IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 13, Issue 5, May 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.317

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305030|

E-Vehicle Wireless Charging Using Solar Panel

Dr. Ann Rufus A[1], K.Gokul Karthick[2], M. Esakki Muthu[3], C.Charles[4], S.Raja[5]

Associate Professor, Department of Electrical and Electronics Engineering, SCAD College of Engineering and Technology, Tirunelveli, Tamil Nadu, India [1]

UG Student, Department of Electrical and Electronics Engineering, SCAD College of Engineering and Technology, Tirunelveli, Tamil Nadu, India [2,3,4,5]

ABSTRACT: One of the most important tactics for reducing dependency on fossil fuels and combating climate change is the electrification of transportation. The use of electric cars (EVs) as a more environmentally friendly substitute for conventional internal combustion engine vehicles has grown. But issues like restricted range, lengthy charging periods, and the requirement for infrastructural development continue to be major obstacles to the broad adoption of EVs. This research suggests a novel way to improve the sustainability and efficiency of EVs by combining solar panels with wireless charging technologies. Renewable energy can be used to augment grid electricity for charging by incorporating solar panels onto the vehicle's body or roof. Convenient charging is made possible without the use of physical connectors or plugs by wireless charging pads or coils placed in parking lots, garages, or dedicated charging stations. There are various advantages of integrating wireless charging with solar panels. In the first place, it lessens reliance on grid electricity, which lowers carbon emissions related to EV charging. Second, by removing the inconvenience of constantly plugging and unplugging charging cords, it improves convenience for EV owners. It also encourages energy autonomy by enabling EVs to use solar energy for charging, particularly in areas with plenty of sunshine. For widespread implementation, nevertheless, obstacles like alignment problems, efficiency concerns, and infrastructure investment must be overcome. While ongoing research focuses on enhancing the efficiency of wireless power transfer, advanced alignment technology can guarantee ideal posture for effective charging. The number of nations where electric cars are used for transportation is continuously increasing. Electric vehicles not only benefit the environment but also reduce transportation expenses by replacing costly fossil fuels.

I. INTRODUCTION

Due to worries about air pollution, climate change, and energy security, the world has been moving more quickly toward sustainable transportation options in recent years. Within this framework, electric cars (EVs) have surfaced as a viable substitute for conventional internal combustion engines.automobiles that provide transportation with no emissions and a lower dependency on fossil fuels. But obstacles like a short driving range, a long charging time, and a large infrastructure requirement for charging remain in the way of EV adoption on a large scale. Novel strategies are being investigated to address these issues and improve the sustainability and efficiency of EVs even more. One such strategy uses solar panels and wireless charging technology to fuel electric cars using renewable energy sources. By decreasing the dependency on fossil fuel-derived grid electricity, this integration not only minimizes the environmental impact of EVs but also offers the possibility of increasing their driving range. This paper aims to investigate the integration of wireless charging for electric vehicles with solar panels. An outline of EV technology as it is today, the obstacles to EV adoption, and the possible advantages of integrating solar panels and wireless charging are given in this introduction.

II. RECENT WORK

The efficiency, robustness, and adaptability of solar panels will continue to grow, improving the functionality and dependability of solar-powered EV charging systems. The development of energy storage technologies such as supercapacitors and next-generation batteries will be essential to overcome intermittency issues. Combining cutting-edge charging algorithms with smart grid technologies to provide smart charging solutions will make it possible to schedule and optimize EV charging dynamically in response to customer preferences, grid demand, and solar energy availability. With the use of vehicle-to-grid (V2G) technology, EVs will be able to function as distributed energy resources since bidirectional energy transfer between them and the grid will be possible.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305030|

III. PROPOSED WORK EXPLANATION

This study's main goal is to determine whether incorporating solar-powered charging infrastructure for electric vehicles is feasible, efficient, and potentially beneficial. The study's objective is to Examine whether combining solar energy with EV charging stations is technically feasible. Analyze the financial sustainability and efficiency of solar-powered EV charging in relation to conventional grid-based charging. Examine the advantages of solar-powered EV charging systems for sustainability and their effects on the environment. Provide useful suggestions and directives for the planning, execution, and management of solar-powered charging infrastructure.

Symbols and Expressions in Mathematics

Sun Irradiance (G): $G0 \sin(\theta) = G$

Where: G0 = Solar constant (about equivalent to 1367 W/m²)

θ = Angle of solar radiation incidence

The solar panel's energy generated (E) is equal to $\eta \times G \times AHt$.

Where:

A = Panel area (m²)

T = Time duration of solar exposure (hours)

BLOCK DAIGRAM

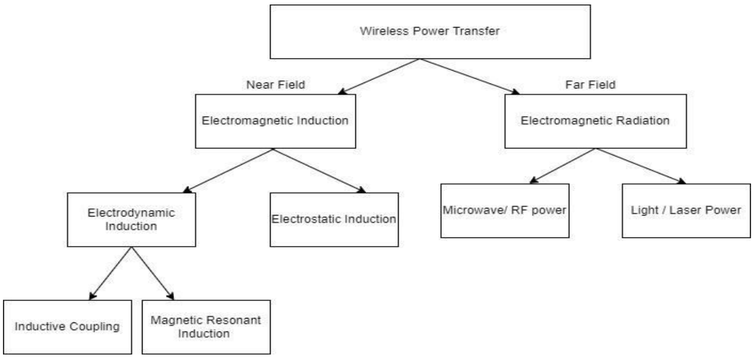

Figure 1.0 Block Diagram of wireless charging

HARDWARE DISCRIPTION

The components are used in solar power bank with wireless charging are

SOLAR PANEL

Figure 1.1 Solar Panel

Photovoltaic (PV) panels, also referred to as solar panels, are solar energy conversion devices. They are composed of numerous smaller components known as solar cells, which are typically silicon-based. These cells experience electrons being knocked out of their atoms by sunshine. An electric current is produced by this electron movement. Since each solar cell only produces a limited quantity of electricity, solar panels are made up of several cells connected to one another.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305030|

SOLAR CHARGE CONTROLLER

Depending on variables like temperature and sunlight intensity, solar panels generate different voltages and currents. These variables are regulated by the charge controller to make sure they meet the needs of the battery bank.

Figure 1.2 Solar Charge Controller

It inhibits current passage from the batteries to the panels when there is no sunshine, preventing discharge, and it keeps excessive voltage from reaching the batteries during charging, which could harm them.

RX-TX MODULE

Receiver (Rx) and transmitter (Tx) modules, or Rx Tx modules for short, are electrical parts used in wireless communication between devices

Figure 1.3 Tx/Rx coil

To enable bidirectional communication, these modules usually work in pairs, with one module acting as the transmitter and the other as the receiver.Data or signals must be wirelessly transmitted from the transmitter module to the receiver module. It typically includes of an antenna, transmitter electronics, and occasionally extra parts for modulation or signal processing.

ARDUINO

Figure 1.4 arduino

The Arduino platform's fundamental hardware element. These are development boards based on microcontrollers with a variety of input and output pins, a USB port for communication and programming, and other parts. the Arduino board's brain. Usually, an AVR microcontroller (such the ATmega series) is used to communicate with external devices and run the code that has been uploaded to the board. Digital input/output, analog input, and other specialty pins (such as PWM pins) are all included on Arduino boards for attaching peripherals like displays, actuators, sensors, and other devices.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305030|

IN4007

Diodes are used to convert AC into DC these are used as half wave rectifiers or full wave rectifier.Three points must be kept in mind while using any type of diode are Maximum forward current capacity,Maximum reverse voltage capacity Maximum forward voltage capacity

Figure 1.5 IN4007

IV. FUTURE SCOPE

Future studies will probably concentrate on improving solar panel and wireless charging system efficiency in order to maximize energy transfer and use. This involves raising the efficiency of solar panels through developments in photovoltaic technology and enhancing the power conversion efficiency of wireless charging transmitters and receivers. The intelligent and dynamic control of charging processes based on variables like grid demand, renewable energy availability, and power costs will be made possible by the integration of wireless charging devices with smart grid infrastructure. This will facilitate the integration of renewable energy sources, optimize charging schedules, and lessen system stress. Bidirectional energy flow may be supported by future wireless charging technologies, enabling EV batteries to feed extra energy back to the grid or other devices as needed, in addition to receiving energy from solar panels. This bidirectional capacity can facilitate energy sharing among EVs, assist vehicle-to-grid (V2G) applications, and improve grid stability.

HARDWARE OUTPUT & RESULT

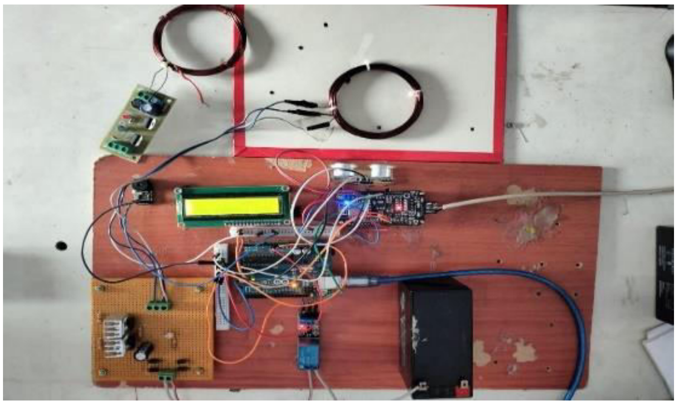

Figure 1.6 Both transmitting and receiving signal of coil for best case scenario

The phrase "best case scenario" describes a situation in which the three coils on the transmitting and receiving sides are perfectly aligned, while the phrase "mid case scenario" describes a situation in which the coils on both sides are partially aligned. "Worst case scenario" refers to a situation in which two coils on opposite sides are fully extended toward one another; this is regarded as the worst case scenario when charging the car. The transmission signal is represented by the yellow wave, and the receiving signal is represented by the green wave. It is possible to conclude from the analysis of these three figures that, although the receiving wave shape varies greatly in each case, the transmitting wave shape is consistently the same. In the optimum scenario, the signals are nearly identical, and in the mid situation, the In the worst situation, the signal achieved its lowest shape and in the best case, it got low. The shift in power for various instances is represented by this entire procedure.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305030|

V. CONCLUSION

This proposed effort intends to promote the shift to a cleaner, greener transportation system and further the development of sustainable mobility solutions by examining the viability and advantages of incorporating solar-powered charging stations for electric vehicles. By working together and doing multidisciplinary research, we can fully utilize solar energy to power the next wave of electric vehicles.

REFERENCES

1. Kempton, Willett, and Jasna Tomic. "Vehicle-to-grid power implementation: from stabilizing the grid to supporting large-scale renewable energy." Journal of Power Sources 144.1 (2005): 280-294.
2. Perez, Richard, et al. "A review of solar photovoltaic levelized cost of electricity." Renewable and Sustainable Energy Reviews 89 (2018): 51-56.
3. Luo, Xiang, et al. "A review of battery electric vehicle technology and readiness levels." Renewable and Sustainable Energy Reviews 107 (2019): 517-534.
4. Sioshansi, Ramteen, and Shmuel S. Oren. "Integration of renewable resources in California part I: optimal electric generating portfolios." Energy Policy 35.12 (2007): 5985-5998.
5. Elgowainy, Amgad, et al. "Impact of battery weight and charging patterns on the economic and environmental benefits of plug-in hybrid vehicles." Journal of Power Sources 195.8 (2010): 2405-2416.
6. Raghunathan, Anand, and Anand R. Gangadharan. "Review of energy storage technologies for sustainable power networks." Sustainable Energy Technologies and Assessments 30 (2019): 25-35.
7. Zhang, Cheng, et al. "A review of distributed energy resources in islanding operation: current status and future developments." Renewable and Sustainable Energy Reviews 108 (2019): 348-362.
8. Colak, Ilhami, and Recep Yumurtaci. "A review on the impacts of vehicle-to-grid and vehicle-to-home on distribution systems." Renewable and Sustainable Energy Reviews 113 (2019): 109281.
9. Elia, Giovanni, et al. "Electric vehicles and renewable energy integration: a review of current strategies and future prospects." Renewable and Sustainable Energy Reviews 75 (2017): 534-547.