Difference Between AC and DC

Aspect	AC (Alternating Current)	DC (Direct Current)
Definition	Current alternates its direction periodically.	Current flows in a single, constant direction.
Waveform	Sinusoidal (or other forms like square, triangular).	Straight line (constant amplitude).
Frequency	Has a frequency (e.g., 50Hz or 60Hz).	Frequency is zero (no alternation).
Voltage	Can be easily stepped up or down using transformers.	Usually constant and harder to convert efficiently.
Source	Generated by alternators in power stations.	Provided by batteries, solar panels, or rectified AC.
Transmission	Efficient for long-distance transmission.	Inefficient for long distances due to resistive losses.
Examples	Power in homes, offices, and industries.	Batteries, mobile devices, and electronics.
Applications	High-power systems, appliances like TVs and refrigerators.	Low-power devices, electronics, and circuits.

Which One is Inside the House?

- **Inside the House**: **AC (Alternating Current)** is delivered to houses because it is more efficient to transmit over long distances and can be easily converted to different voltages using transformers.
    - Typical AC voltage in homes:
        - **110-120V, 60Hz** (e.g., USA, Canada).
        - **220-240V, 50Hz** (e.g., Europe, Asia).
    - AC powers lights, fans, refrigerators, and most appliances.
- DC is present inside electronic devices, but it's derived from AC using a **power adapter or rectifier circuit**.

Which One is on Power Lines?

- **On Power Lines**: High-voltage **AC** is used for power transmission.
    - High voltage reduces current, minimizing energy loss due to resistance (Ohm's Law: P=I2RP = I^2RP=I2R).
    - Example:
        - Power is transmitted at **thousands of volts** (e.g., 110kV, 230kV, or higher).
- **Why Not DC?**
    - Historically, DC was harder to transmit over long distances due to significant energy loss and inefficiency.
    - Modern **HVDC (High Voltage Direct Current)** systems are sometimes used for long-distance transmission due to recent advancements.

Summary

- **AC** is used both in homes and on power lines for its efficiency and easy voltage transformation.
- **DC** is mainly used in low-power electronics and is derived from AC inside devices.

Alternating Current Explained

Circuit Basics: What's the difference between AC and DC power?

What is electricity? How does it work? Nikola Tesla's AC vs DC