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# A review Wireless charging strategies for Electric Vehicle

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**Abstract:** This paper introduces an updated method for battery charging via renewable energy grids, utilizing solar panels and wind turbines. A voltage regulator maintains a constant output voltage, while a Buck-Boost converter transforms LVDC to HVDC. A rectifier circuit rectifies harmonics produced at the wind turbine output. Stored power is available for various electrical components through a continuous output mechanism at the battery side. The project also presents wireless EV charging, focusing on resonant technology for efficient, cost-effective power transmission through resonance coupling. Solar and wind energy serve as the primary energy sources. Buck-Boost converters, voltage regulators, and C smoothing are employed for efficient operation. Transmitter coils coupled with batteries facilitate wireless power transfer. The abstract addresses challenges in EV charging within office environments, including manual cable connections, limited options, safety concerns, and the absence of dynamic charging capabilities. It proposes an innovative WPT system for office parking areas, integrating renewable energy resources and IoT technology. The system automatically initiates charging upon EV parking, with real-time monitoring through the Blynk application. IoT and RFID technologies provide dynamic updates on charging slot availability and implement strict security protocols. A case study demonstrates the system's efficacy in office settings, achieving a 95.9% IRR, lower NPC of USD 1.52 million, 56.7% power contribution by RERs, and significant reduction in annual carbon emissions to 173,956 kg CO2. (1) (2)

## INTRODUCTION

In the upcoming era, where machinery and conveniences rely solely on electrical energy, the generation and storage of this power become paramount. This project focuses on harnessing renewable energy sources for electricity production. Solar and wind energy, readily available in nature, are key components of this endeavor, accessible even in urban areas. Traditionally, electricity has been predominantly generated by thermal power plants, contributing significantly to environmental pollution. Recent studies show a concerning increase in deforestation rates due to the demand for wood as fuel for these plants. This project aims to mitigate environmental harm while ensuring a steady increase in energy production. India, ranked among the world's most polluted countries, faces urgent environmental challenges, with a dire need to reduce carbon emissions. By implementing renewable energy systems for battery charging, particularly through hybrid wind-solar setups, substantial progress can be made in achieving sustainability goals. Sustainable development, crucial for future generations, requires fundamental changes in energy production methods. This project proposes the design and implementation of renewable energy-based battery charging grids to contribute to this goal. The alarming pollution levels in major Indian cities, notably New Delhi, attributed largely to vehicle emissions, necessitate urgent action. The government's initiative to introduce electric vehicles (EVs) aims to address this issue, requiring an expansion of charging infrastructure nationwide. Our project introduces an EV charging solution as part of this effort, emphasizing the importance of the charging method in reducing environmental impact.(1)

## WIRELESS CHARGING

The wireless electricity transmission is based on the inductive coupling techniques, the circuit consists of transmitter and receiver. Properties of coil are the inductance and power capability must meet the category requirements including the

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working frequency and transferring power. The mechanical dimensions must fit to the target applications, including the coil area, turns and thickness.(1)

## III. BLOCK DIAGRAM

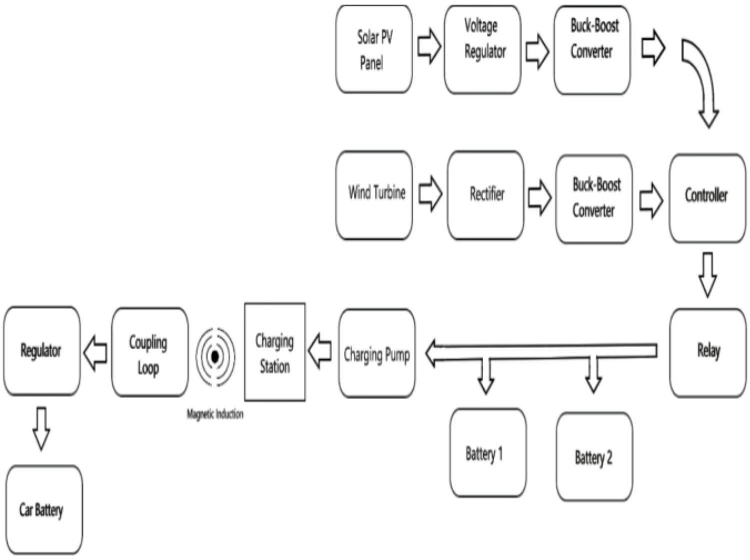


Figure 1: Block diagram of complete process of Recharging of EV through Renewable Grids.

## WIRELESS CHARGING TECHNIQUE

Traditional charging techniques for electric vehicles (EVs) that include physical connections provide several difficulties for users. Frequently, the degradation of cables and plugs needs regular replacements and maintenance. Furthermore, they express apprehensions about the safety and efficacy of electricity transmission. Moreover, the inherent security measures of these systems restrict the freedom and flexibility of vehicle location when charging [3]. In addition to convenience, these limitations might often discourage prospective electric vehicle (EV) customers who prioritize straightforwardness and dependability in their daily encounters. On the other hand, WPT signifies a fundamental change in the method of supplying electricity to electric vehicles. Stemming from the core concepts of electromagnetic induction, WPT systems deploy coils, one in the charging station and one in the vehicle, to assist the transmission of energy over an air gap. This lack of physical connections greatly minimizes the risks of wear-induced inefficiencies and dangers. This provides a more lasting and reliable power supply method. Moreover, the simplicity of WPT serves as a tribute to its user-centric approach. By only parking the car close to a WPT-enabled charging station, customers may commence the charging process, free from the disruption of handling wires or aligning plugs. Another advantage of WPT is its potential to redefine the concept of a charging station. Traditional charging stations are often envisioned as designated spots where vehicles must remain stationary for extended durations. With WPT, however, there is the potential to insert charging mechanisms in a variety of infrastructures. From parking spots in malls or offices to specialized lanes on highways where vehicles can be charged on the go Such innovations could revolutionize the EV charging ecosystem, making charging a more passive, integrated, and seamless activity rather than a distinct, timeconsuming task. Furthermore, the scalability and flexible nature of WPT systems present vast opportunities for integration with other sustainable technologies. Imagine a scenario where solar arrays directly feed into WPT-enabled charging hubs, allowing for the real-time conversion and transfer of solar energy to vehicles. Such integrations could further the sustainability agenda while maximizing the utility derived from RERs. In essence, the advent of WPT is not just an incremental upgrade to the existing EV charging framework; it is a transformative dive. By addressing the core challenges of conventional charging and adding layers of convenience and flexibility, WPT reshapes the future of EV charging. It makes it more user-friendly, efficient, and integrated with everyday experiences. (4)

## IMPORTANCE OF AUTOMATED CHARGING MECHANISMS

In today's fast-paced world, automation is becoming an expectation in many sectors. Historically, numerous systems and processes required thorough human intervention. This often leads to inconsistencies and inefficiencies stemming from

 

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human error For EV charging, automation takes on a nuanced significance Instead of drivers needing to manually adjust settings or monitor their vehicle's charging status consistently, an intelligent automated system can gauge the vehicle's requirements, adjusting in real-time to changes in prevailing conditions. Such adaptability ensures that EVs are not just charged but charged optimally, maximizing battery longevity and ensuring vehicle readiness. (2)

## ENSURING RELIABILITY: MONITORING THE PHOTOVOLTAIC (PV) MODULES

The appeal of solar power lies in its sustainability. However, its efficacy as a consistent energy source relies heavily on the performance of PV modules. These modules, responsible for converting sunlight into usable electricity, are subject to wear, environmental impacts, and potential technical malfunctions Thus, without diligent monitoring, the very foundation of a solar-powered charging station can be compromised. A dedicated monitoring system for PV modules serves dual purposes. First, tracking performance metrics in real-time ensures that the solar panels operate at peak efficiency, translating to consistent and dependable energy output. Second, an early detection system can identify potential issues, allowing for proactive maintenance and reducing downtime. In a world where reliability can significantly impact user trust and adoption rates, such monitoring becomes indispensable. (2)

## INTRODUCING MODERN CONNECTIVITY

The Role of IoT The digital age has been accompanied by an era of extraordinary connectivity. The IoT characterizes this trend, weaving a network of interconnected devices that communicate, share data, and optimize operations based on real-time feedback. Within a solar-powered charging station, the integration of IoT can redefine user interaction. By embedding sensors and communication modules, the charging station can provide users with instantaneous feedback on various parameters, from charging progress to grid health. Furthermore, such integration allows for remote monitoring, where users can check charging status, reserve slots, or even schedule charging sessions via smartphone applications [26]. This level of transparency does not just enhance user experience; it fosters a sense of predictability and control, both of which are crucial for widespread adoption(2).

## STREAMLINING OPERATIONS WITH CHARGING SLOT MONITORING

As more people adopt EVs, the need for charging stations will undoubtedly grow. This spike may cause congestion, with users frequently suffering uncertainty regarding station availability. Charging slot monitoring gives a real answer. By regularly tracking and updating slot occupancy, users may be notified in real-time regarding station availability. Such systems may also interface with booking services, enabling customers to schedule spaces, eliminating wait times and ensuring a smoother charging experience (2)

## PRIORITIZING SECURITY

The Incorporation of Radio Frequency Identification (RFID) Systems With the development of digital infrastructure, security considerations have become crucial. Charging stations, being public utilities, are exposed to unwanted entry and possible abuse. RFID (radio frequency identification) technology gives an elegant answer to this difficulty. Approved automobiles are granted RFID tags; hence, the charging station can promptly verify users, guaranteeing that only those with authorization can use the charging services. This layer of security guarantees that the infrastructure is both safe and trusted by its users(2)

## CONCLUSION

In conclusion, our research presents a pioneering method for EV charging, amalgamating WPT, RERs, and IoT technologies. This innovation not only advances sustainability by leveraging renewable energy but also elevates user convenience through automated vehicle detection and real-time monitoring using the Blynk application. The integration of RFID technology guarantees both effectiveness and security, heralding a significant transformation in EV infrastructure. The wireless charging supports for modern technological reforms. By this way, assist government is building up new reforms and the policy for the betterment of citizens.

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## REFERENCES

1 A. Shashank Prakash Naidu*, “WIRELESS CHARGING OF EV THROUGH RENEWABLE GRIDS”, in International Research Journal of Modernization in Engineering Technology and Science Volume:04/Issue:01/January-2022.
2 Sheeraz Iqbal 1 , Nahar F. Alshammari 2 , Mokhtar Shouran 3,4 and Jabir Massoud 5,* “Smart and Sustainable Wireless Electric Vehicle Charging Strategy with Renewable Energy and Internet of Things Integration” in Smart and Sustainable Wireless Electric Vehicle Charging Strategy with Renewable Energy and Internet of Things Integration. Sustainability 2024, 16, 2487.
3 Gao, M.; Yao, Y.; Yang, F.; Ye, J.; Liu, G.; Wang, B.; Liu, S.; Wang, P.; Lu, Y. Two-dimensional materials for wireless power transfer. Device 2023, 1, 100022.
4 Moeini, S.; Shahabadi, M.; Dana, A. Microwave wireless power transfer system using a dual-dielectric resonator oscillator. AEU Int. J. Electron. Commun. 2023, 170, 154836.

  