# Wireless Electricity Supply

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*Abstract*— Wirelessly transferring power varies from the traditional way of transmitting, which meet the needs of the development of technology. It may be widely used in electronic appliances, medical devices, industry and other fields, and has become a research hotspot at home and abroad. Let us consider a future in which wireless power supply is feasible: cell phones, household robots, mp3 players, laptop computers and other portable electronics capable of charging themselves without being plugged in it, it will free us from that final, ubiquitous power wire. These devices may not even need their bulky batteries to operate. These specific techniques include resonating inductive coupling in efficient and moderate range. The coupling consists of a capacitor along with an inductor with its own resonating frequency. In any system, coupled resonators often exists a "strongly coupled" regime of operations. If one operate in that regime in a given system. This paper as a whole gives an effective, high performance techniques which can efficiently wirelessly transmit the power to desired areas.

***Keywords:*** Wireless Electricity Supply, Wireless Power Transmission, Electrodynamic Induction, Transmitters, Microwave Power Supply, Renewable Energy

## I. INTRODUCTION

Unless we are particularly organized and good with tie wrap, you may probably have few or dustier power cord tangles around your home. You may have been even had to follow one or some particular cord through the seemingly impossible outlet hoping that the plug you pull will be the right one. This is one of the downfalls of electricity. While it can make people's lives easier, it may add a lot of clutter in the process. For these reasons, scientists have tried to develop methods of wireless power conveyance system that would cut the clutter or lead to clean sources of electricity. Researchers have designed and developed several techniques for moving electricity over long distances without wires that is wirelessly. Some exist only as theories, but others are already in use. This paper provides with the techniques that are used for wireless power conveyance systems.

### *A. History*

The foundation for the development of wireless power transmission. WPT Wireless power transmission is commonly known as wireless transmission of energy. It's a technology system that converts electricity into other radio waves for specific receiving devices and then transmits them again onto load of powers. In the19th Century, Nicola Tesla [3] who a experimented about wireless power transmission. In his experiment, he successfully achieved the transfer of energy between Tesla coils and successfully used Tesla coils to light a wireless bulb which mile stoned the foundation for the development of WPT wireless power transmission.

### *B. Grouping of Wireless Power Transmission*

The narrow range transmission is realized by the principles of electromagnetic induction EI, and the upper limit is 8cm. Electromagnetic induction generates current through primary and secondary coils used, and its electromagnetic field can penetrate all non-metallic materials, so as to achieve the transmission from starting devices to end devices. The rule of thumb of electromagnetic induction is too used in power supply of small equipment's because of the limit of transmission distance. Medium range transmission is obtained by electromagnetic coupling resonance principles or wave radio frequency. As compared with the electromagnetic induction, wireless power transfer, the magnetic field is weaker as compare to electromagnetic induction, the transmission power is higher, the transmission distance is longer, and the transmission distance is 2 to 4meters. Radio frequency power transmission mainly transmits radio frequency signal through amplifier, and get direct current DC through demodulation and high frequency rectifiers to realize transmission of powers. Its transmission distance is 100m to 1000m. Microwave or lasers are sent to the receiving antenna, and processed through rectification and modulation. Remote transmission can be used to supply power to remote areas, and it also has important strategic significance for space technology, such as artificial satellites, energy transmission between spacecraft's, and new energy utilization, such as space solar power stations.

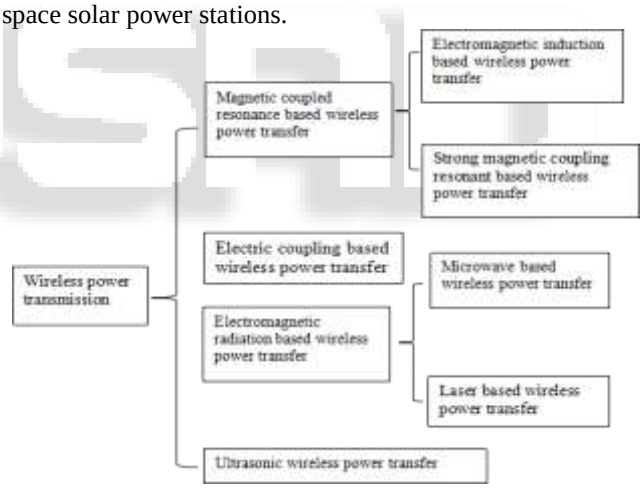


Fig. 1: Power Transmission Taxonomy

### *C. Evanest Wave Coupling*

Researchers at MIT and other research centers believe they had discovered a way to transferring wirelessly using non-radiative electromagnetic energy resonant tunneling NREERT. Since electromagnetic waves could tunnel, they would not propagate through the thin air to be absorbed or wasted, and will not disrupt electronic appliances or cause physical injury like microwave or radio transmission. Researchers anticipated up to 10 meters of range.

### *D. Electrodynamic Induction*

Also called as "resonant inductive coupling" revolves the main problem with non-resonant inductive coupling for wireless power transfer. Specifically saying, the dependency of efficiency on transmission distances. When resonant coupling is used transmitters and receivers are tuned to

 

mutual frequency and the drive current is modified from a sinusoidal wave to a non-sinusoidal transient waveform. Pulse power happens over multiple cycles. This way we can achieve significant power may be transmitted over a few meters to distance of up to a few times the size of the transmitter.

### *E. Radio and Microwave*

Power transmission via radio waves can be made bi-directional, allowing longer distance power beaming supply, with short distance wavelengths of electromagnetic radiations, typically in the microwave range. An antenna may be used to convert the microwave energy back into electricity. Antenna conversion efficiencies exceeding 97% have been realized. Power transfer using micro waves has been proposed for the transmission of energy from orbiting solar power satellites to Earth and the beaming power to spacecraft leaving orbit has been considered.

## II. RESEARCH HOTSPOTS OF WPT

1) Field of intelligent household appliances in 2011, Haier group launched the world's first "tailless TV" without power lines, signal lines and network lines, causing a sensation. The developed TV may achieve and obtain long distance and high efficient wireless power transmission without the use of wires, which is a great example of the combination of wireless power transmission and practical appliances. In addition to that, portable electronic products, such as phones and panel Power Computers may greatly improve the user experience UX through wireless power transmission technology, which is convenient to use.
2) Field of electric vehicle The application of wireless power transmission to the field of electric vehicle charging can greatly improve the scope of application of electric vehicles, increase the penetrate rate of electric vehicles and reduce the number of charging piles, which is conducive to the protection of energy and environment.
3) Implantable medical device the power demand of implantable medical devices is very small. Such as cardiac pacemaker, gastrointestinal endoscopy and so on.
4) Industrial application many environments in the industry cannot use the wired power supply, such as underwater and chemical environment. Wireless power transmission WPT will overcome these short comings and the development of technology used. Such as underwater detector, pipeline detection robot and so on.

## III. CURRENT TECHNOLOGY IN WPT

The most recent research use microwaves as the frequency range of choice for transmitting of energy and power. At present an efficiency of 82% is possible using current technology for microwave power transmission. For t efficiency of the transmission the waves must be guided and focus so that all the energy transmitted by the device is incident on of the wave collection device. High frequencies are impractical because of the high price of transmitters and receivers and the relative low efficiency of currentoptical and infrared and radio devices.

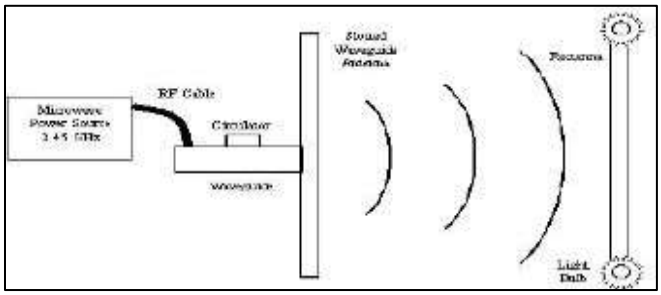


Fig. 2: Microwave Power Transmission

Solar power creating satellites launched into orbits and transmitting power to stations on Earth. This idea was firstproposed in 1970 and all of the experiments have only been carried out in terrestrial laboratories. This would allow them to receive light 99% of the year. A large antenna array facility will be built on the Earth to collect the incoming microwaves. To maintain a good lock on the antenna the satellite will need to be built with a retro directivetransmitter which locks on to a pilot beam emanated from the ground station.

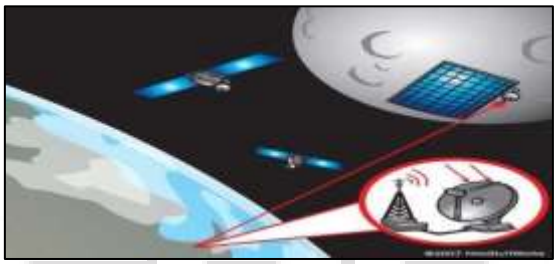

Fig. 3: Solar power satellite beam

Since most of the research is been completed in the 2.4 GHz to 6.2 GHz range there are some spectrum regulatory issues to be dealtwith. Also since the retro directive antenna system is unproven till now. There is the health related concerns that the microwave beam would get off target and microwave some unsuspectingfamilies. However, a Japanese agency is planningto send up 10 to 100 kW low earth orbit satellite to prove its feasibility.

## IV. LATEST INVENTION AND EXPERIMENTS

### *A. Wi Tricity*

The new technology called Wi Tricity is based on using coupled resonant objects. Two resonant objects of the same resonant frequency can greatly exchange energy efficiently, while interacting with the weakly extraneous off resonant objects.

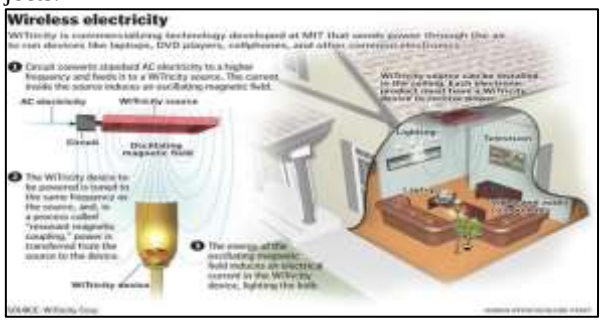


Fig. 4: Wi Tricity image of how the fields work.

A person on a swing ride is a good example for this one. A swing is atype of resonance, when the person pumpshis or her

 

legs at natural frequency of the swing is he or she able to impart their substantial energy.

Fig. 4: Experiment at MIT for WPT

The presented design consists of two resonant copper coils system. One coil is attached to the power source first. Instead of illuminating the environment with electromagnetic waves, it occupies space around it with a non-illuminating magnetic field oscillating at MHz frequency. The non-illuminating field mediates the powerexchange with the other coil (the receiving device), which especially designed to resonate with the field. The resonant nature of the process guarantees of the strong interaction between the sending unit and the receiving unit, while the interaction with the rest of the environment is weak.

## V. FUTURE ASPECTS

### *A. Power-Generating Solar Satellite Inhabitat*

Japan wants to power up three million houses with wireless energy from space in coming future. They have amazing plans to send a solar-panel-equipped satellite into space that could wirelesslybeam a gig watt-strong stream of power down to earth seriously.

Fig. 5: Japan's wireless, power-generating, solar satellite inhabitat

A test model is scheduled for launch in 2017. To iron out all the kinks and get a fully functional system set up is estimated to take three or decades. A major kink, iscoping with the possible dangers when a 1-gigawattmicrowave beam aimed at a small spot on Earth if misses its target.

The $23 billion project just received major backing from Mitsubishi and designer IHI (in addition to research teams from 17 other countries).

### *B. Third-Generation Wireless Power*

.Power by Proxi has developed a 4G wireless power delivery system. Earlier generations of wireless power technology were on split transformers consisting of twohalves: one is input side (primary) and other is an output side (secondary). Electrical energy applied to the primary is then converted to an electromagnetic field that induces a current in the secondary, which passes the energy to a load system. The very essential difference between earlier generations of wireless power solutions and the one developed by Power by Proxi is that the Power by Proxi system offers high efficiency levels as compare torelatively loose coupling arrangements across an air gap or through any nonmetallic substrate.

Fig. 6: Experiment at INTEL for WPT

Power by Proxi takes a different approach to wireless power with its patented Proxi Wave technology. It uses coils to transmit and receive power between a energy transmitters.

Many technologies are being developed around the globe for power transfer using microwaves

1) Beam control, Target detection, Propagation
2) Transmitters: - Magnetron, travelling wave tube amplifiers, klystron, semiconductor amplifiers.
3) Antennas: - In some MPT experiments in Japan, the phased array antenna was adopted to steer a direction of the microwave beam.

## VI. CONCLUSION

Wireless power transmission WPT of electrical power is considered as a large scope in electrical engineering for future prospects of power generation and transfer. Solar power satellites are the near future of supplying non-conventional energy to people soon. The several methods and aspects regarding wireless power transmission WPT of electrical power are discussed above. The evolution phases of the technology from the time of scientist Nikola Tesla has been overviewed.

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