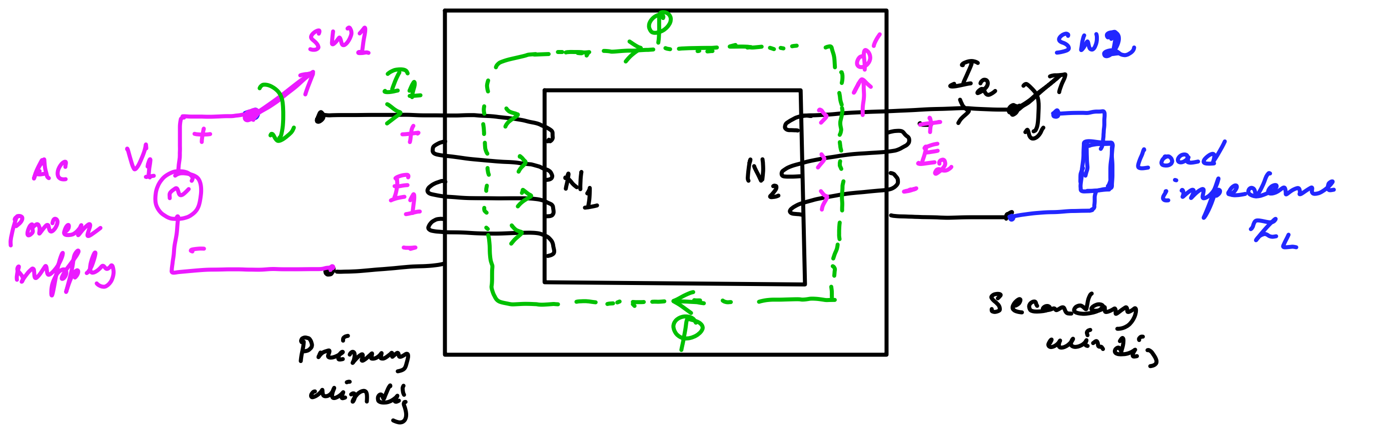


Closing SW1
(No load condition)

$$e_1 = -N_1 \frac{d\phi}{dt}$$

$$E_1 = \sqrt{2}\pi f N_1 \phi_{max}$$

$$E_2 = \sqrt{2}\pi f N_2 \phi_{max}$$

✓ $$E_2 = \left(\frac{N_2}{N_1}\right) E_1$$

Closing SW1 & SW2

- Current flow I_2
- Try to produce ϕ' to oppose ϕ
- To maintain ϕ in the core the mmf needs to be balanced & to counteract ϕ', more current will be drawn from primary side $\left(\phi = \frac{N_1 I_1}{R}\right)$

$$N_1 I_1' = N_2 I_2$$

$$N_1 I_1 = N_2 I_2$$

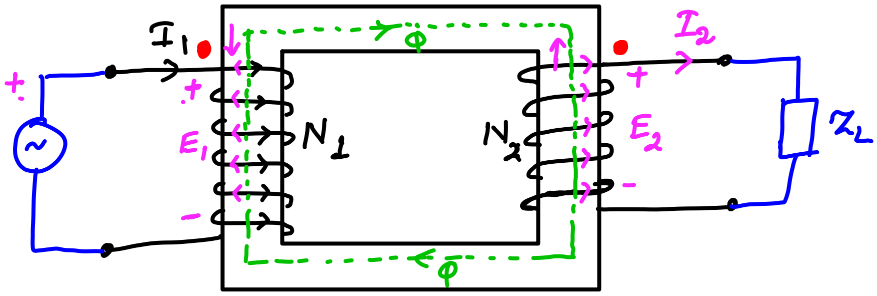
$$I_1 = I_\phi + I_1'$$

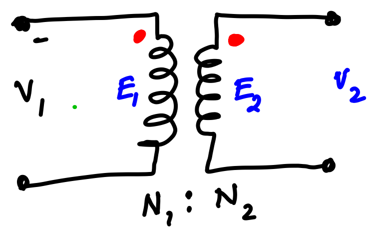
✓ • $$I_1 = \left(\frac{N_2}{N_1}\right) I_2$$

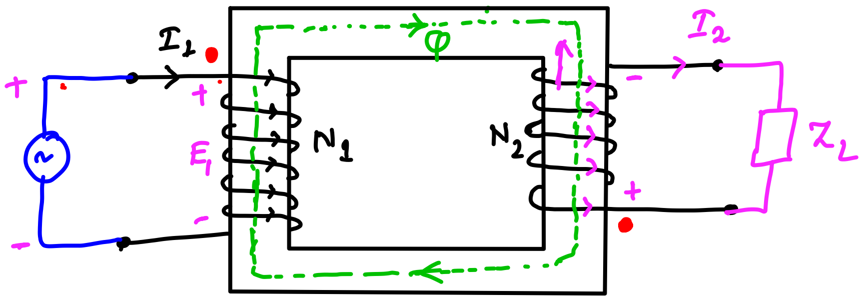
$$\boxed{E_1 I_1 = E_2 I_2}$$

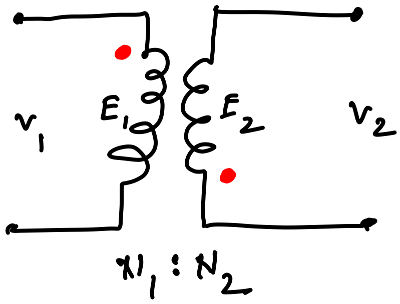
Transfer of power from one electric circuit to another.

Schematic diagm

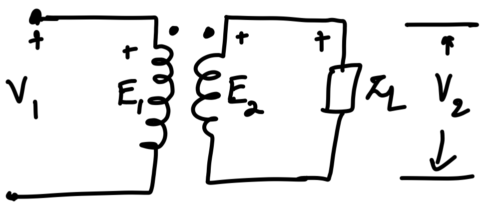








- **Impedance transformation.**



$$V_1 = \left(\frac{N_1}{N_2}\right) V_2$$

$$I_1 = \left(\frac{N_2}{N_1}\right) I_2$$

Impedance $\quad Z_2 = \frac{V_2}{I_2}$

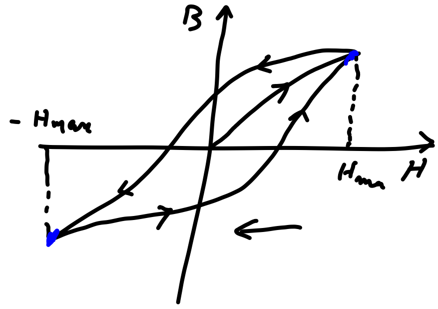
In primary side $\quad \frac{V_1}{I_1} = \left(\frac{N_1}{N_2}\right)^2 \frac{V_2}{I_2}$

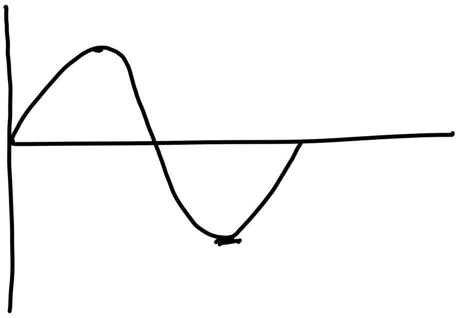
$$\Rightarrow \boxed{Z_2' = \left(\frac{N_1}{N_2}\right)^2 Z_2}$$

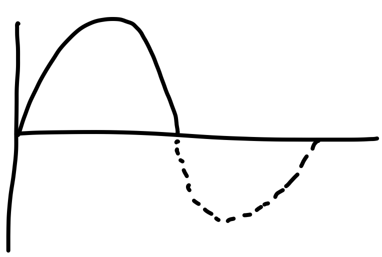
The impedance Z_2 of secondary side is referred to primary side.

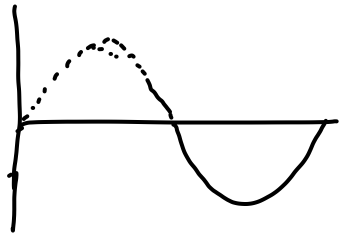
Z_2 is transferred to primary side $\rightarrow Z_2'$.

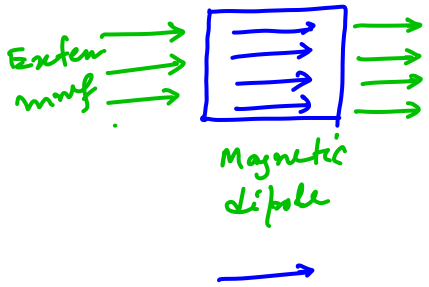
- Hystresis loop of iron

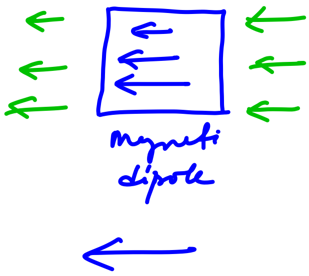












- Due to the A.C. excitation of transformer the magnetic dipoles keep on flipping from one direct? to another

↓ Doing work

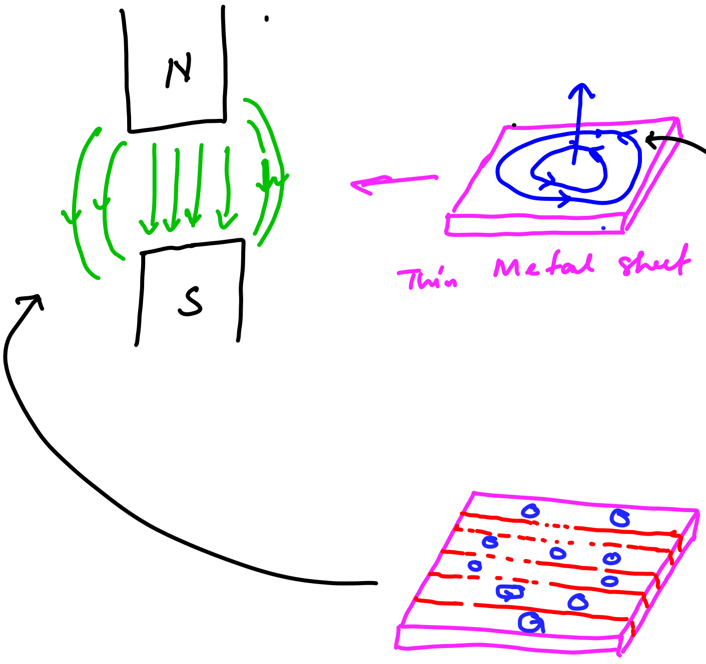
Need energy from input supply

↓

Energy gets dissipated as heat in the iron core.

↓

The associated power loss in core is called <u>"Hystresis Loss"</u>.



The currents are called "eddy currents"

⇓

$i_e^2 R$ loss

Laminated metal sheet

↑

The metal sheet is cut into small thin pieces and they are insulated from one another

$i_e^2 R$ loss will be reduced

↑

The power loss due to the presence of eddy current in the iron core is called "Eddy current loss".

→ In the iron core

↓

✓ Hystresis loss → (minimized by using cold-rolled-grain-oriented steel)

\+

✓ Eddy current loss → (minimize by laminating the core)