WIRELESS CHARGING OF ELECTRIC VEHICLE

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ABSTRACT

Wireless charging technology for electric vehicles (EVs) has been extensively researched as an alternative to traditional wired charging. We present an abstract on the current state of wireless charging for EVs, including the underlying technology, system design, and challenges associated with wireless charging infrastructure implementation. We also discuss the advantages of wireless charging, such as convenience, safety, and increased efficiency. We look at the various types of wireless charging systems available today. A wireless charger for electric vehicles (EVs) is a charging technology that eliminates the need for physical cables or plugs. Instead, magnetic induction is used to transfer energy wirelessly from a charging pad on the ground to a receiver on the vehicle. This technology has several advantages, including increased convenience and decreased wear.

Keyword: *Wireless Charging Technology, Electric Vehicles, Magnetic Induction, Convenience, Safety, Efficiency*

I.INTRODUCTION

Fossil fuels are increasingly being used today, which will cause air pollution and some other problems. At the same time, automobile is the main travel tools in our daily lives. It also uses fossil fuels, but the efficiency is very low. So now, a high efficiency and environmentally friendly trip mode need to be consummated. Solar energy is inexhaustible and renewable. The radiation power on the earth surface annual year is about 8 1013 kW, which in per second, the exposure to the Earth is equal to the energy released in burning 5 million tons of coil. Similarly, the wind resources are also very considerable. The total amount of available resources is about 72 trillion, even if only about 20%, the resources is about 7 times of the sum of world energy consumption or electricity demand. But at the same time, wind power resources and solar energy resources still have many problems, such as big fluctuation, low utilization rate, low efficiency, poor reliability, low stability and so on. Target at the above problems, the Wind/Solar hybrid system is proposed. The Wind/Solar hybrid system makes the use of complementary of wind and solar energy in time, along with the energy storage system, making an organic combination of them three. So that the renewable energy can be stable and efficient. Different from traditional cars using gasoline, electric vehicles use electricity as the power source. Electric vehicles can effectively solve environmental pollution and energy transformation . Conventional charging method for charging piles can be divided into wired charging and wireless charging. Wired charging piles use cables to transfer power. The advantage is that the efficiency of it is very high. But the disadvantage is that it may produce electric sparks, charging is limited by location and so on. Wireless charging solves the above problems properly. Nowadays, it is mainly used on phones, computers and some other low power equipment. The technology of wireless power transfer on electric vehicles is now a hot spot. The common ways of wireless charging are divided into 3 aspects: electromagnetic inductive coupling, magnetic coupling resonance and microwave irradiation. The disadvantage of magnetic coupling resonance and microwave irradiation is that the efficiency and power of them is low. WPT technology does not require contact between the vehicle and the payment device, thus eliminating the inconvenience and danger of traditional methods. The first goal

is to replace the electronic payment process with the new WPT technology. while maintaining power ratio and efficiency. The long-term goal is to provide dynamic power to vehicles on the road. This shrinks the battery, but takes longer. After that, high battery costs and various problems, which are the main problems of electric vehicles, will be solved. The growing electric vehicle market is driving the demand for greater convenience and reliability. Great effort has been put into WPT technology. The feasibility of its application in wireless charging of electric vehicles has been proven by the organization through several demonstrations. Leading companies and large international suppliers are looking for work.

II. LITERATURE SURVEY

1. Adel El-shahat et al. (2019) has given knowledge about essential requirements of electric vehicle charging and the various types of wireless charging methods compare to other methods, inductive power transfer has great power transfer efficiency prototype for inductive wireless power transfer is detailed.
2. A.M.Alsomali[6] et al (2017) has detailed the strategies of charging electric vehicles pulse width modulation isused to step down the voltage to a constant level. To reduce the charging time, time multiplexing method is used. Time multiplexing method is a successful charging method by simulation.
3. Bhuvanesh Arulrajetal (2019) has given the idea of charging electric vehicle by using solar and wind system. Two separate batteries are used to store solar energy and wind energy. By comparing this two through voltage sensor, arduino decides which gives power to charge a vehicle by wireless charger. Dynamic charging method is the fastest charging method.

III. METHODOLOGY

Defining the problem: This involves identifying the specific problem that the wireless charging system is intended to solve, as well as any constraints or requirements that must be met. (Ex. Compatibility with specific devices, charging speed, etc.) Research and Analysis: This step involves researching and analyzing existing wireless charging technologies, as well as any relevant industry standards or regulations.

Conceptual Design: Based on the research and analysis, designers develop a conceptual design for the wireless charging system, including key features and specifications.

Prototyping: Once the conceptual design is complete, designers can create a prototype of the wireless charging system, allowing for testing and refinement of the design.

Because there are no conductive wires required with wireless charging, conduction losses that can occur with wires can be fully eliminated. Moreover, incorrect human handling of wires during the plug-in and plug-out charging procedure might occasionally be dangerous. Hence, for reasons of safety, human intervention can be eliminated. Wireless charging has some drawbacks despite appearing to be efficient and time-saving. Infrastructure development is a key component of implementation that must be done to meet the objectives. This will involve a significant financial outlay at every level of the project, making it expensive. The system is intended to charge electric vehicles (EVs) when they are immobile, such as in parking garages or open spaces. There has been a lot of interest in the idea of charging EVs while they are in transit because a physical connection is not necessary. Dynamic wireless charging is the process of recharging an EV while it is moving.

IV.WORKING

Resonant electromagnetic induction (also known as inductive charging) is used as the principle for charging EVs wirelessly. Just like the smart phones have a magnetic coil inside them that receives electricity from the charging pad's magnetic coil, similarly with a magnetic coil inside the charger that sends current to the magnetic coil on the car's underside, wireless charging in EVs works in the same way as wireless charging in smart phones. The complete procedure for wireless charging of EV takes place in the following manner:-

1. The wireless charging system contains a Charging Pad which is installed on a wall or in the ground and is connected to a power supply.
2. Another equipment is the Receiving Pad which contains a coil of wire and electronics and is mainly located on the underside of the EV.

3. When the EV is being parked over the wireless charging pad which is connected to an electrical power source generates an AC current field or Electromagnetic Field.
4. Now due to Inductive Coupling the AC current is induced in the coil (within the receiving pad on the vehicle) by the alternating magnetic field created by the charging pad.
5. The electronics withing the receiving pad of vehicle convert induced AC current into DC current. The DC power is used to charge the EV's battery.
6. The charging process is managed by the Onboard Charger of the vehicle.
7. Tasks like status update, ensuring safety and managing the charging process are done by the Communication Protocols that allow the charging pad and the vehicle to communicate are often included in the wireless charging systems of EVs.

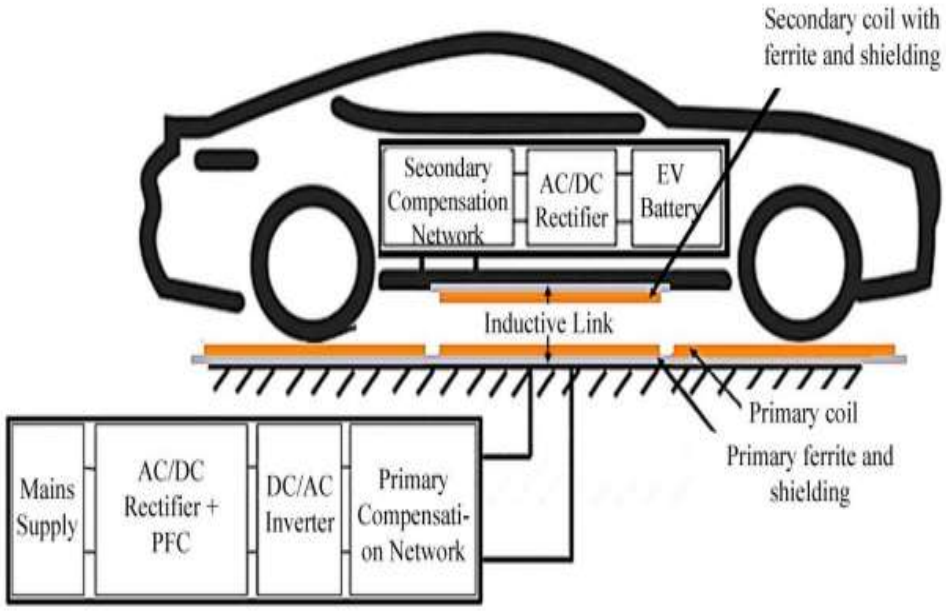


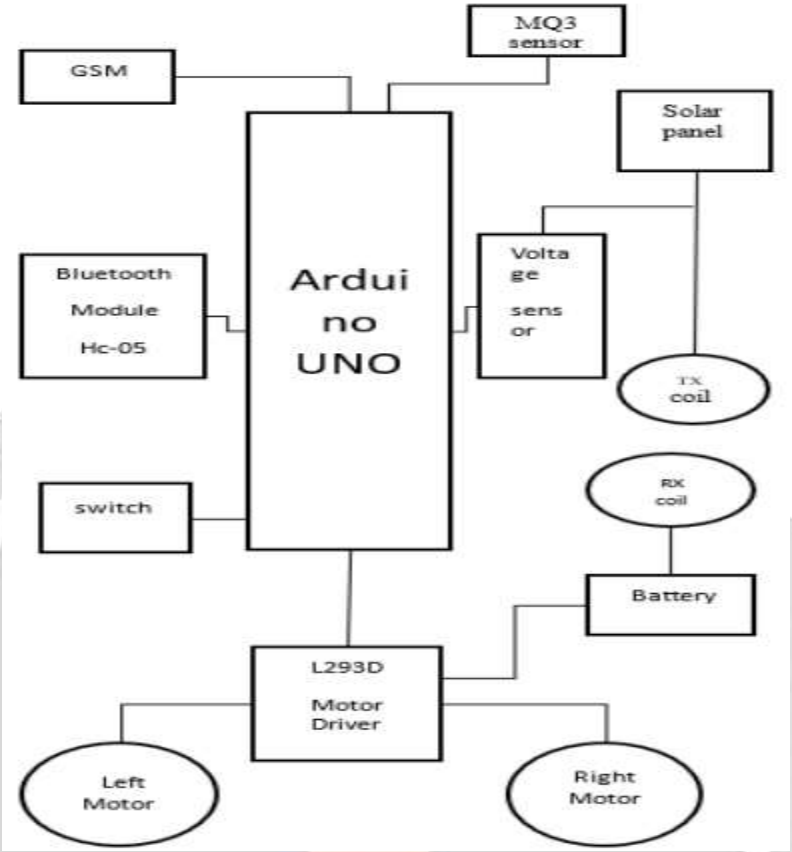
Fig: *Design of a wireless EV charging system*

Options for wireless charging an EV: There are two options to charge an EV wirelessly:

A. Static EV charging: In this type of charging the EV is not moving while charging. The EV is parked over installed wireless charging coil in the designated space either at home or office charging station.

B. Dynamic EV Charging: In this type of charging the EV is not stationary while charging rather it is indeed moving and getting charged. However, it is recommended to operate this type of charging smoothly at 65mph, exceeding this speed limit might be dangerous. Obviously, this technology will be very costly and is long from getting to countries world-wide. The automaker Stellantis is already working on a solution to build wireless charging for EVs into certain roadways. In September 2021, the state of Michigan announced a partnership with Electreon to create the first wireless EV charging road in the U.S., a one-mile stretch in Detroit that will be available to the public when completed.

V.BLOCK DIAGRAM



VI.RESULTS AND DISCUSSION

The voltage obtained at various height were measured with the help of a multimeter and recorded for further analysis.For the dynamic wireless charging of electric vehicles, the transmitting coil is buried under the highway. When the electric vehicle, which carries receiving coils that passing through transmitting coils, the power is transferred through magnetic coupling. Combining the Wind/Solar hybrid system with the wireless charging system of electric vehicles and building up a wireless charging system of electric vehicles based on Wind/Solar hybrid system.

Sr. no	Height (mm)	Small coil Voltage (v)
1.	150	3.5
2.	120	5.6
3.	90	8.2
4.	60	9.6
5.	40	10.3
6.	30	12
7.	20	13.2
8.	10	15.1

Table. Comparison of displacement of all 4 cases

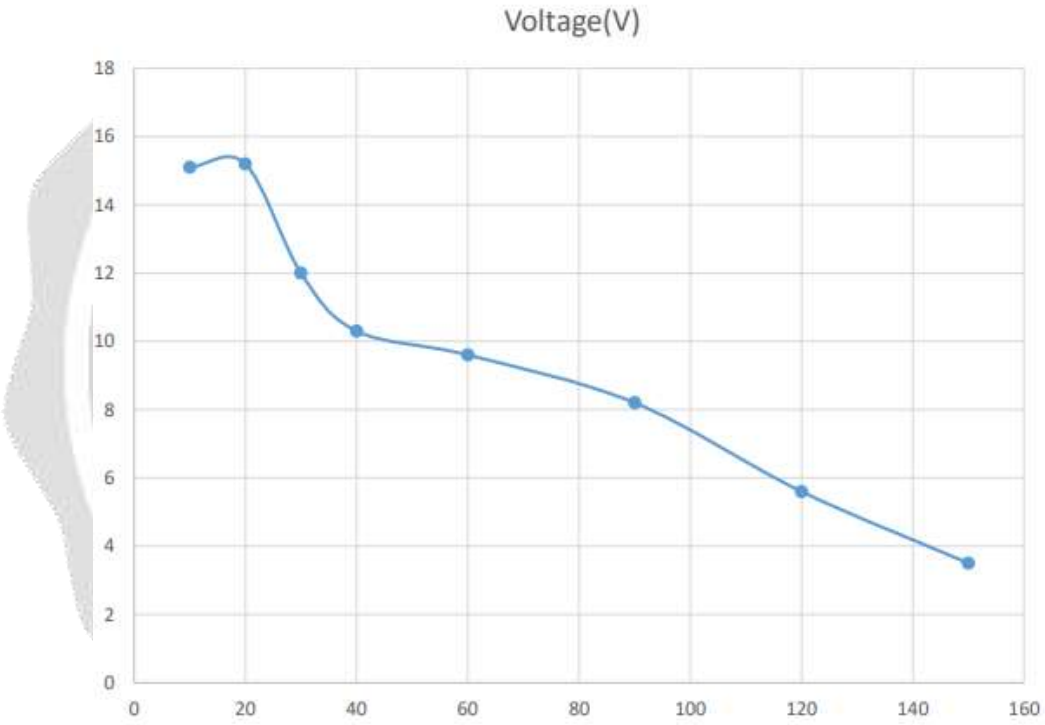


Fig.Displacement Vs Voltage Variation

VII.FUTURE SCOPE

Wireless charging technology for electric vehicles has great potential for the future, and here are some of the possible future developments and applications of this technology:

Increased efficiency: While wireless charging is already more efficient than traditional wired charging, there is still room for improvement. Future developments could lead to even more efficient wireless charging systems, which would reduce charging times and increase the range of electric vehicles.

Integration with smart grid technology: Wireless charging systems can be integrated with smart grid technology, which would allow for more efficient charging and distribution of electricity. This would help to reduce the strain on the electrical grid and ensure that electric vehicles are charged at optimal times.

Dynamic wireless charging: Dynamic wireless charging is a technology that allows electric vehicles to charge while they are in motion. This could potentially eliminate the need for charging stations altogether, as electric vehicles could charge while they are on the road.

VIII.CONCLUSION

In conclusion, this review paper given a brief overview of wireless charging for EVs. It is clear that wireless charging has made significant strides in past few years, providing many advantages, like convenience, reduced wear and tear and improved safety. Along with the improving technology, the efficiency and charging speeds of wireless systems are likely to improve. Wireless charging technology for electric vehicles offers many advantages, including convenience, safety, and reduced emissions. This technology allows electric vehicle owners to charge their vehicles without the need for cords or cables, making it a more convenient and user-friendly option for many consumers.

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