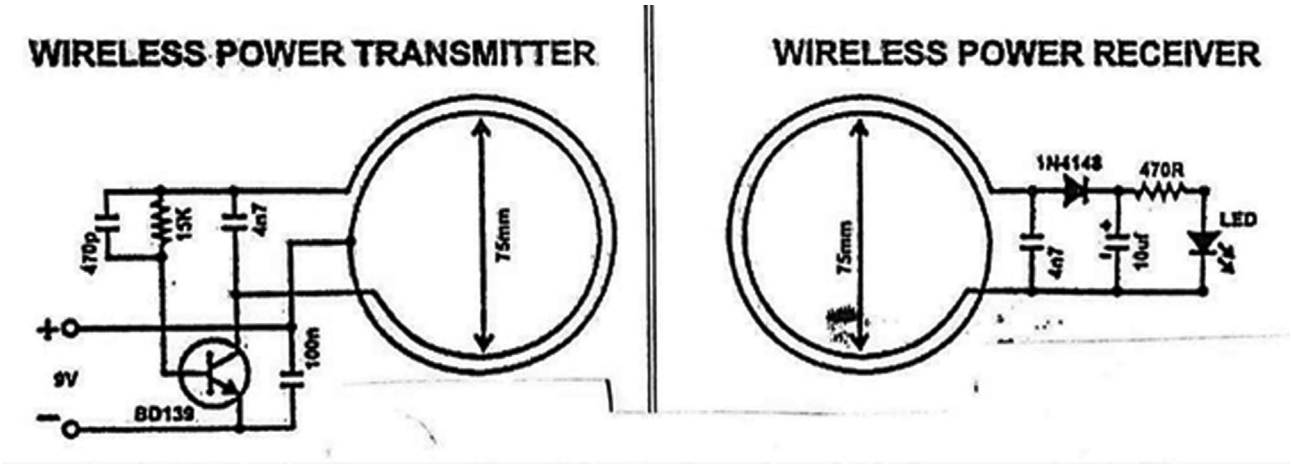


Figure 6. Circuit diagrams of Wire Power Transmitter and Receiver.

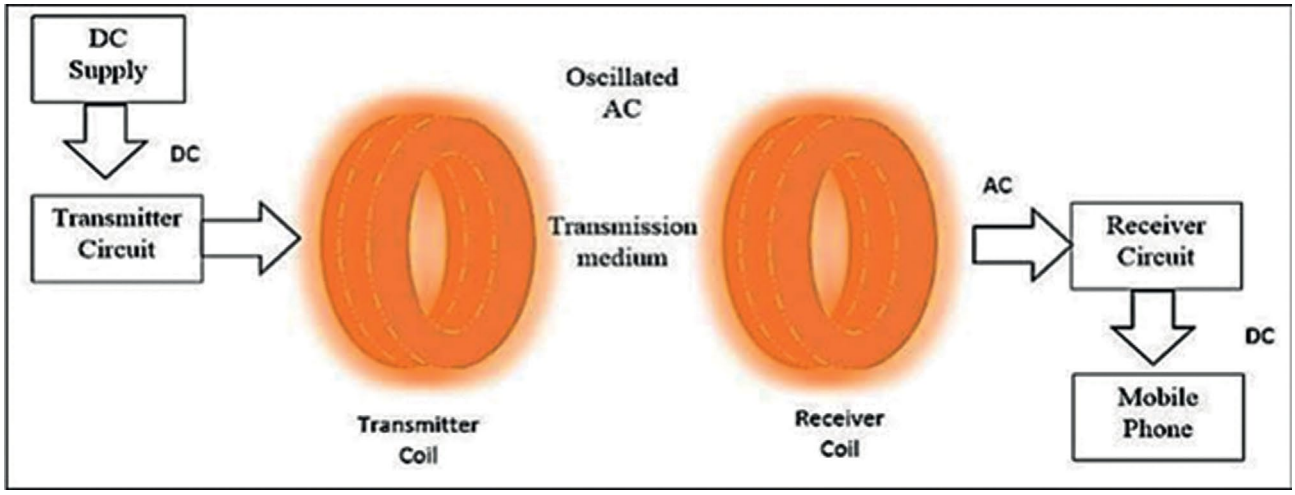


Figure 7. Complete schematic diagram of Wire Power Transmission system.

the trains which would make these systems wireless. Traditionally, the heavy wires on the electric train tracks cause the trains to become hazardous as they are transmitting 200Vac.

METHODOLOGY

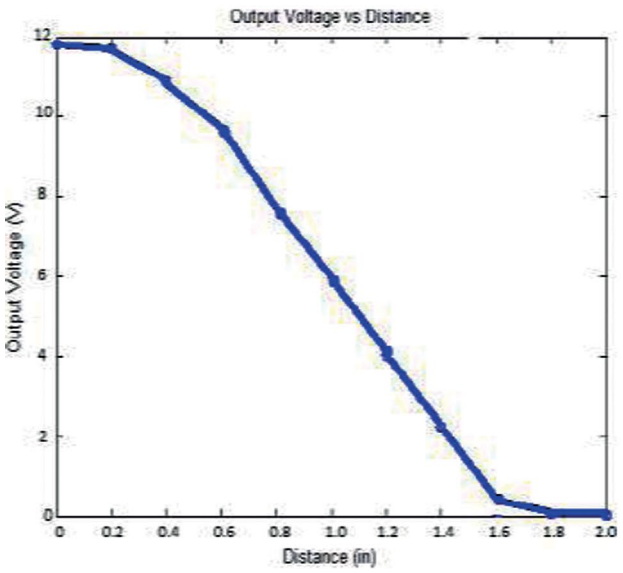
Designning and Working

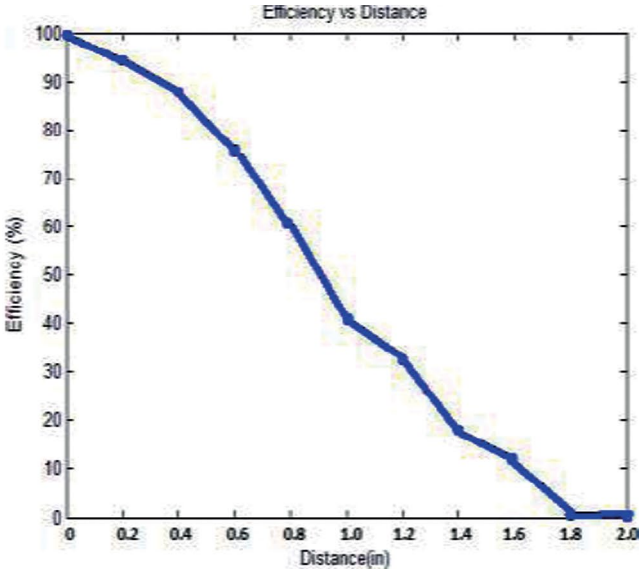
In this project, the essential principle involves converting DC power to AC power using switching and filters and then again converting it back to DC using voltage regulator. Electrical energy stored in rechargeable 18V battery supplied by solar panel. Transfer of energy by induction to the receiver via mutual induction. The transfer of energy performed by magnetic field.

When we turn on the switch the solar panel supply its energy via battery and battery starts charging. During this system, primary and secondary coils works as a transformer and generates AC voltage. The bi-polar NPN transistor "BD139" is placed which is employed to regulate on and off the load. Three capacitors are used in transmitter circuit and two capacitors are used in receiver circuit with their suitable resistances. In this system, capacitors are used for filtration which reduce the effect of noise sources. The system will work by using transmitting and receiving coils to transmit power from an AC line to resistive load. We place a voltage regulator which converts AC voltage into DC voltage which transmits the facility to the electrical load.

Physics and Mathematical Framework behind this work:

According to Orested's law, when the current is stable, a magnetic flux is generated. Expanding upon this is Bio-Savart's law, which is given by the following equation:





$$B = \frac{\mu_o}{4\pi}\int_1 \frac{Idl \times e_r}{r^2} \quad (1)$$

Where, *Idl* is the symbol for the current source in the wire, divided into nearly infinite segments *r* is a vector quantity that shows the displacement from the current source to the point in the field

e_r is the unit vector of *r* and μ_o represents the permeability of free space.

$$B = \frac{\mu_o NIa^2}{2(a^2+d^2)^{\frac{3}{2}}} \quad (2)$$

B represents the magnetic flux, N is the number of turns of the coil or loop, and I is the amount of current through this loop, a represents the radius of the transmitter and d is the distance between the transmitter and receiver.

And the estimate for the amount of flux received by the receiver is given by

$$\phi = \iint_s BdS \quad (3)$$

Where, S is the surface area of the secondary coil. Applying Faraday's law to find the amount of EMF induced, it is given by:

$$\varepsilon = -\frac{d\phi}{dt} \quad (4)$$

One of the phenomena that occurs during this process is that the variation in electric field of the receiving coil tends to induce a magnetic field in itself. This is known as self-induction and is represented by L:

$$L = \frac{N\phi}{I} \quad (5)$$

By combining the two equations shown above:

$$\varepsilon = -M\frac{dI}{dt} \quad (6)$$

And from here we achieve M which is the mutual inductance of the two coils combined, measured in Henry. As the emf induced on the coil is proportional to the mutual inductance, it can be represented by the following equation:

$$M = k\sqrt{L_1 L_2} \quad (7)$$

Here, k is known as the coupling factor where L1 and L2 are inductances of the primary and secondary coil. If the equation is alternating, then we get the following equation:

$$\emptyset = \iint_A \frac{\mu_o Nisin(\omega t)a^2}{2(a^2+d^2)^{\frac{3}{2}}} dA \quad (8)$$

The equation above shows that whatever voltage in the secondary coil is induced is a function of multiple parameters discussed above.

RESULTS AND DISCUSSION

An experiment has conducted to urge the WPT efficiency. The transmission coupling was supply from DC source. The difference within the distance between primary transmitter and secondary receiver are varied to get the distance for WPT.

The voltage transmitted to receiver drops because there is increase in the distance between the transmitter and receiver. The efficiency of the power transmitted drops because there is increase in the distance between transmitter and receiver.

The graph result shows the different distances with the voltage varied when the distance is different The DC input source was used which is a solar panel and the mobile phone is used as a load. The DC output voltage is getting decrease as the distance increases, it shows inverse relation. Mobile phone stops charging if the distance increases which means less voltage transferred to the load. The above measurements suggest that the system is suitable when the distance from transmitter coil to the receiver coil ranges from 0 to about 1.4inches. From the graph, we conclude the WPT is higher when the distance is low.

Based on experimental result, the study on WPT has aspect in terms of distance and range of frequency and the result show the closer the distance, the transfer of voltage is higher, distance of the nearest is the most efficient WPT. The system further enhanced by integrating the charging adapter with the mobile so that users will need to place mobile phones on charging pad to charge it.

CONCLUSION

Solar power generation and Wireless Power Transfer both the technologies are focused in our work. The idea of WPT through renewable power generation provides clean, green, non-conventional and efficient power transmission through wireless medium. This would offer great development in the field of solar and wireless technology. The physics and laws behind wireless power technology are the main steps of the project which were discussed. Review the current industry situation and available solutions are evaluated. The system consist of transmitter and receiver boards developed and uses a coupling phenomenon to transfer of electricity. By utilizing the wireless technology, we can get rid of fossil fuel electric power plants that generates harmful greenhouse gases for global warming. Wireless electricity transmission overcome these problems well. However, technology will change concept of electricity in near future and to acquire the most efficient, effective, pollution free and healthy way of getting electricity.

Now it a reality that power transmission can be possible without wires to any terrestrial distance. Many Electrical and Electronic Engineers and Researchers' have published numerous experiments, observations, and measurements, qualitative and quantitative. Dr. Nicole Tesla is the father of this invention. It has an amazing economic and social impact on our society. Many countries around the globe will benefits from this service. Finally, we can say "GOODBYE WIRES"

FUTURE WORK

Wireless Power Transmission Technologies with the help of solar power considered as a great scope in future of generation of power and transfer. Solar Satellites will be the future for supplying non-conventional energy. Commercial Space-Solar Power System operational within 25 years. Only time will tell if this is achievable goal or not. The technological and financial challenges facing by space- solar power are far from trivial. We know that history shows humans can achieve tremendous success when sufficient motivation is given. We can also implement this technology in wide range of applications such as shopping malls, airports, office environment, home appliances and any other public spaces by overcoming the constraints.

AUTHORSHIP CONTRIBUTIONS

Authors equally contributed to this work.

DATA AVAILABILITY STATEMENT

The authors confirm that the data that supports the findings of this study are available within the article. Raw data that support the finding of this study are available from the corresponding author, upon reasonable request.

CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ETHICS

There are no ethical issues with the publication of this manuscript.

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