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Perspective

Wireless Power Transmission and its Applications

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DESCRIPTION

Wireless power transfer is the transmission of electrical energy without the use of wires as a physical connection. Wireless energy uses the same fields and waves as wireless communication devices. Various Radio Frequency (RF) technologies are used for wireless power transfer. In 1980 it was demonstrated by Nikola Tesla. There are three main systems used for wireless power transfer: solar cells, microwaves, and resonances. Electrical equipment uses microwaves to send electromagnetic radiation from a source to a receiver. The name wireless power transfer states that transferring electrical energy from a source to an electrical device without the use of wires. There are basically two coils: transmitter coil and receiver coil. The transmitting coil is powered by alternating current to generate a magnetic field, which induces a voltage in the receiving coil.

The basics of WPT include the induced transfer of energy from the transmitter to the receiver via a vibrating magnetic field. To obtain this direct current supplied by the power source, it is converted to high frequency alternating current by a specially designed electronic device built into the transmitter. In the transmitter section, alternating current amplifies the copper wire to create a magnetic field. If the receiver coil is placed in close proximity to the magnetic field, the magnetic field can induce alternating current in the receiver coil. The electrons in the receiving device then convert alternating current into direct current, which becomes available energy.

In general, a wireless power system consists of a transmitter which is connected to a power source called power source B. The main power line that converts the current into a time-varying electromagnetic field, and one or more receiving devices that receive the current and convert it to DC or AC power used by the electrical load. At the transmitter, the input power is converted into an oscillating electromagnetic field by some kind of antenna device. The antenna can be a coil of wire that produces a magnetic field, a metal plate that produces an electric field, an antenna that emits radio waves, or a laser that produces light. A similar antenna or coupling device on the receiver converts the vibration field into an electric current. An important parameter that determines the nature of a wave is the frequency that determines its wavelength.

Wireless power technology includes into two main categories: short-range and long-range. In close-field or non-radiative technology, energy is transferred over short distances over a magnetic field using inductive coupling between the coils of the wire, or over an electric field using capacitive coupling between metal electrodes. Inductively coupled is the most widely used wireless technology. Its applications include charging handheld devices such as phones and electric toothbrushes, wireless charging or continuous wireless power transfer in implantable medical devices such as induction cookers, artificial cardiac pacemakers and electric vehicles.

Benefits of wireless power transmission

- The WPT system completely reduces existing high voltage transmission wires, substations, and towers between consumers and power plants.
- Reduces power distribution and transmission costs.
- Consumers cost of electrical energy is also reduced.
- Energy may be transmitted to locations where wired transmission is not possible.

APPLICATIONS

- The largest application of the WPT is the production of power by placing satellites with giant solar arrays in Geosynchronous Earth Orbit and transmitting the power as microwaves to the earth known as Solar Power Satellites (SPS).
- WPT is used in moving targets like fuel-free-electric vehicles, fuel- free airplanes, fuel-free rockets and moving robots.
- The other applications of WPT are Wireless power source or Ubiquitous Power Source, RF Power Adaptive Rectifying Circuits and Wireless sensors.

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