IRJMETS

e-ISSN: 2582-5208

International Research Journal of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

SOLAR WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM FOR NONSTOP EV CHARGING

Dr. S.S. Mungona[*1], Miss. Samruddhi Lokhande[*2], Mr. Harshal Dabhade[*3], Miss. Krutika Yawale[*4], Mr. Abhishek Lakade[*5], Mr. Aniket Sangole[*6]

[*1,2,3,4,5,6]Department Of Electronic & Telecommunication, Sipna College Of Engineering, Amravati, Maharashtra, India.

DOI : https://www.doi.org/10.56726/IRJMETS55065

ABSTRACT

Our project aims to transform the electric vehicle (EV) charging landscape by introducing a revolutionary "Solar Wireless Electric Vehicle Charging System" in a world where sustainable transportation solutions are becoming more and more important. With constant access to clean energy, this ground-breaking system which includes essential parts like solar panels, an HF transformer, an Arduino microcontroller, an LCD display, and battery storage—promises to revolutionise EV charging. A thoughtfully planned solar panel array, ideally positioned to capture and transform solar energy into a workable power source for EV charging, is the central component of this project. In order to effectively manage this solar energy and ensure that it is compatible with EVs, the HF transformer is essential. The brains behind the system, the Arduino microcontroller, manage energy distribution, real-time tracking and wireless charging, and the LCD display gives customers access to important data like energy savings and charging status. In order to ensure continuous EV charging, particularly at night or in cloudy situations, battery storage has been included to store excess solar energy for later use. With this project, EV owners will have an environmentally beneficial and self-sufficient way to charge their vehicles, lowering their reliance on traditional power networks and promoting a more sustainable and clean future. This Solar Wireless Electric Vehicle Charging System is poised to revolutionise the way EVs are charged by leveraging cutting-edge technologies and the sun's energy to provide a continuous and environmentally friendly charging experience.

I. INTRODUCTION

Electric car sales are steadily rising now that they are ubiquitous on the road. Electric vehicles have been demonstrated to reduce travel expenses by utilizing electricity instead of gasoline, which is significantly less expensive, in addition to their favorable benefits on the environment. If you drive an electric car, use rooftop solar panels to recharge it at home. To ensure that you're locating a reputable, trustworthy local solar installation that provides affordable solar. At a time when sustainability is paramount, the Solar Wireless Electric Car Charging System is a revolutionary piece of technology with the potential to revolutionize the electric car charging market. This concept combines creativity with environmental consciousness to address the increasing need for clean and efficient transportation. This project's primary objective is to eliminate the limitations of traditional charging methods and enable owners of electric vehicles to charge their vehicles continually. By integrating wireless technology and solar energy, this system ensures continuous electric mobility, so contributing to a greener future. In addition to personal electric car ownership, the idea offers adaptable uses in a range of sectors, from remote locations with poor grid connectivity to public EV charging stations. It serves as an example of the adaptability needed to embrace sustainability on a global scale. As we go on our journey, we are switching from traditional gasoline-powered transportation to sustainable, ecofriendly electric mobility. Our commitment to reducing carbon emissions and creating a cleaner, more sustainable future for future generations is symbolized by the Solar Wireless Electric Vehicle Charging System. Wireless power transmission, or WPT, is one of the power transfer methods that has grown the fastest over the last two to three years without the need for cables. This state-of-the-art technology is very dependable and efficient. These days, wireless power transfer is necessary for electrical automobiles to continue operating profitably.

II. LITERATURE SURVEY

In year 2018 author Johnson. proposed a Wireless Charging Technologies. Johnson's study focuses on wireless charging technologies for electric vehicles. The research emphasizes the convenience and reduced wear and tear on charging connectors provided by wireless charging solutions, making them a compelling choice for EV owners. [1]

In this paper, Greenfield,, D., & Shah, R. proposed Environmental and Economic Impact . Greenfield's analysis center on the environmental and economic implications of solar wireless EV charging systems. The research underlines the positive impact on the environment by reducing reliance on non renewable energy sources. Additionally, it points to long-term cost savings, making it a sustainable and economically viable option for EV charging. [2]

Solar Power Integration for EVs is proposed by Smith .In Solar Power Integration for EVs Smith's research explores the efficient generation of electricity for electric vehicles through solar panels. The integration of solar power significantly reduces carbon emissions and charging costs, making it a sustainable and cost-effective solution for EV owners. [3]

The authors proposed a system in which a Combined Solar and Wireless Charging Systems. They have introduced the integration of both solar and wireless charging technologies for electric vehicles. Their findings highlight a holistic solution that offers sustainable and hassle-free EV charging, aligning with the growing demand for eco-conscious transportation. [4]

In 2022, Integration of Vehicle-to-Grid (V2G) Capabilities proposed by authors. Wilson identifies the challenges and prospects in the widespread adoption of solar wireless EV charging systems. Challenges include cost barriers and the need for infrastructure development. The research envisions a promising future with advancements in energy storage and grid integration, enhancing the efficiency and accessibility of these systems. [5]

III. METHODOLOGY

The primary controller on the transmitter side is an ESP32 microcontroller. It interacts with other components and oversees the system's operation.

Switch Module The relay module regulates the power supply to the charging coil and is connected to the ESP32. It enables the wireless transfer of electricity to the receiving coil when it is engaged. To measure the voltage and current while the ESP32 is charging, a voltage/current sensor is connected to it. It aids in charging status monitoring and guarantees secure operation. Wireless power transfer is facilitated by a magnetic field created by the charging coil, which is linked to the relay module. When engaged, the receiving coil beneath the car generates a voltage. The voltage and current from solar panels are controlled by a charge controller, which is connected to the panels. Ensuring proper battery charging through the use of solar energy is the responsibility of the charge controller. ESP32 Microcontroller: Acting as the primary controller on the receiving end, it is comparable to the transmitter side. In addition to communicating with other parts, it controls the charging process. An LCD display connected to the ESP32 gives the user feedback in real time by displaying the battery's charging voltage. The receiving coil, which is placed underneath the car, absorbs the magnetic field produced by the transmitting coil and uses it to create a voltage that is used to charge the battery. The electric vehicle's battery is linked to the charging coil. It doesn't require any physical connections because it gets power wirelessly from the transmitting coil to charge. For the ESP32 to operate the car, two motors are connected. With the help of the Android app, the ESP32 may remotely drive the car by providing input to these motors. EMF induction is the process by which wireless power transfer takes place. Underneath the car, the receiving coil receives a voltage from the magnetic field created by the transmitting coil. The electric car's battery is subsequently charged using this voltage. Through the use of an Android app, customers can remotely manage the charging process by connecting the transmitter side ESP32. Users have the convenience and freedom to turn on and off charging through the app. The smart solar wireless electric vehicle charging system is described in this overview along with its circuit diagram and description. It can be developed and adjusted to meet unique needs and functionalities.

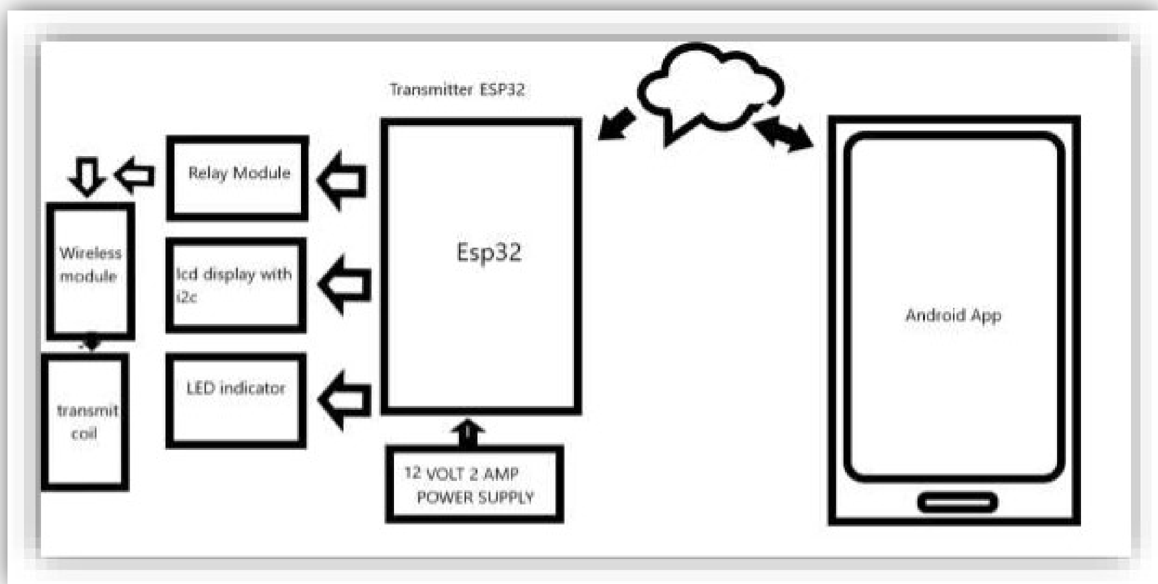


Figure 1:- Working of Charging system

IV. WORK FLOW

1. The PV solar panel is the first component of the system; it gathers solar energy and transforms it into electrical power. These panels are positioned to capture the most sunlight possible for effective energy production.
2. After being harvested, the solar energy is sent into the MPPT converter, which maximizes power output. By ensuring that the system runs at its maximum power point, it improves energy conversion efficiency.
3. Electric car charging is made possible by the grid inverter, which transforms DC (Direct Current) power from the solar panel and MPPT converter into AC (Alternating Current). For gridtied charging systems, this is crucial.
4. The conventional power grid is represented by the AC grid. This is where surplus solar energy can be used as a backup power source in grid-tied charging scenarios or sent back to the grid for credit when solar generation is insufficient.
5. The system incorporates high-capacity batteries to store extra solar energy. Continuous charging is possible with these batteries, particularly at night or in situations where solar energy production is insufficient.
6. The MCU controller serves as the system's brain, coordinating the charging procedure, checking battery condition, and managing and regulating energy flow.
7. The receiving coil installed in the electric car and the transmitting coil in the charging station enable wireless energy transmission. Convenient, cordless charging is made possible by this wireless connection, improving user experience.

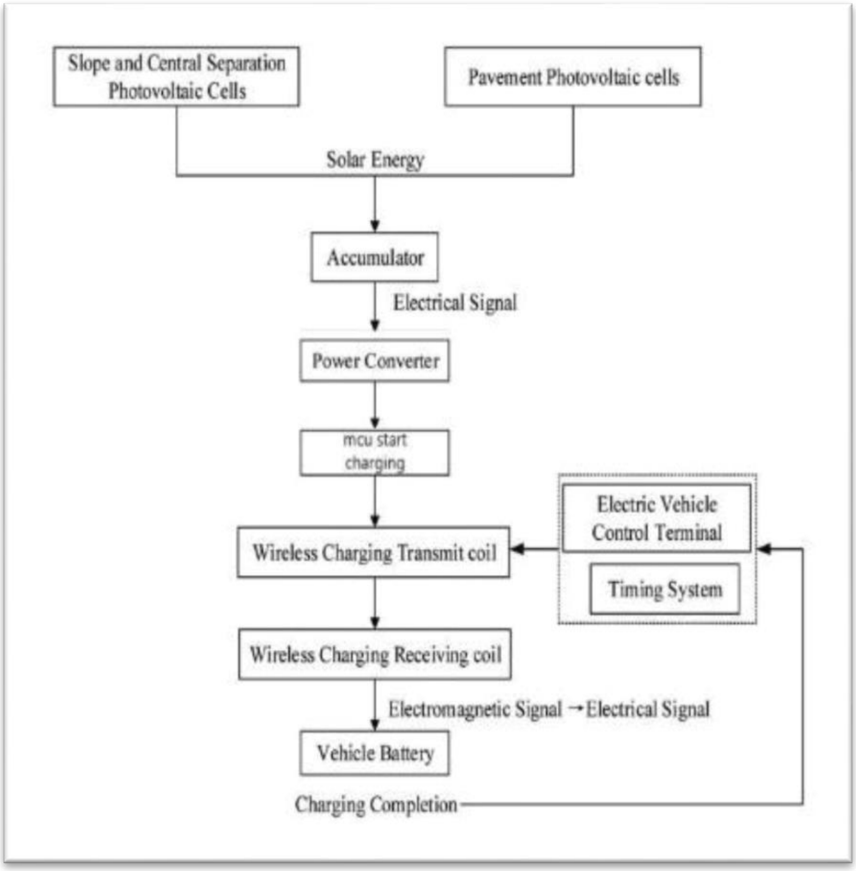
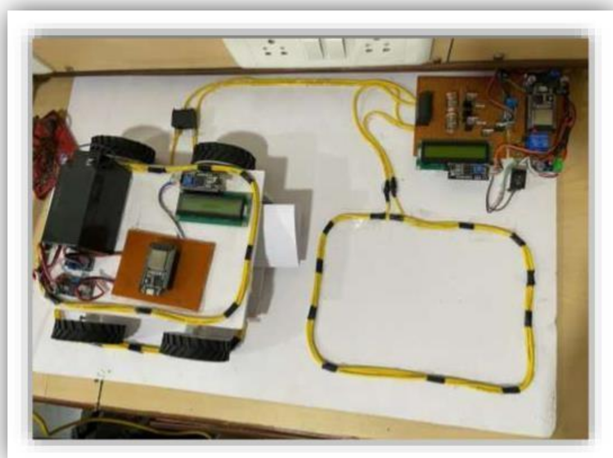


Figure 2: Work Flow

V. RESULT

Technology and Infrastructure Integration Challenges in Dynamic Wireless Power Transfer for Electric Vehicles

Dynamic wireless charging is the process of employing resonant inductive power transmission to wirelessly charge a moving vehicle. In order to do this, pickup coils are installed in the automobile and source coils are placed in the road. The two coils are then connected to transfer as much energy as feasible. The implementation of dynamic wireless charging systems is contingent upon the availability of charging infrastructure, which is constrained by its cost. In theory, these systems offer infinite range and enable the utilization of smaller batteries, thereby reducing expenses and weight associated with EV batteries.



IRJMETS

e-ISSN: 2582-5208

International Research Journal of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

VI. CONCLUSION

To sum up, the "Solar Wireless Electric Vehicle Charging System for Nonstop EV Charging" project is a big step in the right direction toward redefining effective and sustainable electric vehicle charging methods. Our state-of-the-art system that utilizes clean energy for continuous electric vehicle charging was developed by combining several components, including solar panels, HF Transformers, Arduino microcontrollers, LCD screens, and high-capacity batteries. This concept offers flexible applications across a range of sectors in addition to meeting the growing demand for environmentally friendly transportation. The system's versatility and wide-ranging effects are demonstrated by its adaptability to public EV charging infrastructure, fleet and commercial operations, home use, rural and off-grid locations, emergency services, campuses, tourist sites, and public events. In line with international initiatives to lower carbon emissions and encourage the adoption of clean energy, the Solar Wireless Electric Vehicle Charging System presents the possibility for environmentally friendly mobility options going forward. This project has the potential to significantly impact the future of electric mobility and make a positive impact on a cleaner, more sustainable world with additional improvement and implementation.

VII. REFERENCES

[1] Strongly coupled magnetic resonances for wireless power transfer: Kurs, A., Moffatt, R., Joannopoulos, J., Fisher, P., and M. Soljacic (2007) Science, pp. 83–86.

[2] In IEEE Transactions on Power Electronics, pages 1819–1825, Cannon, Hoburg, Stancil, and Goldstein (2009) discuss magnetic resonant coupling as a possible method for wireless power transfer to several tiny receivers.

[3] Compact contactless power transfer system for electric vehicles, Nagatsuka, Y., Ehara, N., Kaneko, Y., Abe, S., and Yasuda, T. (2010), Proc. IPEC, pp. 807–813.

[4] (2010) Online electric car employing inductive power transfer system, in Proc. IEEE ECCE, pp. 1598–1601; Sungwoo, L., Jin, H., Changbyung, P., Nam-Sup, C., Gyu-Hyeoung, C., and Chun-Taek, R. [5] (2011) High efficiency midrange wireless power Garnica, J., Casanova, J., and Lin, J.

[6] Aurbach, D., Marom, R., Elazari, Salitra, R., and Etacheri, V. (2011), "Difficulties in the development of advanced Li-ion batteries: A review," Energy Environmental Science 4, pp. 3243.

[7] Journal of Power Sources, pp. 111; Gerssen-Gondelach, S., and Faaij, A. (2012). Performance of batteries for electric vehicles on short and longer term.

[8] 2014 saw the publication of Yiming, Z., Zhengming, Z., and Kainan, C.'s study of frequency drop in resonant wireless power transfer in IEEE Trans. Power Electron., pp. 1058–1063.

[9] "Feasibility study on bipolar pads for efficient wireless power chargers," Nguyen, T.-D., Li, S., Li, W., and Mi, C. (2014), Proc. APEC Expo.

[10] (2015) Wireless Power Transfer for Electric Vehicle Applications, IEEE Journal of Emerging and Selected Topics in Power Electronics, S. Li et al., pp. 4.