A Review on Wireless Electricity Transmission Technology: Study

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***Abstract*— In this research paper, Wireless Power transmission (WPT) is a useful and convenient technology that can be employed to collect solar energy and concentrate on earth surface without the need for a wire connection called a solar power satellites (SPS) Since the wireless power transmission combines many theories and explained by many methods, this paper discusses the different methods used for the wireless electricity. This adapter is connected to a waveguide ferrite circulator which protects the microwave source from reflected power. In their advantages, disadvantages and economical consideration will also be presented.**

Keywords- Wireless Electricity Transmission high-voltage lines, electromagnetic field.

I. INTRODUCTION

Wireless transmission system basically is a principle to transfer the power through wireless .the first ever principle in which came into existence war Witricity . It means the short name of electricity & its concept is depends on magnetic resonance. Wireless transmission is useful in cases in which connecting lines are inconvenient, dangerous or impossible .The efficiency of the conventional power transmission system can be improved by using the quality material but this introduces a significant increment in cost. It is the most common method of wireless power transmission is carried out through direct induction followed by resonant magnetic induction. Some other methods are taking from account electromagnetic radiation in the form of microwaves or laser and some time electric wire with natural media.. As per the requirement of demand the power consumption is increases day by day, when the power generation is then power loss is also increased. The major part of loss is in the transmission & distribution of power . During the transmission & distribution of power the loss is about 26%. Losses are occurs due to usage of wires & grid, for reducing this loss percent here we are using the wireless transmission with the help of some common methods as wireless transmission of electricity are-

1. Electromagnetic induction
2. Electrostatic induction
3. Electromagnetic radiation
4. Laser method
5. Electrical conduction
6. Microwave method

II. ELECTROMAGNETIC INDUCTION

The main aim of our design is to provide experimenting with wireless embedment networks. It must be compact, low power, and flexible in order to meet a wide range of experimental works. It has a central microcontroller that performs all sensing, communication and computation works.

The electrodynamics induction near-field wireless communication technology is used at distances of up to about one-sixth the wavelength. This action of an electrical transformer is the simplest form of wireless energy transfer. The primary and secondary circuit of a transformer are not directly connected. Energy transfer takes place through a process known as mutual inductance. Main functions are stepping the primary voltage either up or down and electrical isolation. Phone and electric toothbrush chargers and electrical power distribution transformers are examples of how this principle is used. The application range of the resonance increases slightly.

If resonant coupling is used, the transmitter and receiver are tuned to the same resonant frequency inductors. The performance can be further improved by modifying the drive current of a sinusoidal waveform of a sinusoidal transient. The action of an electrical transformer is the simplest instance of wireless energy transfer. The primary and secondary circuits of a transformer are not directly connected. The transfer of energy takes place by electromagnetic coupling through a process known as mutual induction. Electromagnetic induction works on the principle of a primary coil generating a predominantly magnetic field and a secondary coil being within that field so a current is induced in the secondary. Coupling must be tight in order to achieve high efficiency. As the distance from the primary is increased, more and more of the magnetic field misses the secondary. Even over a relatively small range the simple induction method is grossly inefficient, wasting much of the transmitted energy.

The application of resonance improves the situation somewhat. When resonant coupling is used the transmitter and receiver inductors are tuned to a mutual frequency and the drive current is modified from a sinusoidal to a no sinusoidal transient waveform. A common use of the technology is for powering contactless smartcards, and systems exist to power and recharge laptops and cell phones.

III. ELECTROSTATIC INDUCTION

The “electrostatic induction effect” or “capacitive coupling” is an electric field gradient or differential capacitance between two elevated electrodes over a conducting ground plane for wireless energy transmission involving high frequency alternating current potential differences transmitted between two plates or nodes. The electrostatic forces through natural media across a conductor situated in the changing magnetic

flux can transfer energy to a receiving device (such as Tesla's wireless bulbs). Sometimes called "the Tesla effect" it is the application of a type of electrical displacement, i.e., the passage of electrical energy through space and matter, other than and in addition to the development of a potential across a conductor.

In some cases when small amounts of energy are required the high elevation of the terminals, and more particularly of the receiving-terminal ' may not be necessary, since, especially when the frequency of the currents is very high, a sufficient amount of energy may be collected at that terminal by electrostatic induction from the upper air strata, which are rendered conducting by the active terminal of the transmitter or through which the currents from the same are conveyed."-

An electrostatic induction or capacitive coupling, the passage of electric energy by a dielectric. In practice, an electric field gradient or differential capacitance between two or more insulated blocks, plates, electrodes, or nodes, which are elevated above a conductive ground plane. The electric field is generated by feeding the sheets with a high potential, high-frequency AC power supply. The capacitance between two terminals and a higher powered device form a voltage divider.

IV. Electromagnetic Radiation

Radio waves are used for wireless transmission of sound messages, or information, for communication, as well as for maritime and aircraft navigation. The information is imposed on the electromagnetic carrier wave as amplitude modulation (AM) or as frequency modulation (FM) or in digital form (pulse modulation). Transmission therefore involves not a single-frequency electromagnetic wave but rather a frequency band whose width is proportional to the information density. The width is about 10,000 Hz for telephone, 20,000 Hz for high-fidelity sound, and five megahertz (MHz = one million hertz) for high-definition television. This width and the decrease in efficiency of generating electromagnetic waves with decreasing frequency sets a lower frequency limit for radio waves near 10,000 Hz. The curvature of the Earth limits the line-of-sight distance from the top of a 100-metre (330-foot) tower to about 30 kilometers (19 miles). Marconi's unexpected success in transmitting messages over more than 2,000 kilometers led to the discovery of the Kennelly–Heaviside layer, more commonly known as the ionosphere. This region is an approximately 300-kilometre-thick layer starting about 100 kilometers above the Earth's surface in which the atmosphere is partially ionized by ultraviolet light from the Sun, giving rise to enough electrons and ions to affect radio waves. Because of the Sun's involvement, the height, width, and degree of ionization of the stratified ionosphere vary from day to night and from summer to winter.

The main reason for greater distances with radio waves and optical devices is the fact that the electromagnetic radiation can be in the far field to be (with high directivity antennas or well-collimated laser beam) adapted the shape of the reception area, so it provides almost radiated power at long range. The maximum directivity for antennas is physically limited by diffraction.

V. Laser Methods

When electromagnetic radiation in detail the visible spectrum (10s microns (um) to 10s nm) capable of transmitting power through the conversion of current into a laser beam, which is then at a solar cell receiver it This mechanism is usually called "power beaming "because the power at a receiver, convert it into usable electrical energy radiated can be known. The laser "power beaming" technology has been studied primarily in military weapons and space and applications will be developed for commercial and consumer electronics Low-Power applications. Wireless energy transfer system using laser for consumer space has to satisfy Laser safety requirements. laser energy transmission allows much higher energy densities, a narrower focus of the beam and smaller emission and receiver diameters. laser generation system mass, laser generation temperature requirement..

VI. Electrical Conduction

- Electrical conduction is the movement of electrically charged particles through a transmission medium.
- The movement can form an electric current in response to an electric field. The underlying mechanism for this movement depends on the material.
- Conduction in metals and resistors is well described by Ohm's Law, which states that the current is proportional to the applied electric field. Disturbed charge of ground and air method. The wireless transmission of alternating current through the earth with an equivalent electrical displacement obtained by the air above long areas that are higher than the resonant electrical induction methods and low compared with the electromagnetic radiation methods. Electrical energy can be transmitted through inhomogeneous earth with low loss because the net resistance between earth antipodes is less than 1 ohm, the electrical adjustment takes place predominantly by electrical conduction through the oceans, and metallic ore bodies and similar subsurface structures. The electric displacement by electrostatic induction through the more dielectric regions such as quartz deposits and other nonconductive minerals. Recipients are attracted by currents through the earth while an equivalent electric displacement is carried out in the atmosphere.

VII. Microwave Method

Hear a directional transmission using radio waves are as long distance power transmission for a shorter wavelengths of the electromagnetic radiation, as usual microwave range. A converter Rectenna is used for converting the microwave energy into electricity. It is efficiency is released have been in excess of 95%. Power beaming using microwaves has been for the transfer of energy from solar power satellites orbiting the earth and leave the beaming of power to spacecraft orbit has been considered.

VIII. Conclusion

In this the concept of Microwave Power transmission (MPT) and Wireless Power Transmission system is presented. As we know the own has their advantages and disadvantages of microwave power transmission. Hence the selection of the technology is depends upon the number of parameters such required power, distance, medium, application, complexity and cost. This concept offers greater possibilities for transmitting power with negligible losses and ease of transmission than any invention or discovery.

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