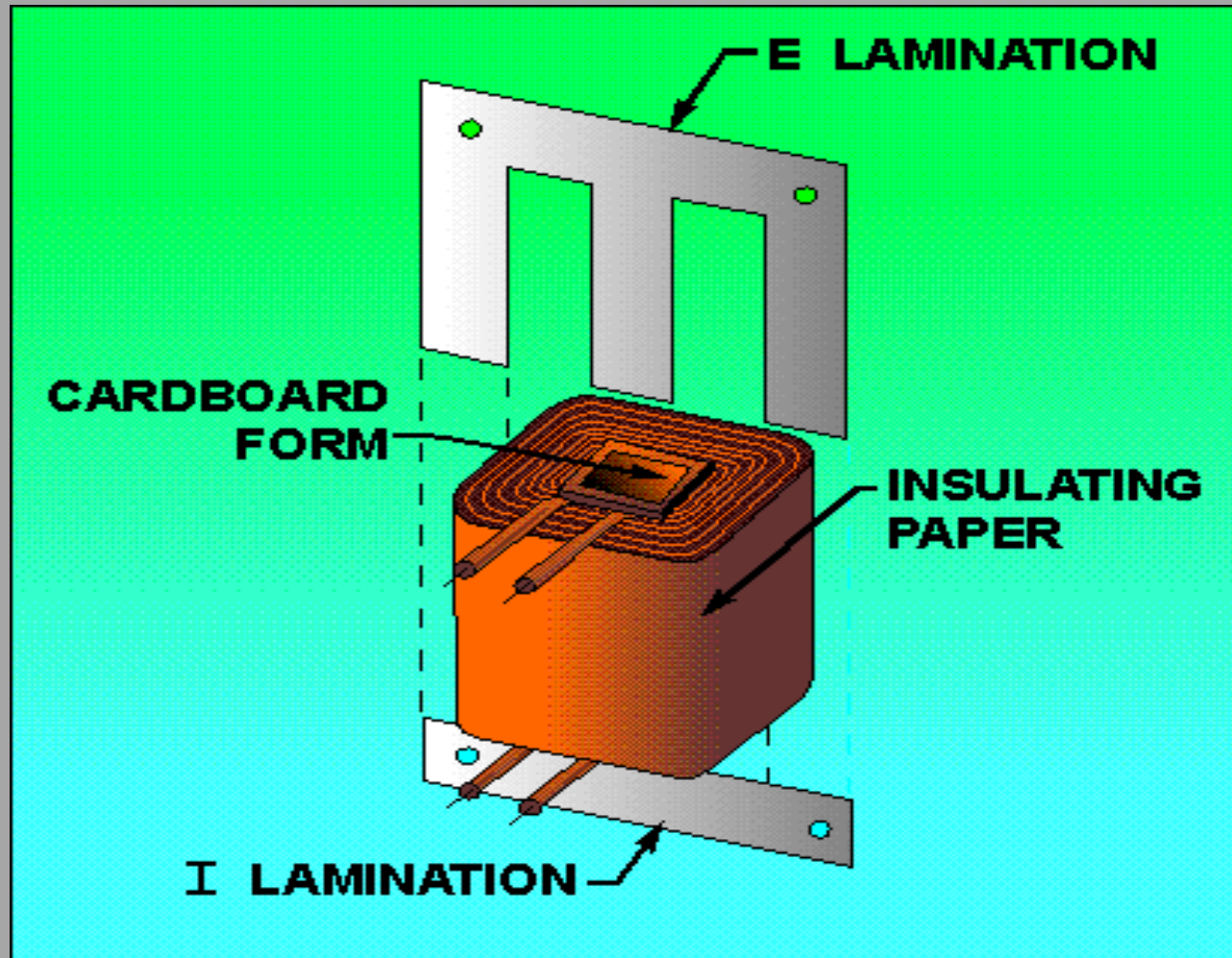
transformer



Parts of a transformer



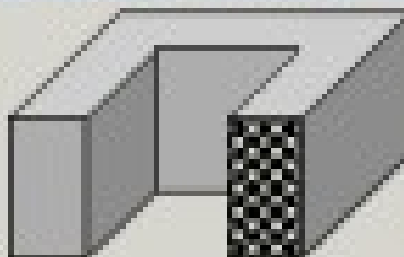
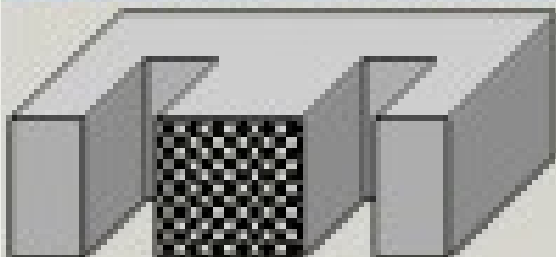
Parts of a transformer



Transformer design requirements

$$\frac{\text{Primary Voltage}}{\text{Secondary Voltage}} = \frac{\text{number of turns (primary)}}{\text{number of turns (secondary)}}$$

Transformer calculation © Silvio Klacik 1999



Square dimension of the core

20 x 20 millimeters

MAX power: 16 W

Primary coil (input parameters)

Input: 220 Volt

VOLTS milliAMPERS

220

6.272

Current power: 1.38 W

Secondary coil (output parameters)

VOLTS milliAMPERS

12

100

12

100

Number of coils - wire thickness (ϕ)

2610

0.06 mm

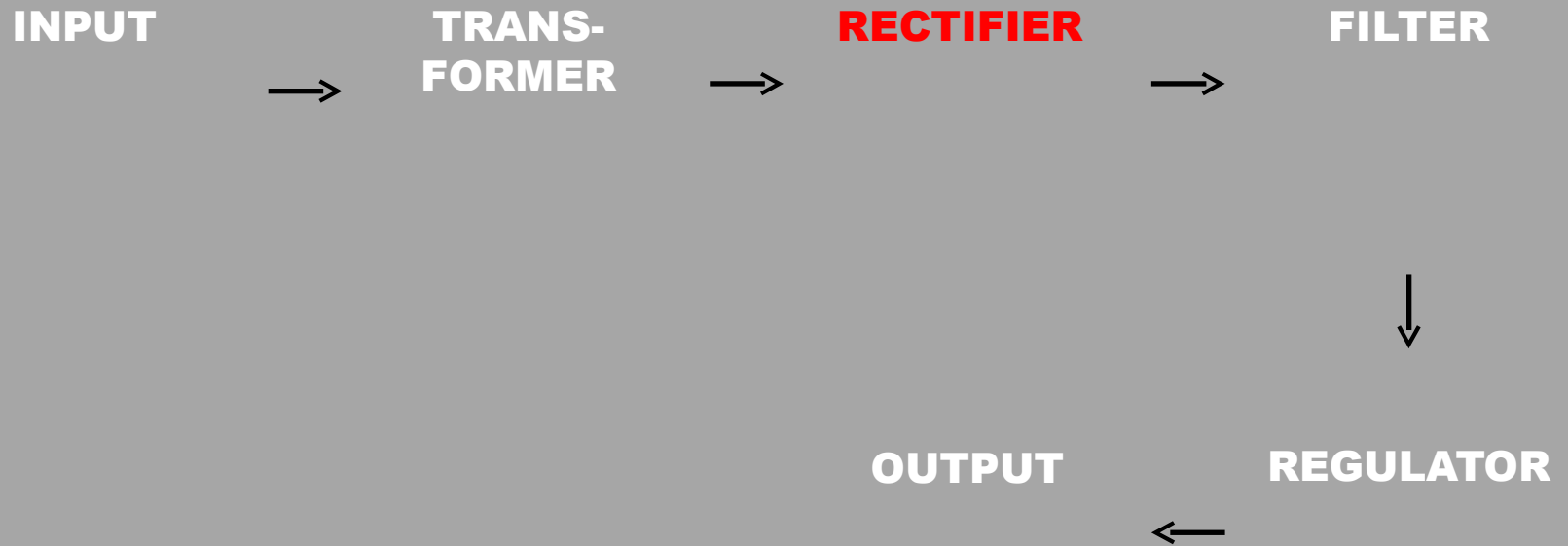


Number of coils - wire thickness (ϕ)

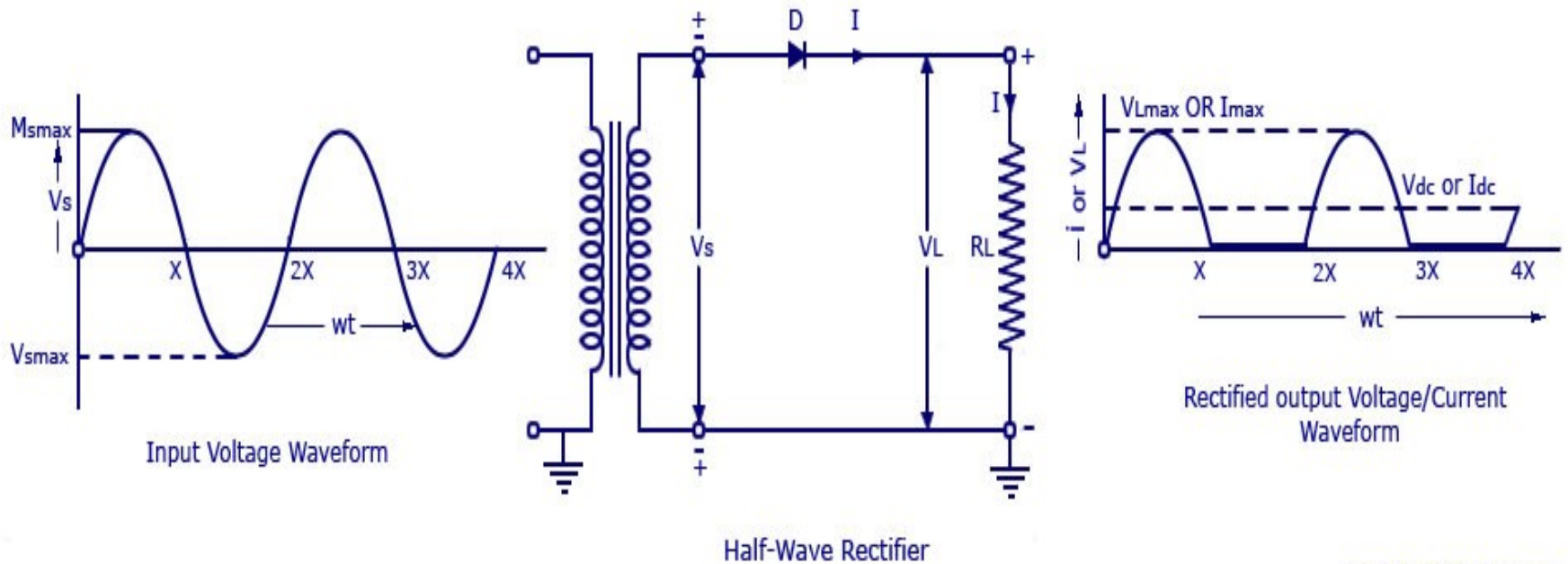
142

0.22 mm

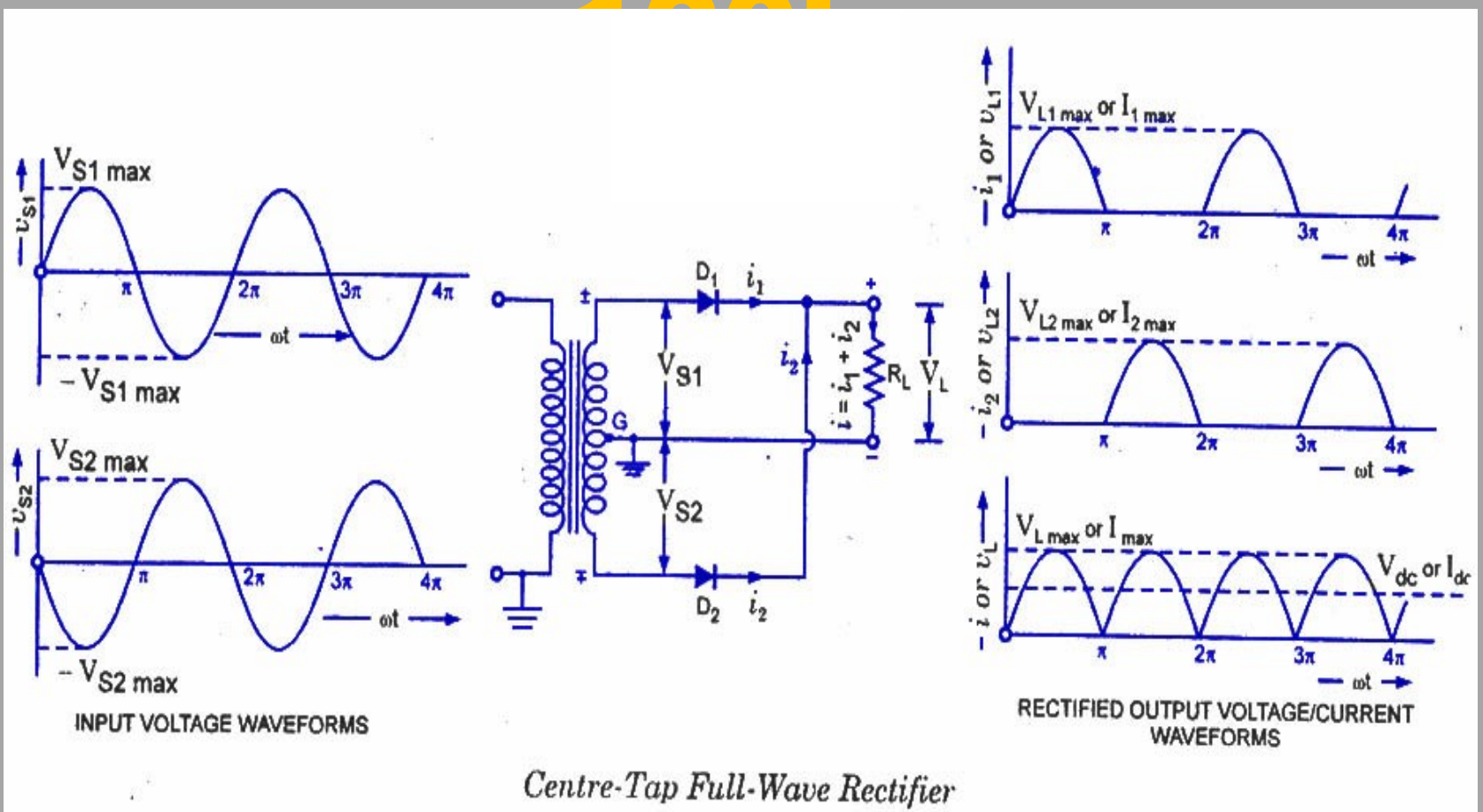
Power supplies



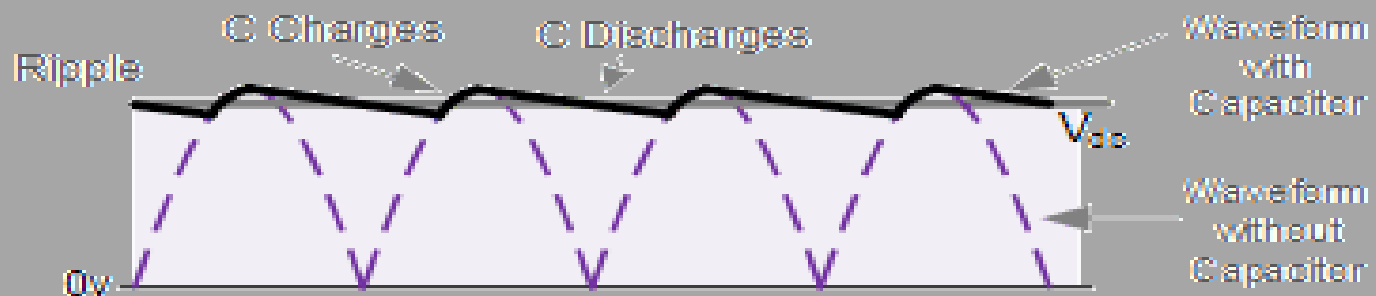
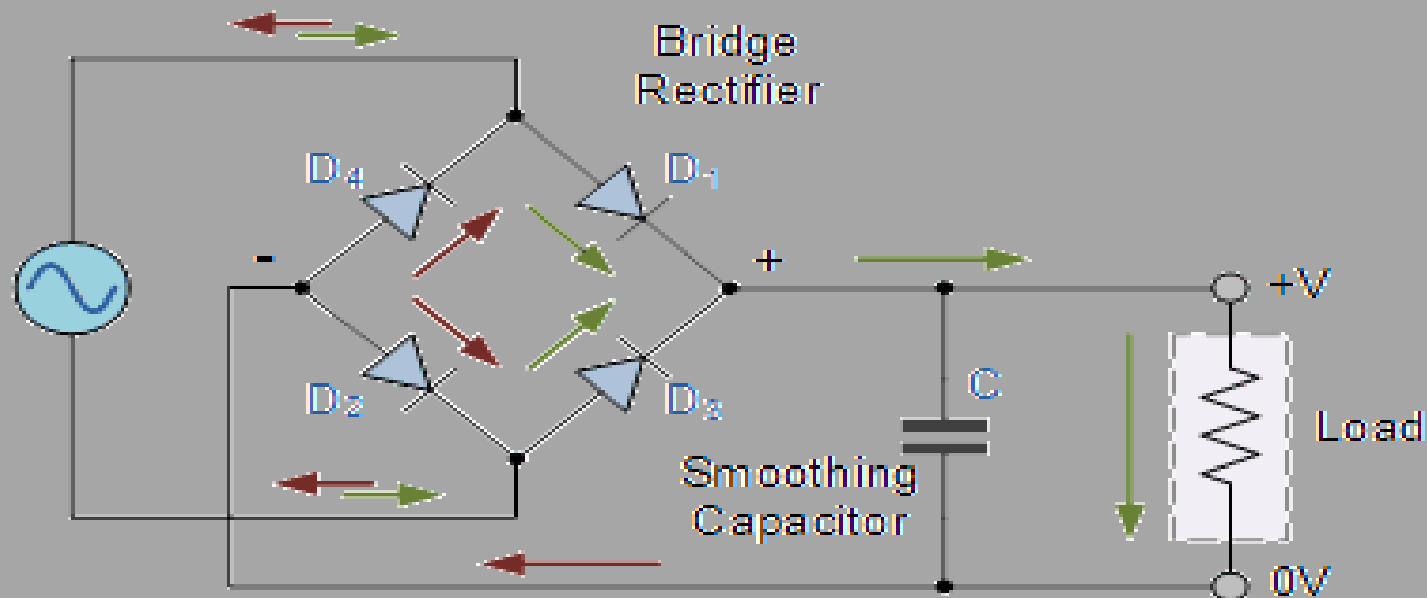
Half-wave rectifier only one half cycle



Full-wave rectifier both half cycles



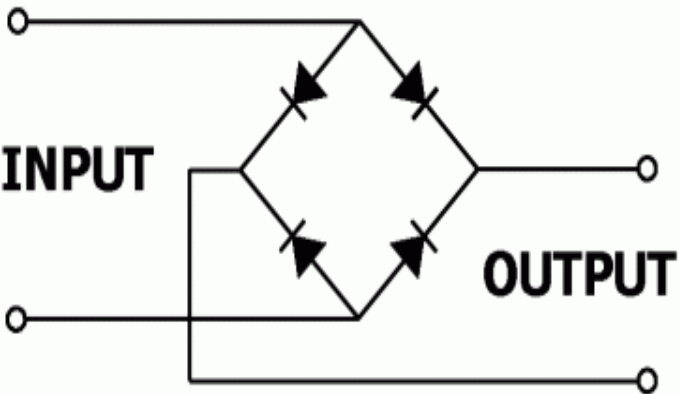
Full wave bridge rectifier



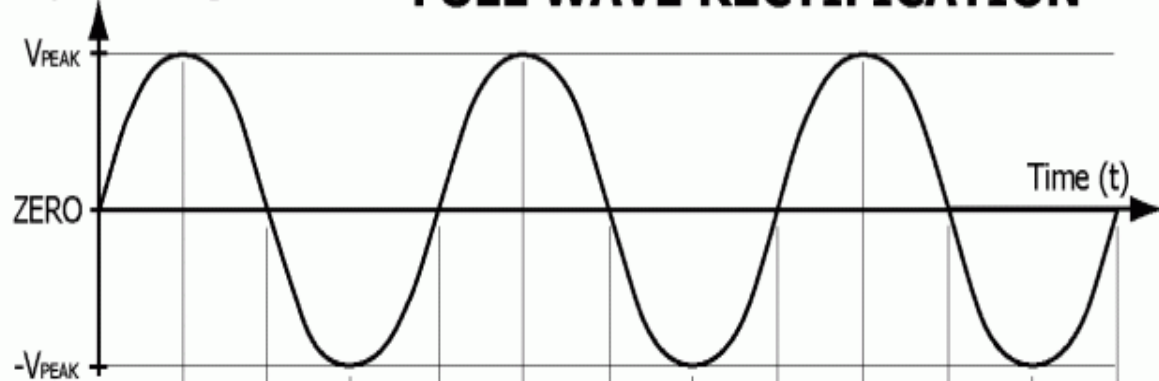
Resultant Output Waveform

Full wave bridge rectifier

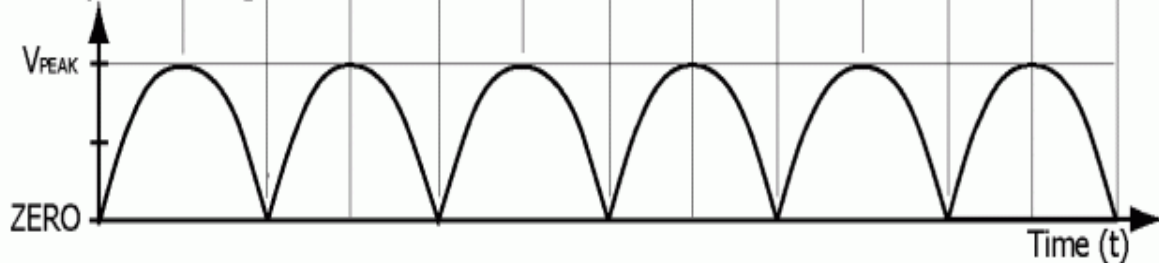
FULL WAVE RECTIFIER



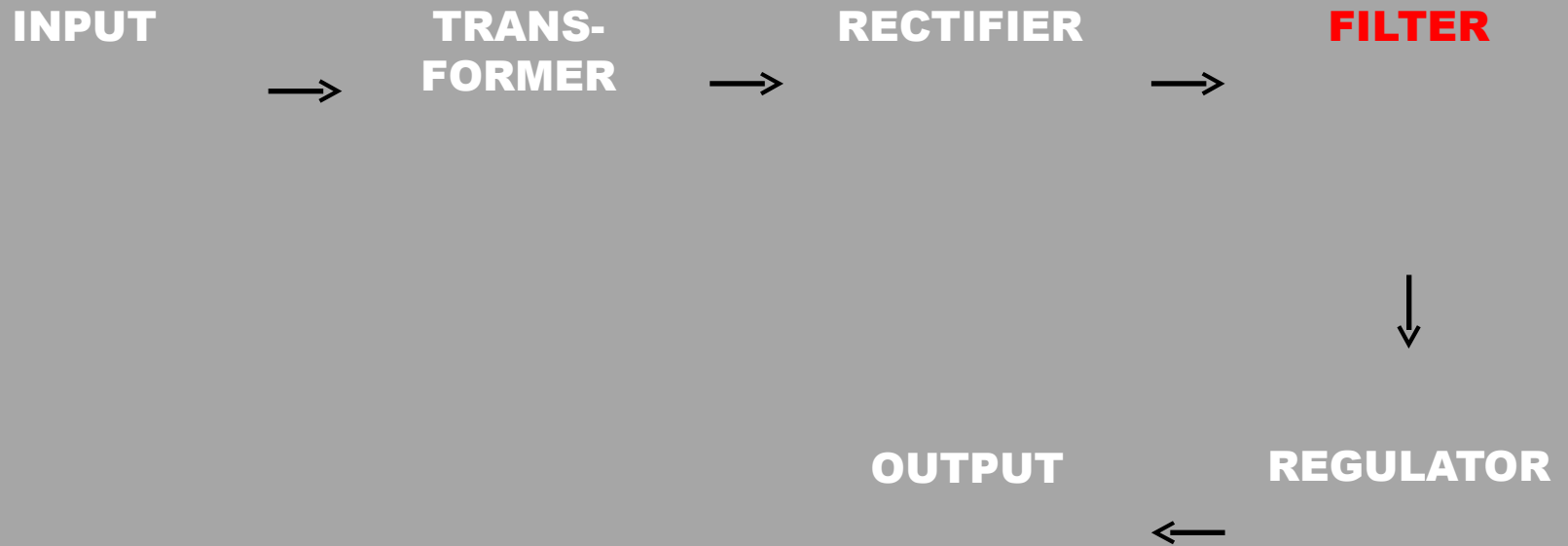
Input Voltage



Output Voltage



Power supplies



Electrolytic capacitors



Electrolytic capacitors-most common failure





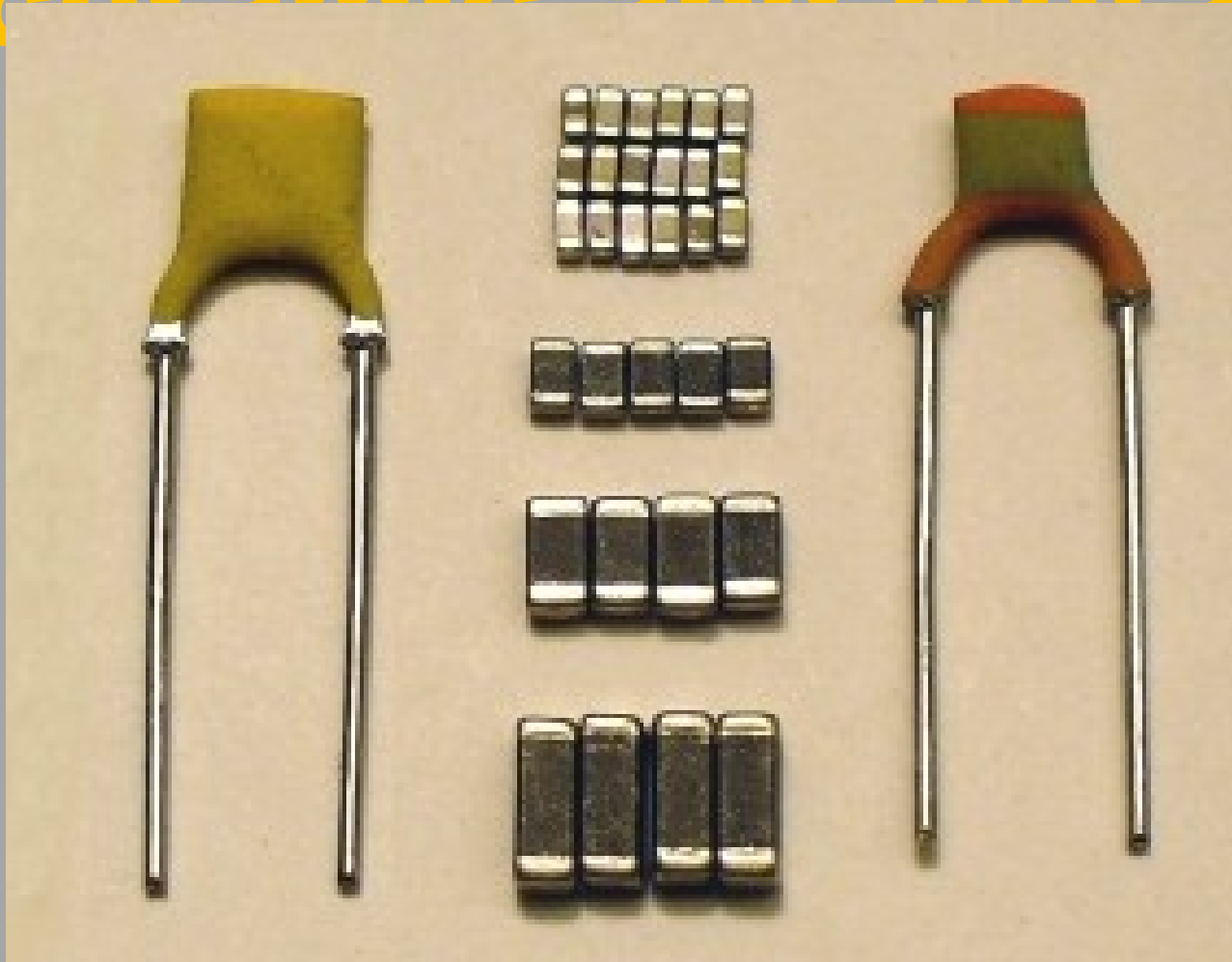
Computer power supply filtering

- ▣ Computers use large numbers of filter capacitors, making size an important factor
- ▣ **Solid tantalum** and wet tantalum capacitors offer some of the best CV (capacitance/voltage) performance in some of the most volumetrically efficient packaging available.

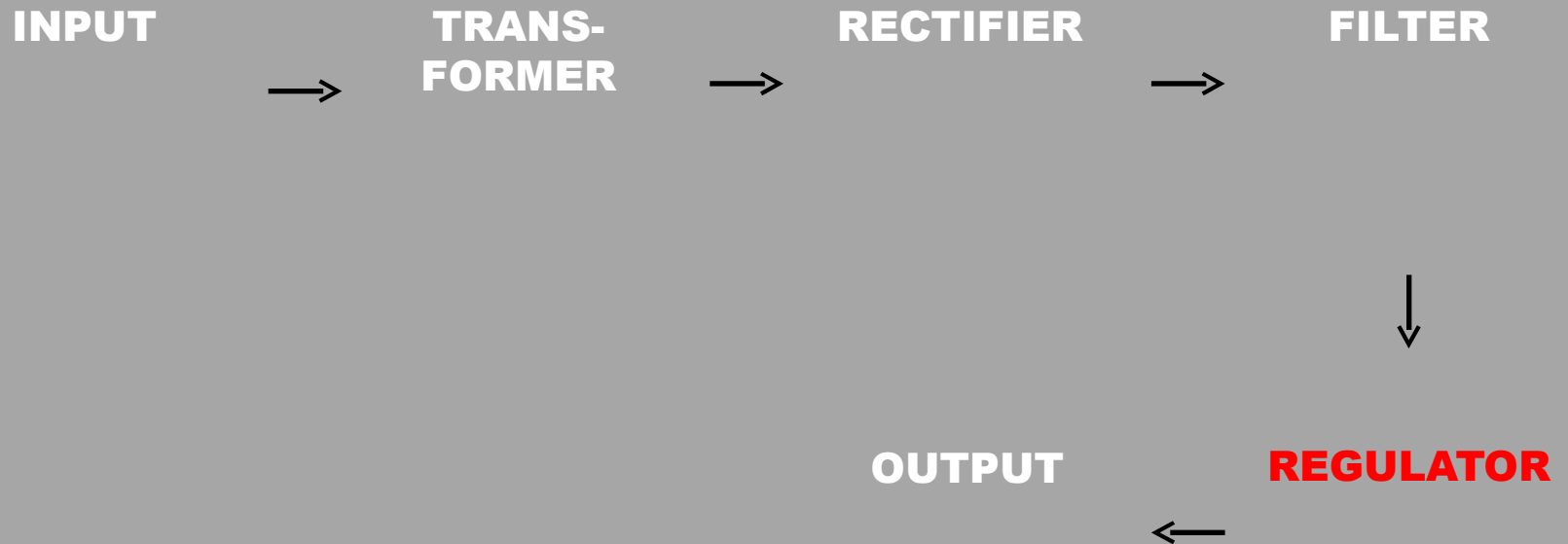
Layers of silver mica dipped in epoxy



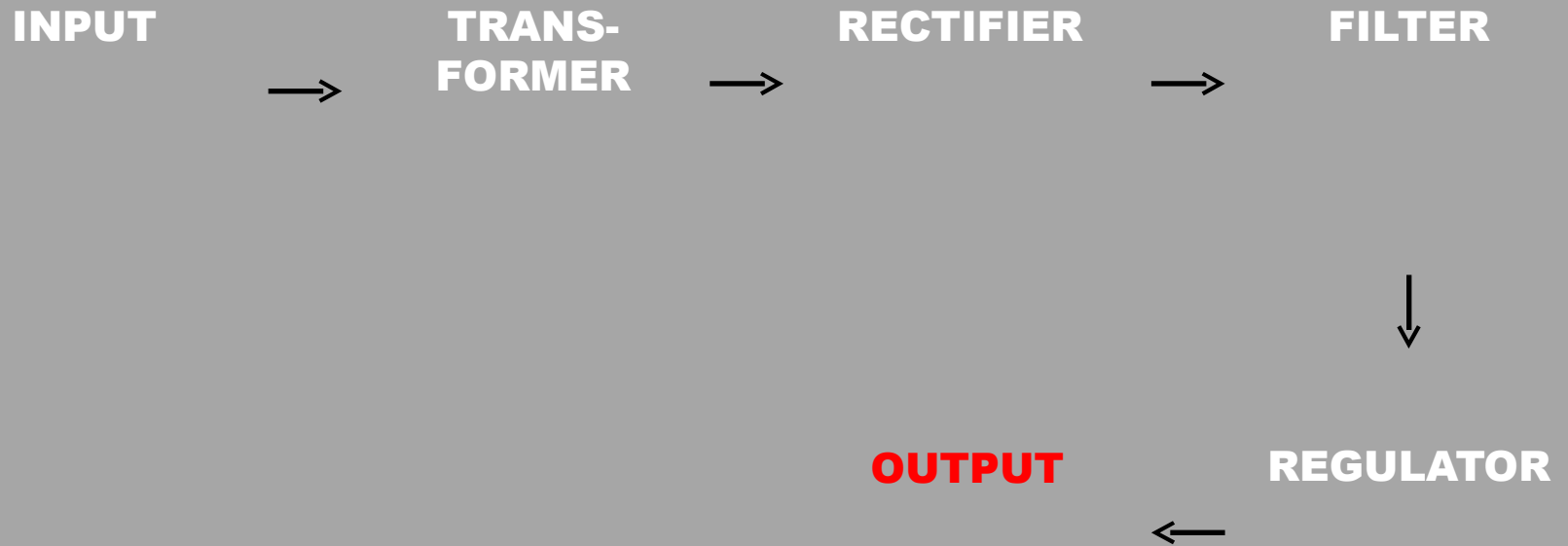
Ceramic disc- layers of ceramic and metal



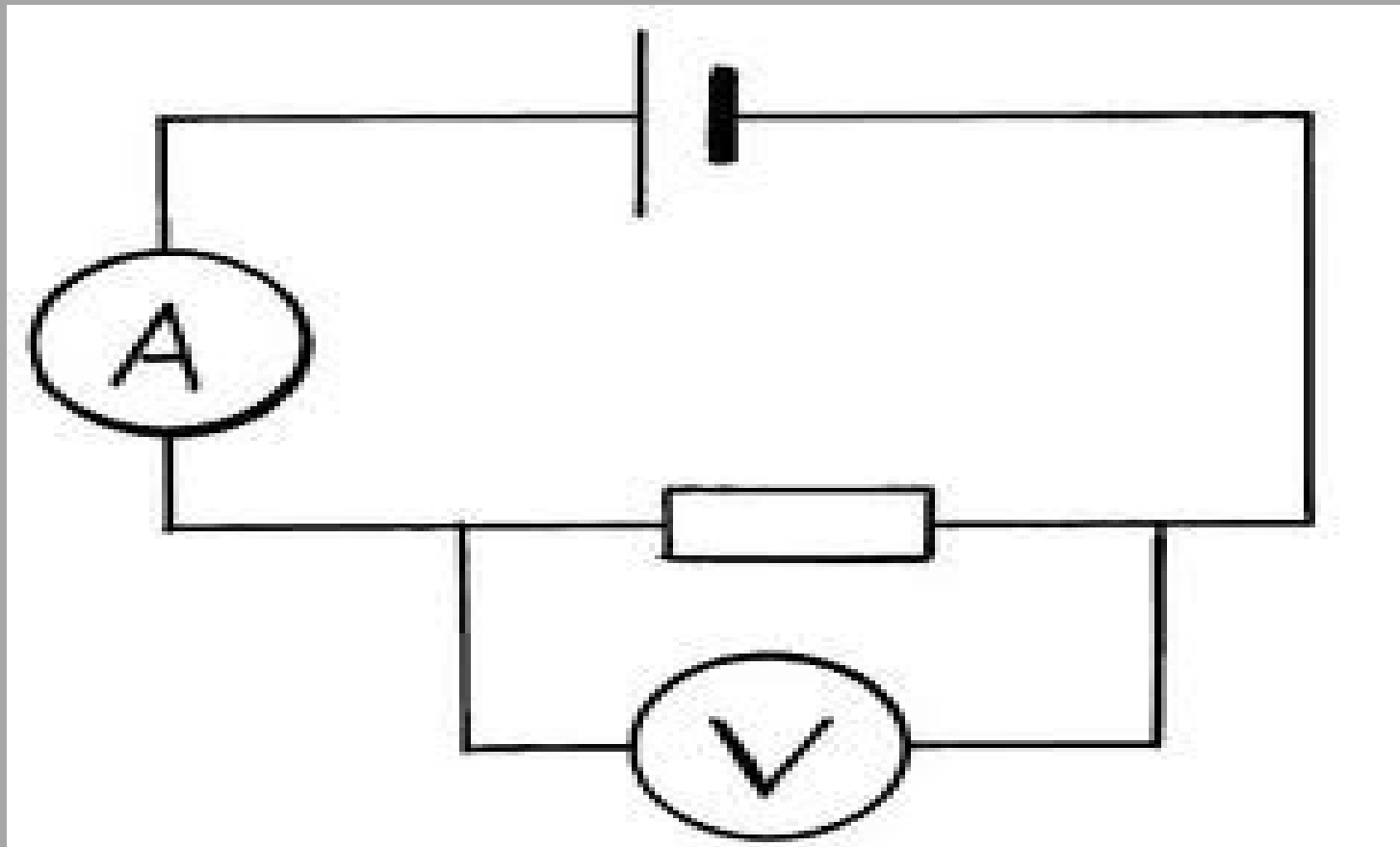
Power supplies



Power supplies



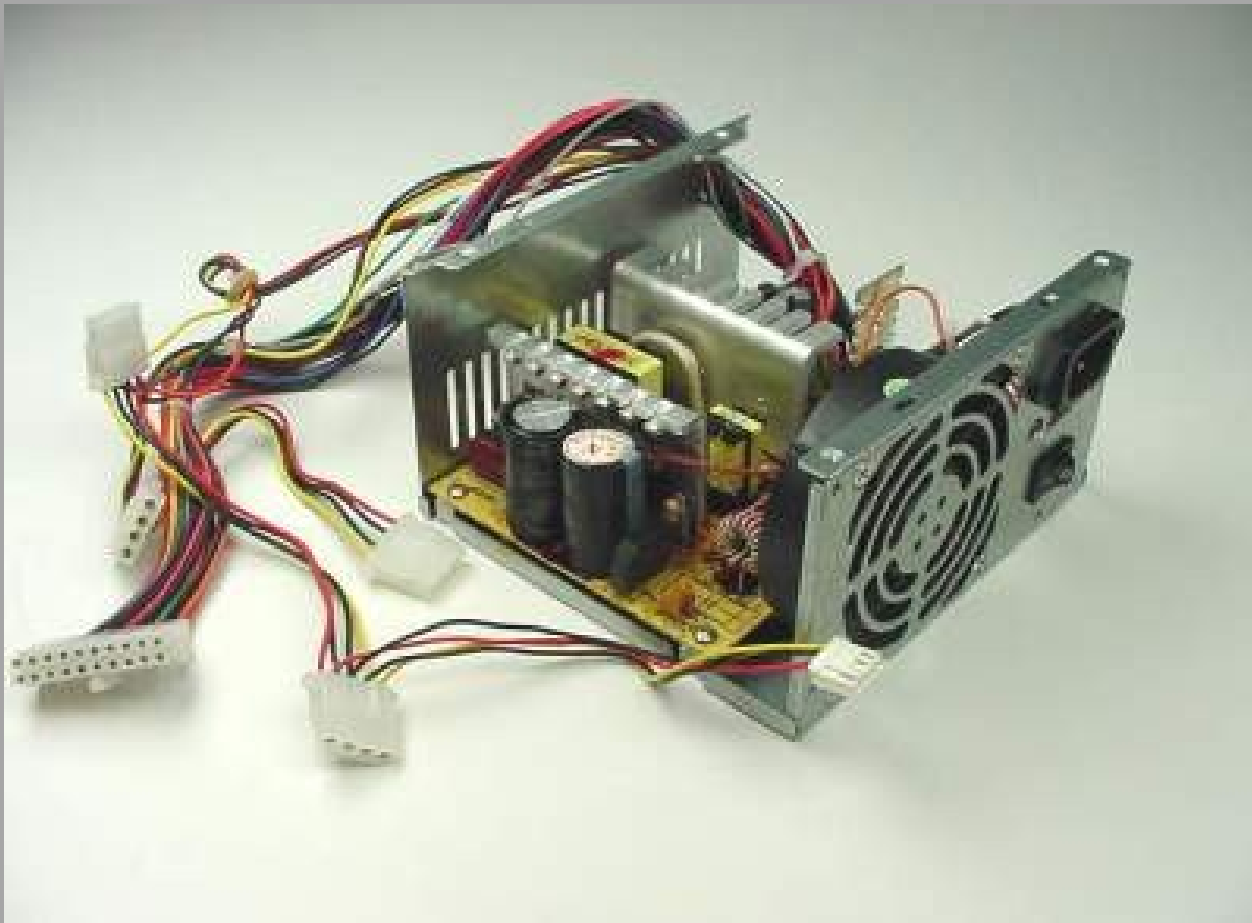
Ammeter in series voltmeter in parallel



Multimeter



Computer power supply multiple



Typical amateur radio power supplies

Device	Voltage	Current
10 w transmitter	13.8 VDC	3A
200 w transmitter	13.8 VDC	20 A

