

Review On Wireless Power Transmission By Using Satellite Solar System

¹ Darshan Kudalkar, ² Dhanashree Aeer, ³ Suraj Karangutkar, ⁴ Prajakta Pasupaleti.
^{1,2,3,4}Student , Bachelor in SSPM's College Of Engineering, kankavli

Abstract: In solar power Satellite System; the main aim is to design an efficient energy system which will collect solar energy in space and transmit to ground with higher efficiency. It should also able to control infrastructure of global environment and energy problems on human beings. Without connecting the wire the electrical energy from a power source and also the load across an air gap which can be transmitted mandatorily by using wireless power transmission system. In this paper, wireless power transmission we can carry out by using a pilot study to exist technology, not only recent technology but also future trends. We have also given application of wireless transmission in plenty description.

Index terms: WPT, SPS, Rectenna, Magnetron

I. INTRODUCTION

The electricity can be generated by the different ways, generation of electricity only due to the natural resources. These all requires non conventional energy sources and few decades the renewable energy sources will exhaust through the earth. solar power requires large panels for the generation of large amount of electricity hence the amount of the cost is increases, but by using the SPS system we can acquire end less energy sources ,number of satellites are available in the space and they their own energy and these are endless energy sources hence for the future aspects the SPS system by using the WPT is essential to overcomes the drawback from the current existing system .Satellite energy is the endless energy source which is available in space and it can produce huge amount of heat and also the light. In solar power satellite the main aim of this paper is that to design an efficient energy system which will collect energy in space through the various orbits and transmitted to ground with the higher efficiency and uses where the location is needed No need to invest as a grid in large amount. During the transmission of electricity large amount of losses are occurred not only for the transmission system but also the generating station. In electrical grid distribution system the resistance of the wire causes losses of 26% to 30% of the energy generated. The generation is done primarily base on the fossil fuels, which will not last long days. The main advantage of SPS system by using the WPT is that it is a pollution free, replacement of fossil fuel in future transmission line will be eliminate, head lines and also the cables. No any environmental pollution is created such as air and water during the generation. The power can published by various Indian government agencies put that number at 30%, 40% and greater than 40%. This is attributed to technical losses (grid's inefficiencies) and theft. Any problem can be solved by state-of-the-art technology. The above discussed problem can be solved by choosing an alternative option for power transmission which could provide much higher Efficiency; low transmission cost and avoids power theft. Microwave Power Transmission is one of the promising Technologies and may be the righteous alternative for efficient power transmission

II. SOLAR POWER SATELLITE CONCEPT

Solar power is a reality. Today, increasing numbers of photovoltaic and other solar-powered installations are in service around the world and in space.

Sun is source of this space based solar power system. This system is work on the radiation of sunlight. In this system solar panel is convert sunlight rays into radiating energy. Type of solar panel is gallium arsenide. Then this radiation energy converted into electrical energy.

This energy is generated in space but this energy utilize in earth so for utilize transfer this energy transfer to the earth by using special equipment. This energy generated 30,000km away from earth so required special equipment to transfer energy to earth.

This equipment is magnetron and rectenna. Magnetron is device that converts electrical energy into microwave energy and transfer to the earth.this microwave energy is collected on earth by using rectenna and this microwave energy into electrical energy.

We use energy in from AC supply and output of rectenna in form of DC so this energy converted into AC supply for utilization.

Conversion of solar energy:-

There are two method are use for solar energy to electrical power (DC) as follow.

i) photo voltaic (PV) conversion

ii) Solar dynamic conversion –from research there is most useful method is photovoltaic conversion. In this case there are semiconductor cells (e.g. silicon or gallium arsenide) to directly convert photos into electrical power via rate of mechanical mechanism weight. The implementation of sps system is rather different the photovoltaic cells are less expensive generally lighter in from land based glass protected solar plate.

A. Conversion DC to microwave power

To convert the DC power to microwave energy there are use the antenna towards the earth, like klystrons, magnetrons are used.

The DC power converted to microwave power at transmitted end of the system by using magnetron. The heat

of the magnetron is the high voltage system the magnetron is diode type electron tube, which uses the interaction of magnetic and electric field to produce oscillation of vary high peak power.

As the electrons move towards their objective, they encounter the powerful magnetic the permanent effect tends to deflect the electrons away the anode due to the combined affect of electric and magnetic field an electrons trajectory they revive to the at right angle to there previous direction due there obtain result expanding circular orbit around the cathode. which overnight reaches the anode. Due to interactions of this rotating space charge wheel with the configuration of surface of anode, produced the alternating current at very high frequency in resonant cavity of the anode. One of these cavities through waveguide output is taken the low cost and readily magnetron available in ground.

Also this principle would be used at special magnetron would be developed for space use. A solar power satellite operating with 10GW of radiated power would radiate a total power of one microwatt in a channel with is 400Hz.

B. Transmitting Antenna

We can make Power transmission via radio waves is more directional with wavelength of electromagnetic radiation, typically in the microwave range. power beaming using microwaves has been proposed for transmission of energy from orbiting solar power satellites to earth and beaming of, allowing longer distance power beaming, with shorter power to spacecraft leaving orbit has been considered.

The sizing of the equipment is design by the distance from transmitter to receiver, the wavelength and the Rayleigh criterion or diffraction limit, used in standard ratio frequency antenna design. Also applied to lasers.

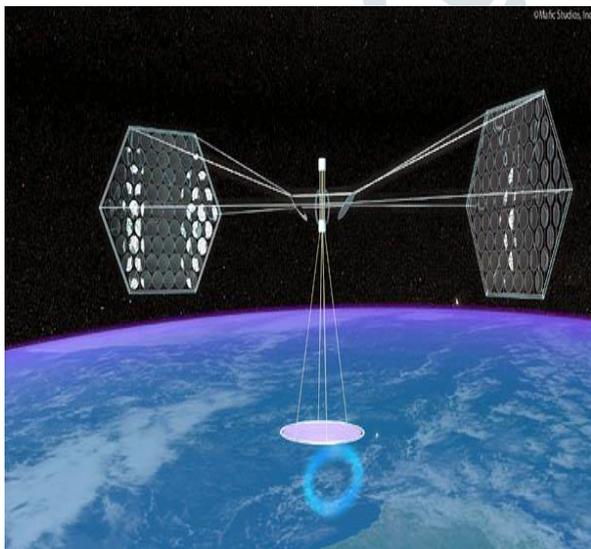


Fig 1. Shows a design of Solar Power Satellite (SPS)

The energy is available for 24 hours in a day in space therefore We can get great benefit by implementing these solar cells in space instead of implementing them on the ground, because of this the total solar energy available to the satellite could be between four and five times more than available anywhere on Earth and 15 times more than

the average location. The testing has been demonstrated that wireless energy transmission to the Earth can be accomplished at very high efficiencies. These Tests have also shown that the energy density in the radio-frequency beam can be limited to safe levels for all life forms. The concept is simple; the technology exists.

C. Transmission

The electro-magnetic induction and electro-magnetic radiation has disadvantages so we can use implementation of electrical conduction and resonant frequency methods. In this resonant induction method is most implementable. This method could allow for elimination of many existing high tension power transmission line and facilitate the inter connection of electric generation plants in global scale.

The microwave source consists of microwave oven magnetron with electronics to control the output power. This output power ranges from 50W to 200W at 2.4GHz. These microwaves are situated on the electromagnetic spectrum with frequencies ranging from 0.3 to 300GHz. Here in this the energy which is transmitted by microwave is very diffusive in nature.

The use of microwave is to transmission is well proven .the experiments in the tens of kilowatts have been performing in California in 1975.

These methods achieve distances on the order of a kilometer.

D. Ground Segment

The sps system requires a large receiving area with a rectenna array and the power network connected to the existing power grids on the ground each rectenna element supplies few watts and the total received power is in the GW. This rectenna may be used to convert the microwave energy back into electricity

The rectenna is a passive element with a rectifying diode, and is operated without any extra power source. It has a low pass filter between the antenna and the rectifying diode which is used to suppress radiations of higher harmonics .It has also an output smoothing filter.

The earth based receiver antenna is a critical part of the original sps concept. It has many short dipole antennas, connected via diodes with conventional microwave antenna the reception efficiency is still better, but the cost and complexity is also considerable greater, almost certainly prohibitively to crops and farms animals may be raised under a rectenna so such rectenna would not be expensive in terms of land use. It has a 25% collects and conversion efficiency but rectennas have been tested with greater than 90%.

III. WIRELESS POWER TRANSMISSION

Wireless power transmission, also known as inductive power transfer, can be used for short range or even long range without cords. This technology provides efficient, fast, and low maintenance cost as compared to previous technologies. It also allows portable electronics to charge themselves without ever being plugged in ubiquitous power wire. On the other hand, power loss of this technology is very less as compared to wired electricity transmission. The main function of wireless power transfer is to allow electrical devices to be continuously charged and lose the constraint of a power cord. There are three main systems used for WPT such as microwaves, resonance, and

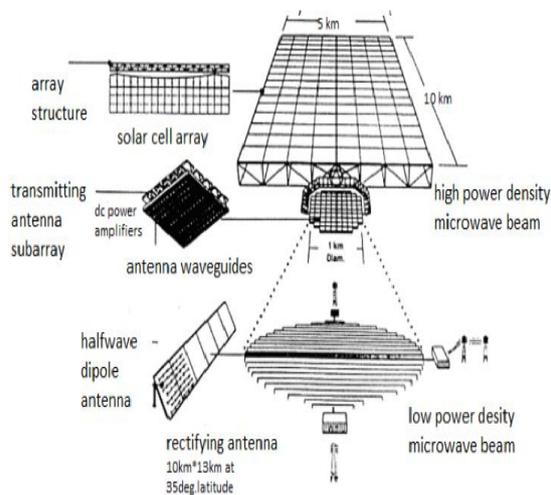
solar cells. Microwaves would be used to send electromagnetic radiation from a power source to a receiver in an electrical device.

The founder of AC electricity, Nikola Tesla, was first to conduct experiments dealing with WPT. His idea came from the notion that earth itself is a conductor that can carry a charge throughout the entire surface. While Tesla's experiments were not creating electricity, but just transferring it, his ideas can be applied to solve our energy crisis. Each application has its respective drawbacks but also has the potential to aid this planet in its dying need for an alternative to creating power.

order to achieve high energy conversion efficiency which is the most important parameter of such a device.

There are at least two advantages for rectennas:

- (1) the life time of the rectenna is almost unlimited and it does not need replacement (unlike batteries).
- (2) It is "green" for the environment (unlike batteries, no deposition to pollute the environment).



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Fig 2. Depicts a reference system

The main components of Wireless Power Transmission are Microwave Generator, Transmitting antenna and Receiving antenna (Rectenna).

IV. BLOCK DIAGRAM

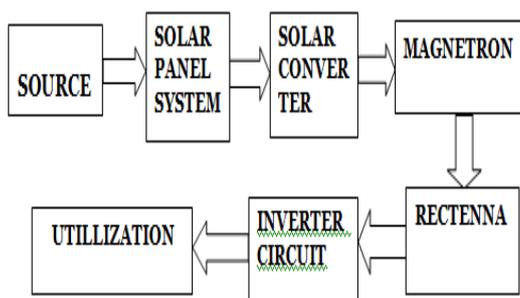


Fig 3. Basic Block Diagram

A. Rectenna

One of the most promising methods to harvest the wireless energy is to use a **rectenna** which is a combination of a **rectifier** and an **antenna**. The wireless energy can be collected by the antenna attached to rectifying diodes through filters and matching circuit. The rectifying diodes convert the received wireless energy into DC power. The low-pass filter will match the load with the rectifier and block the high order harmonics generated by the diode in

Rectenna

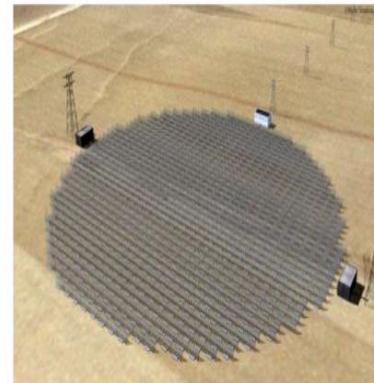


Fig 4. Rectenna

B. Magnetron:

The magnetron is diode type electron tube, which uses the interaction of magnetic and electric field in the complex cavity to produce oscillation of very high peak power. It employs radial electric field, axial magnetic field, anode structure and a cylindrical cathode. The cylindrical cathode is surrounded by an anode with cavities and thus a radial electric field will exist. The magnetic field due to two permanent magnets which are added above and below the tube structure is axial.

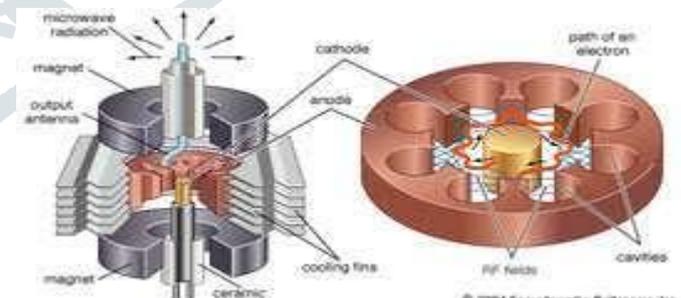


Fig 5. Magnetron

V. ADVANTAGES

- 1. The zero gravity and high vacuum condition in space would allow much lighter, low maintenance structures and collectors.
- 2. The cost of transmission and distribution becomes less and the cost of electrical energy for the consumer also would be reduced.

3. The power failure due to short circuit and fault on cables would never exist in the transmission and power theft would be not possible at all.
4. The power could be transmitted to the places where the wired transmission is not possible.

Gatina - University of La Réunion - Faculty of Science and Technology.

VI. DISADVANTAGE

1. Maintenance of SPS is expensive.
2. Transportation of all the materials from earth to space and installations is highly challenging.

CONCLUSION

S.P.S. appear to possess many significant environmental advantages as compared to alternative approaches to meeting increasing terrestrial demands for energy including requiring considerably less land area than terrestrially based sps system.

Fossil fuels which are used for electric power plants generate green house gases, these gases are responsible for global warming, and SPS can overcome this problem. SPS utilizes the fully power of the technology .We can get efficient, cost effective, losses free environment.

Though the success of sps depends on the successful development of key technology. It is certain the result will be worth the effort. SPS can solve energy problem for long term.

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