Linear Circuits

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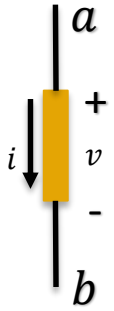
Power

Objective: By the end of this lesson, you should be able to define power and understand how power relates to voltage and current.

Builds Upon



- Electric current (i) - the quantity of charge that passes through a given area in a specified time.

$$i(t) = \frac{dQ}{dt}$$

- Voltage (v) - the energy either gained or lost per coulomb of charge.

$$V = \frac{dw}{dq}$$

What is power?

- Charged particles (q) flow over time (t) and produce current (i).

$$i = \frac{dq}{dt}$$

- Voltage (v) is produced by the energy (w) lost or gained by the moving charge (q).

$$v = \frac{dw}{dq}$$

- Power (p) is the rate at which the charges' energy (w) changes over time (t).

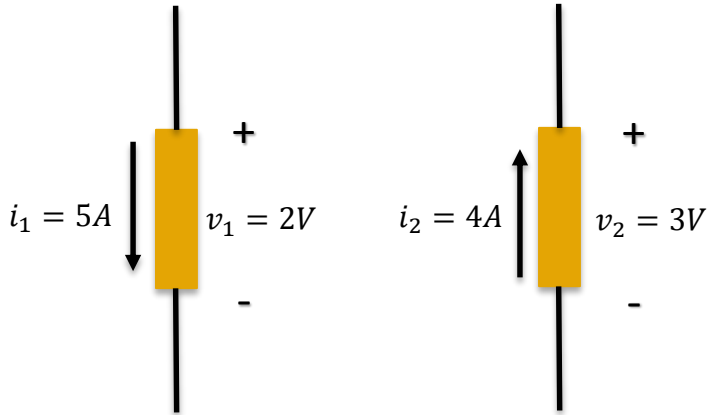
$$p = \frac{dw}{dt}$$

- Power can also be expressed as the product of current and voltage.

$$p = \frac{dw}{dt} = \frac{dw}{dq}\frac{dq}{dt} = vi$$

- Variable: p
- Unit: watts, W

Calculate power for known voltage and current.



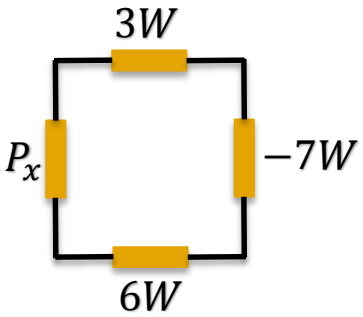
- Quiz: Calculate p_1. Is power generated or consumed?

- Quiz: Calculate p_2. Is power generated or consumed?

The sum of power generated and consumed in a system is zero.

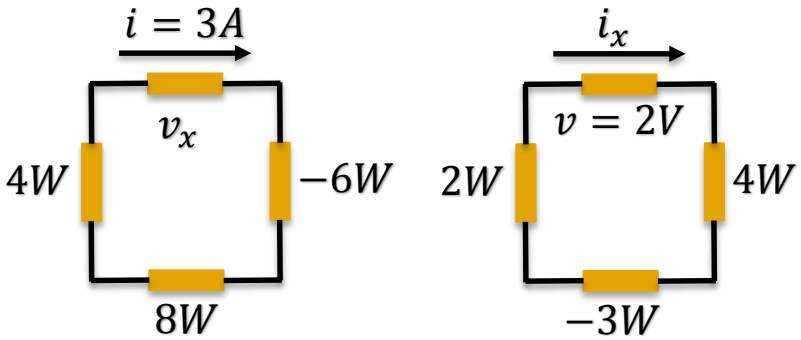
- Power is the rate of change of energy and energy is always conserved.

- Therefore, the sum of power generated and consumed in a system is zero.



- Quiz: Calculate power P_x.

Use power to find unknown voltage and current.



- Quiz: Find v_x.

- Quiz: Find i_x.

Key Concepts

- Power is the rate at which energy changes over time.

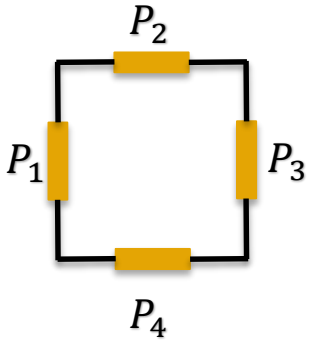
$$p = \frac{dw}{dt}$$

- Power can also be expressed as the product of current and voltage.

$$p = vi$$

- The sum of power generated and consumed in a closed system is zero.

$$\sum_{0}^{n} P_n = 0$$



What is power?

- Charged particles flow over time and produce current.
- Voltage is produced by the energy lost or gained by the moving charge.
- Power is the rate at which the charges' energy changes over time.
- Power can also be expressed as the product of current and voltage.