**CHAPTER 1**

**INTRODUCTION**

* 1. **INTRODUCTION**

The concept of wireless transmission for charging and powering engines and devices has been discussed since the Tesla days. But that didn't work as there was no technical support at the time. In 2007, researchers took an important step in this direction by being able to control the light from a wireless source two meters away. Since this significant achievement, significant progress has been made in the field. One of the many other applications of wireless power transmission (WPT) is charging electric vehicles (EVs), which has many advantages and is being researched.

The term "conductive charging system" also applies to conventional wired or plug-in charging methods. There are some issues with the attached solutions. For example, they need thick charging cables and connectors. In addition, the charger must be manually connected to the power source and the product to be charged. The wired charging system is also not friendly to users and the environment. Due to factors such as temperature, ground contact, or self charging equipment, the charging line may short out or the insulation may deteriorate, resulting in electric shock. They can be used with multiple batteries, or a non-capacity battery can be replaced on a single charge as needed, shortening charging time and reducing risk. For example, if a car can travel a certain distance on one charge with some batteries, it can be increased times by using more batteries. Alternatively, the vehicle battery can be changed to charge at the charging point while driving. But batteries also have some problems.

**1.2 PROJECT OVERVIEW**

The project aims to design, develop, and deploy a solar-powered electric vehicle (EV) charging infrastructure along highways, providing a sustainable and reliable charging solution for EV owners. The project will integrate solar power generation, energy storage, and EV charging systems to create a self-sustaining ecosystem. The increasing adoption of electric vehicles (EVs) has created a need for convenient and reliable charging infrastructure, particularly along highways. However, the existing charging infrastructure is inadequate, leading to range anxiety among EV owners.

* 1. **OBJECTIVE**

1. Reduce greenhouse gas emissions: Promote the adoption of electric vehicles by providing a reliable and sustainable charging infrastructure.

2. Increase EV adoption: Encourage the growth of the EV market by addressing range anxiety and charging infrastructure limitations.

3. Improve energy efficiency: Utilize solar power to generate electricity, reducing reliance on fossil fuels and lowering carbon emissions.

4. Enhance driver experience: Provide convenient, fast, and reliable charging services to EV owners, enhancing their overall driving experience.

A diagram of a car driving on a road

Description automatically generated

**CHAPTER 2**

**THEORY**

***2.1 ELECTRIC VEHICLE****:*

Electric vehicle (EV) charging stations can be used with solar panels to reduce the load on the controller. This study provides proof of state-of-the-art analysis of remote-control transmission to charge electric vehicle batteries using solar panels to generate electricity. The purpose of this research is to expand knowledge about the wireless power transfer (WPT) framework, as well as to learn more about the solar electric car charging station. To achieve this goal, various types of solar EV charging stations have been extensively researched. After learning a few principles, the different WPT components are explored in several sections. Examination of the compensation and multiple coil models and the advantages of each coil over the others were made in the framework of wireless power transmission for solar-powered electric vehicles.

**Keywords:** electric vehicle, wireless charging, wireless power transfer, inductive power transfer, capacitive power transfer. dynamic wireless charging

Batteries are heavy, initially expensive, and have a long lifespan. After a certain point, it becomes unable to carry any more batteries due to the weight. These issues will be resolved with future updates to electronic storage devices. WPT is another method that can be used to fix battery problems. For example, by using a wireless charging system, the initial cost can be reduced by avoiding large and bulky batteries. The WPT method is efficient and effective as it eliminates the clutter of cables and connectors that come with manual add-on payment systems.

**2.2 LITERATURE SURVEY:**

With a careful review of the relevant research literature, we discuss and analyses the working ideas, strategies, materials, methods, and various aspects of EV wireless charging systems in this study. The following list contains the main results of this study:  Provide results and comments on relevant questions.  Before going into details about EV wireless charging systems and the various methods used for this purpose, a brief introduction to the WPT method is given.  Completed the review of SWCS and DWCS and provided an overview of the design process called a gap, the air between the electrodes is ionized, producing electricity.  The IPT-based DWCS prototype and design have been reviewed.  Wireless charging system communication and control power management and system compatibility

Several studies have been conducted on the feasibility and potential benefits of using solar roadways for EV charging. Below are some relevant studies in this field: "Solar Roadways: A Step Towards Future Sustainability" by R. L. Shah and N. N. Bhatt: This study proposes the concept of solar roadways and discusses their potential benefits, including reducing greenhouse gas emissions, optimizing land use, and providing sustainable transportation infrastructure. "Wireless Power Transfer for Electric Vehicles Using Embedded Roadway Infrastructure" by T. Zhang et al.: This study proposes a wireless charging system for EVs using embedded roadway infrastructure, which involves embedding charging coils in the road surface and wirelessly transmitting power to the EVs. The study demonstrates the feasibility and efficiency of the proposed system through simulation and experiments.

Electric Vehicle Charging with Solar Roadways: A Technical and Economic Feasibility Study" by D. Dawson et al.: This study evaluates the technical and economic feasibility of using solar roadways for EV charging, considering factors such as cost, efficiency, and environmental impact. The study concludes that solar roadways can be a viable and cost-effective solution for EV charging. "Solar Roadways: A Game Changer for Sustainable Transportation" by M. A. Alam and M. M. Hossain: This study proposes a solar roadway system for EV charging and discusses its potential benefits, including reducing reliance on fossil fuels, promoting sustainable transportation, and reducing air pollution. Overall, the literature survey indicates that solar roadways can be a promising solution for EV charging, offering several benefits such as sustainability, efficiency, and optimized land use. The proposed wireless charging system using solar roadways builds upon these existing studies and aims to provide a practical and efficient charging solution for EVs.

**2.3 NEED OF THIS TECHNOLOGY**

The Wireless Charging of Electric Vehicles Using Solar Roadways technology addresses several needs in the transportation and energy industries. Firstly, it reduces the reliance on fossil fuels and promotes the use of renewable energy sources by utilizing the power of the sun to generate electricity. This helps to reduce the carbon footprint of electric vehicles and contributes to the global effort to combat climate change. Secondly, it eliminates the need for frequent charging stops, thereby increasing the convenience and practicality of electric vehicles for everyday use. This can help to alleviate the range anxiety that many electric vehicle owners experience and promote the widespread adoption of electric vehicles. Thirdly, the technology has the potential to reduce the cost of charging infrastructure by utilizing the existing road network to provide wireless charging capabilities, thus reducing the need for dedicated charging stations. The Wireless Charging of Electric Vehicles Using Solar Roadways technology has the potential to revolutionize the transportation industry and contribute to a more sustainable and efficient energy system.

A close-up of a device

Description automatically generated

**CHAPTER 3**

**BLOCK DIAGRAM AND CIRCUIT DIAGRAM**

**3.1 BLOCK DIAGRAM**

A diagram of a system

Description automatically generated

1. Solar Power Generation:

Solar power generation is the process of converting sunlight into electricity using photovoltaic (PV) cells. The PV cells are arranged in a solar panel, which is then connected to a charging system.

A. Solar Panel Efficiency

The efficiency of a solar panel is determined by its ability to convert sunlight into electricity. The efficiency of a solar panel is typically around 15-20%.

B. Solar Panel Angle and Orientation

The angle and orientation of a solar panel can significantly impact its efficiency. The optimal angle and orientation for a solar panel are typically between 30-40 degrees and facing south.

2. Energy Storage Systems:

Energy storage systems (ESS) are used to store excess energy generated by the solar panels during the day for use during periods of low sunlight or at night.

A. Battery Types

There are several types of batteries that can be used for energy storage, including lead-acid, lithium-ion, and nickel-cadmium.

B. Battery Management Systems

Battery management systems (BMS) are used to monitor and control the charging and discharging of batteries.

3. Electric Vehicle Charging Systems:

Electric vehicle charging systems are used to charge EVs using the energy stored in the ESS.

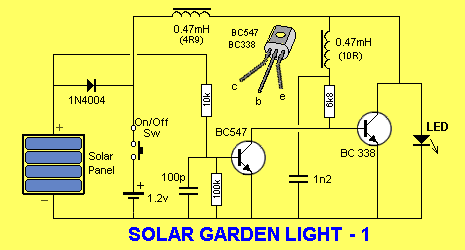
A. Charging Levels

There are three levels of charging: Level 1 (120V), Level 2 (240V), and DC Fast Charging.

B. Charging Protocols

There are several charging protocols, including SAE J1772, IEC 62196, and CHAdeMO.

**3.2 CIRCUIT DIAGRAM**



**CHAPTER 4**

**CONSTRUCTION AND WORKING**

**4.1 Construction:**

A diagram of a car

Description automatically generated

Wireless power transfer over a short distance is accomplished using inductive coupling. Power is transferred by use of mutual induction between two coils. The receiving antenna is made up of the secondary coil, whereas the transmitting antenna is the primary coil.

**4.2 Working**A diagram of a circuit

Description automatically generated

**4.21 Working principle of tesla:**

Tesla coils are high-voltage transformers that are often used as transmitters for wireless power transmission. The Tesla coil is a resonant transformer, the primary and secondary LC circuits are only loosely connected. We use it as a transmitter because it's a transformer but it works differently than a normal transformer, it gives us a lot of power and a high-frequency output that produces more induction on the load side. Tesla coils use a high-voltage generator to charge a capacitor (called a primary capacitor) and temporarily store the charge.

Tesla coils are high-voltage transformers that are often used as transmitters for wireless power transmission. The Tesla coil is a resonant transformer, the primary and secondary LC circuits are only loosely connected. We use it as a transmitter because it is a transformer but it works differently than a normal transformer, giving us more power, and more frequency output, which has a greater impact on the cargo. Tesla coils use a high-voltage generator to charge a capacitor (called a primary capacitor) and temporarily store the charge. When the capacitor is fully charged and connected to a special switch called a gap, the air between the electrodes is ionized, producing electricity.

**4.22 AC TO DC CONVERSION CIRCUIT:**

All electrical or electronic equipment must be validly powered. While Tesla coils operate at different frequencies, most of the devices we use every day operate at 50 or 60 Hertz. To keep the LC resonant frequency constant, the Tesla coil operates at higher frequencies and produces higher frequencies. Tesla coil power cannot be used directly by any device; instead, it must be converted to a form that can be used by other devices.

A diagram of electrical components

Description automatically generated

The details of all bridge rectifiers are done sharply and vividly. Figure 5 shows a schematic diagram of a complete rectifier bridge converting AC voltage to DC voltage; Figure 4 shows the circuit configuration of the full bridge rectifier. In our project, this AC-DC converter was used twice, once to supply DC voltage to the load LED at the receiving end and once in the oscillator circuit.

**CHAPTER 5**

**ADVANTAGES AND LIMITATIONS**

**5.1 Advantages**

1. It can be easily and quickly installed in automobiles.
2. Low power consumption.
3. Simple and Portable.
4. Easy to implement.
5. Cost effective.
6. Ecologically Friendly
7. Compared to a similar gas-powered vehicle, operating costs are lowered by 80%
8. Multiple EVs can be charged simultaneously.
9. Infinite range and instantaneous charging
10. Quieter than standard automobiles in nature

**5.2** **Disadvantages**

1**.**Limited range and power

2.It's expensive

**CHAPTER 6**

**RESULT ANALYSIS**

**6.1 Result:**

Wireless power transfer for electric car using ATmega328 microcontroller can be done by different methods such as inductive coupling or resonance coupling using ic555 circuit, and power MOSFET circuit with primary and secondary coil works well. The results of this project will depend on characteristics such as efficiency, range and power transfer capacity, as well as specific usage and design options. It is important to consider the safety, EMI, and overall performance of the system. The result will depend on the success of hardware integration, firmware programming, energy storage for the EV battery on both sides where the coils are energized, and this car is solar powered, both wireless and solar energy is stored in the battery. Another explanation of the project is how long the battery lasts. This process will be done with the operation of the ATmega328 microcontroller.

A solar panel with wires and wires

Description automatically generated

**CHAPTER 7**

**CONCLUSION AND FUTURE SCOPE**

**7.1 Conclusion**

In this study, wireless charging of electric vehicles was investigated. Wireless charging for electric vehicles is the most effective technology. Wireless charging has many advantages over wireless charging. Due to his extensive travels. It reduces the time required to charge the car and even allows charging EVs on the go.

It is predicted that the world will be completely wireless in the future. Wireless charging has many advantages over wireless charging. With further advancements in technology, wireless charging of electric vehicles could become a reality. Inverter design control, topology, and personal safety still need further research in the short term.

**7.2 Future Scope**

The city and country should prepare to have electricity in the future. It is based on the instructions of the authorities and the latest technology. Offering the best performance, safety, and economy, electric vehicles have the potential to change the way transportation.

Dynamic electric car charging is essential; The technology could also power biomedical implants, enable supersonic hyperloop travel, and create humanoid robots. The opportunities offered by business problems are limitless.

Today, the electric vehicle market is growing rapidly. WEVC may become more competitive as new technologies and equipment are developed. Power electronics can also benefit from advanced equipment. In addition to leakage currents, switching losses are another important energy waste in WEVC systems. Static WEVC can release workers after removing the job from the ledger, but not the pay change.

**CHAPTER 8**

**REFERENCES**

**8.1 Reference**

1.Kiran Mai Momiji, "Wireless Electric Vehicle Charging System [WEVCS]. July 12, 2019.

2. Cavel-Canti, M.C.; Oliveira, K.C.; Azevedo, G.M.; Moreira, D.; Neves, F.A. Maximum Power Point Tracking Techniques for Photovoltaic System. In Proceedings of the PELINCEC 2005 Conference, Warsaw, Poland, 15–20 October 2005.

3. Al-Amoudi, A.; Zhang, L. Optimal Control of a Grid Connected Po System for Maximum Power Point Tracking and Unity Power Factor. In Proceedings of the Seventh International Conference on Power Electronics and Variable Speed Drives, London, UK, 21–23 September 1998.

4. Rufer, A. The efficiency of energy storage systems-the influence of the exchanged power

5. Elena Paul, Nimmy Paulson, Rijo Bijoy, Benny K.K, “WIRELESS CHARGING OF ELECTRIC VEHICLES”, International Research Journal of Engineering Technology, Vol.6, Issue 6, June 2019.