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POWER YOUR ENTIRE HOME WITHOUT WIRES

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Abstract— Generally the power is transmitted through wires. We cannot imagine the world without electric power. Imagine a future in which wireless power transfer is feasible. As the demand increases day by day, the power generation increases and the power losses is also increased. In our present electricity generation system we waste more than half of our resources. Much of this power is wasted during transmission from power plant generators to the consumer. Now-a-days global scenario has been changed a lot and there is tremendous development in every field. If we don't keep pace with the development of new power technology we have to face a decreasing trend in the development of power sector. The transmission of power without wires may be one noble alternative for electricity transmission. This paper presents a comprehensive review and detailed analysis of various techniques used for wireless power transmission.

Keywords— wireless power transmission, WiTricity

I. INTRODUCTION

The First attempts to transmit energy wirelessly with the purpose of doing so are attributed to Serbian inventor N. Tesla at his laboratory in Long Island; New York .Tesla based his wireless electricity idea on a concept known as electromagnetic induction which was discovered by Michael Faraday in 1831and holds that electric current flowing through one wire can induce current to flow in another wire, nearby. To illustrate that principle, Tesla built two huge world power towers that would broadcast current into the American air, to be received remotely by electrical devices around the globe. Few believed it could work. And to be fair to the doubters, it didn't exactly. When Tesla first switched on his 200 foot-tall 1000000 volt Colorado Springs tower 130 foot-long bolts of electricity shot out of it, sparks leaped up at the toes of passerby and the grass around the lab glowed blue. it was too much, too soon. Tesla had always tried to introduce worldwide wireless power distribution system. But due to lack of funding and technology of that time, he was not able to complete the task. Then onwards this technology has not been developed up to the level which would be completely applicable for practical purpose. Research has always been going on and recent developments have been observed in this field. But now Tesla dreams have come true. After more than 100 years of dashed hopes, several companies are coming to market with technologies that can safely transmit power through the air. Despite advances wireless power transmission has not been adopted for commercial use. Until this development after all phrases "mobile electronics" has been a lie: how portable is your laptop if it has to feed every four hour, like an embryo, through a cord? How mobile is your phone if it shuts down after too long away from a plug? And how flexible is your business if your production area can't move the ceiling lights? [2]

II. WIRELESS ELECTRICITY TRANSMISSION

Magnetic induction is a technology that you will probably remember from your physics classes at high school. You need two coils, a transmitter coil and a receiver coil. An alternating current in the transmitter coil generates a magnetic field which induces a voltage in the receiver coil. This voltage can be used to power a mobile device or charge a battery.

Inductive Coupling

The first wireless powering system to market is an inductive device, much like the one Tesla saw in his dreams, but a lot smaller. It looks like a mouse pad and can send power through the air, over a distance of up to a few inches. A powered coil inside that pad creates a magnetic field, which as Faraday predicted, induces current to flow through a small secondary coil that's built into any portable device, such as a flashlight, a phone. The electrical current that then flows in that secondary coil charges the device's onboard rechargeable battery.

Radio-frequency harvesting

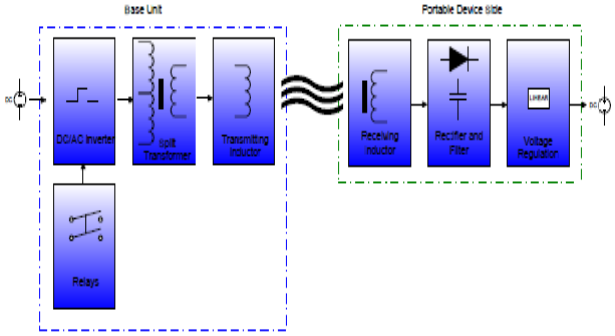
The induction systems are only the beginning. Some of the most visually arresting examples of wireless electricity are based on what's known as radio frequency, or RF. While less efficient, they work across distances of up to 85 feet. In these systems, electricity is transformed into radio waves, which are transmitted across a room, then received by so-called power harvesters and translated back into low-voltage direct current.

Magnetically Coupled Resonance

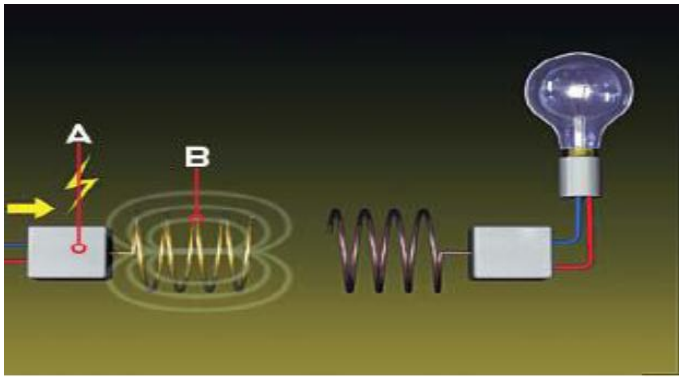
INVENTED BY MIT'S SOLJACIC (who has dubbed it WiTricity), the technique can power an entire room, assuming the room is filled with enabled devices. Though WiTricity uses two coils one powered, one not, just like eCoupled's system it differs radically in the following way: Soljacic's coils don't have to be close to each other to transfer energy. Instead, they depend on so-called magnetic resonance. Like acoustical resonance, which allows an opera singer to break a glass across the room by vibrating it with the correct frequency of her voice's sound waves, magnetic resonance can launch an energetic response in something far away. In this case, the response is the flow of electricity out of the receiving coil and into the device to which it's connected. The only caveat is that receiving coil must be properly "tuned" to match the powered coil.

How it works

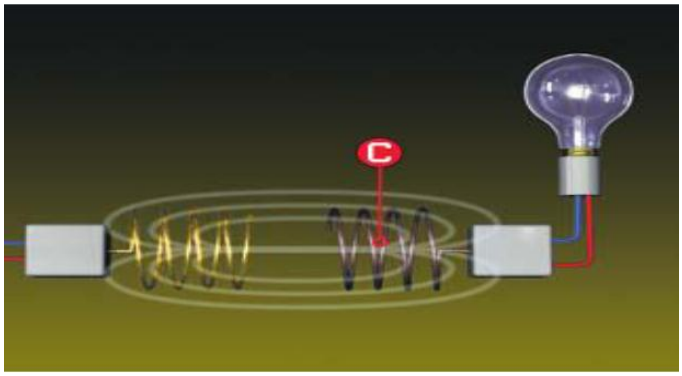
The concept of wireless electricity works on the principle of using coupled resonant objects for the transfer of electricity to objects without the use of any wires. This concept of WiTricity was made possible using resonance where an object vibrates with the application of a certain frequency of energy. So two objects having similar resonance tend to exchange energy without causing any effects on the surrounding objects. [11]



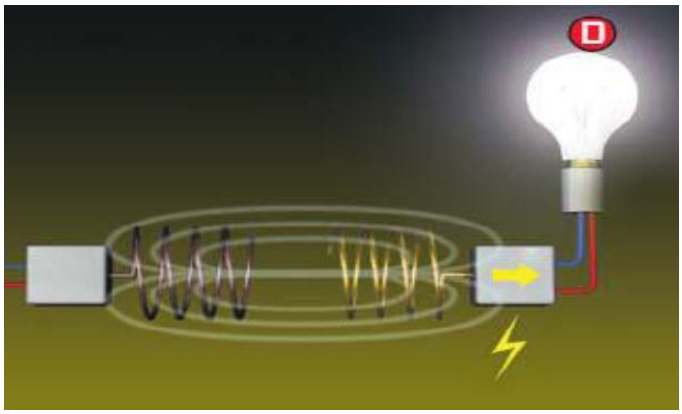
A circuit [A] attached to the wall socket converts the standard 60-hertz current to 10 megahertz and feeds it to the transmitting coil [B]. The oscillating current inside the transmitting coil causes the coil to emit a 10 -megahertz magnetic field



The receiving coil [C] has the exact same dimensions as the sending coil and thus resonates at the same frequency and, in a process called magnetic induction, picks up the energy of the first coil's magnetic field.



The energy of the oscillating magnetic field induces an electrical current in the receiving coil, lighting the bulb [D].



III. RECENT RESEARCH

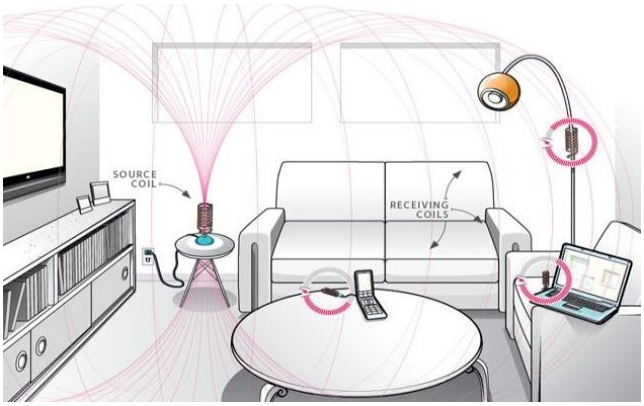
Japan space scientists make wireless energy breakthrough

Japanese scientists have succeeded in transmitting energy wirelessly, in a key step that could one day make solar power generation in space a possibility,[3]Researchers used microwaves to deliver 1.8 kilowatts of power enough to run an electric kettle through the air with pinpoint accuracy to a receiver 55 meters (170 feet) away. While the distance was not huge, the technology could pave the way for mankind to eventually tap the vast amount of solar energy available in space and use it here on Earth, a spokesman for The Japan Aerospace Exploration Agency (JAXA) said. "This was the first time anyone has managed to send a high output of nearly two kilowatts of electric power via microwaves to a small target, using a delicate directivity control device," he said. JAXA has been working on devising Space Solar Power Systems for years, the spokesman said. Solar power generation in space has many advantages over its Earth-based cousin, notably the permanent availability of energy, regardless of weather or time of day.
While man-made satellites, such as the International Space Station, have long since been able to use the solar energy that washes over them from the sun, getting that power down to Earth where people can use it has been the thing of science fiction.
"But it could take decades before we see practical application of the technology—maybe in the 2040s or later," he said.
"There are a number of challenges to overcome, such as how to send huge structures into space, how to construct them and how to maintain them.

Need for wireless power transmission

Wireless electricity is one of the most emerging solutions to the global power crisis. It is defined as the transfer of wireless electricity or power from a source to a load without the use of any artificial interconnecting conductors such as wires [13]. Wireless electricity is being used primarily on the basis that at times, wires can be inefficient (power is lost as wires transmit electricity over long distances), inconvenient (in terms of cost and labor) and sometimes hazardous (many people may be electrocuted or put in some sort of danger).
Wireless transmission is employed in cases where instantaneous or continuous energy transfer is needed, but interconnecting wires are inconvenient, hazardous, or impossible.

Number of household points receives electricity at the same frequency using single transmitting coil as long as they all are at resonance. So this setup could Recharge all the devices in a room at once.



IV. APPLICATIONS

Direct Wireless Power—when all the power a device needs is provided wirelessly, and no batteries are required. This mode is for a device that is always used within range of its *WiTricity* power source.

Automatic Wireless Charging—when a device with rechargeable batteries charges itself while still in use or at rest, without requiring a power cord or battery replacement. This mode is for a mobile device that may be used both in and out of range of its *WiTricity* power source.

in the macroscopic world, this scheme could potentially be used to deliver power to robots and computers in a factory room, or electric buses on a highway (source-cavity would in this case be a ‘‘pipe’’ running above the highway).some other applications where wireless power transmission can be used are Consumer electronics, Transportation, Industry applications, Medical devices, Military applications and Robots.

V. CONCULSION

In conclusion, it is clear that resonant inductive coupling power transmission would be extremely beneficial to society if it were implemented in homes and homes electronics. From an environmental stand point, this technology could replace disposable batteries and cords, reducing dangerous chemicals and potential for poisoning communities. The transition would be somewhat slow and take many years to show up in a majority of places. However switching to wireless power would increase the efficiency and convenience of these electronics, while lowering the environmental impact in the long run. Wireless power transmission would have many interesting applications. Some of the

applications involve simply powering devices or vehicles from a remote power source. However, the energy grid could be affected as well. If long distance, high efficiency wireless power transmission is possible, we could reduce our reliance on transmission lines to transfer energy over long distances. Moreover, wireless power transfer could allow an alternative source of clean energy by transmitting solar power from space back down to places where it is needed on earth. Further research into wireless transmission will show whether some of these plans are feasible.

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