



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

A futuristic digital interface with a glowing Earth globe in the center. The background is dark blue with various data visualizations including bar charts, line graphs, and network diagrams. Text elements like 'BUSINESS', 'NETWORK SEARCH', and 'LADING 100%' are visible. A person's hand is seen at the bottom, interacting with the interface.

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 7, July 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijrset@gmail.com

 www.ijrset.com

Electric Vehicles Charging Roads: Advanced Technology Trending Now a Days

Loveneesh Talwar ¹, Purvi Mathur ², Roshanshu Wadhera ³, Sudhanshu Najawan ⁴

Head of Department, Department of Electrical Engineering, YCET, Jammu, Jammu & Kashmir, India¹

U.G. Student, Department of Electrical Engineering, YCET, Jammu, Jammu & Kashmir, India^{2,3,4}

ABSTRACT: This Paper refers to a WPT system to charge the on-board batteries of an electric city-car considered as a study case. The electric city-car uses four series connected 12V, 100A·h VRLA batteries and two in-wheel motors fitted in the rear wheels, each of them able to develop a peak power of 4 kW to propel the car. The work done has been carried out mainly in three different stages; at first an overview on the wired EV battery chargers and the charging methodologies was carried out. Afterwards, background of different WPT technologies is discussed a full set of Figures of Merit (FOM) have been defined and are used to characterize the resonant WPTs to the variations in resistive load and coupling coefficient. In the second stage, the WPT system for the study case has been designed. In the third stage, a prototypal of the WPT system has been developed and tested. Design of the WPT system is started by assessing the parameters of the various sections and by estimating the impact of the parameters of the system on its performance. The design process of the coil-coupling has come after an analysis of different structures for the windings, namely helix and spiral, and different shapes for the magnetic core; further to the preliminary results that have shown the advantages of the spiral structure, a more detailed analysis has then been executed on this structure. The coil design has encompassed the determination of the inductive parameters of the two-coil coupling as a function of the coil distance and axial misalignment. Both the analysis and the design were assisted by a FEM-approach based on the COMSOL code. The paper includes also a brief overview of emerging topics on WPT systems such as on-line electric vehicle (OLEV), shielding of the magnetic fields produced by a WPT system, and standards on WPT operation. These three issues play a significant role in the advancement of the WPT technology.

KEYWORDS: Wireless Power Transfer (WPT), Figures of Merit (FOM), High Frequency Inverter, Wide Band Gap (WBG) devices

I. INTRODUCTION

Growing concern in the reduction of the polluting emissions due to the transportation means has led to the adoption of vehicles powered by comparatively cleaner sources of energy, such as batteries, fuel cells and so on, in place of internal combustion engine (ICE) based vehicles. Differently from ICE vehicles, electric vehicles (EVs) are not a matured technology in terms of vehicle autonomy, and a lot of research efforts is being carried out by academia and industries to improve the overall performance of the these vehicles. Various solutions are being adopted to increase the autonomy of the vehicles such as conceiving batteries of higher energy density, relaxing the batteries during acceleration and regeneration by supplying and absorbing the current peaks by means of super capacitors, arranging fast chargers, charging while on move etc. On-board batteries are typically recharged at home or at stations/parking places through conductive battery chargers. Generally two types of conductive battery chargers are used: off-board and on-board. On-board chargers can be used to charge from the utility outlet at home or at charging stations during the day time. Off board chargers operate like a gas station and are designed to manage high powers in order to perform a fast charge. In most of the battery chargers the power flows only from the utility grid to the battery, and for this reason they are often termed as unidirectional battery chargers (UBCs); beside circuitual simplicity, UBCs enjoy reduced grid interconnection and lower battery degradation. On other hand, some battery chargers manages power flowing in both directions and are able to perform ancillary operation in favour of the grid, such as peak power shaving or reactive power compensation. These battery chargers are called bidirectional battery chargers (BBCs). Charging of an electric vehicle can be performed by either conductive (or wired) charging or wireless charging. Wired charging uses connection means between electric supply and charge inlet of the vehicle. Even though wired charging is popular, the problems with messy wires and safety matter in wet environment are a major drawback of this charging. Since a few years, a large interest is growing for the supply of the electric loads through a field to dispense from any wired connection with the grid. The apparatuses that actuate the through the-field supply are termed as wireless power transfer systems (WPTSs).

Their deployment has started for the recharge of the batteries that are fitted in grid-detachable equipment. Recharging is executed while the equipment is standing in an on-purpose set but the long time perspective is the supply of equipment while moving, with the purpose of removing the batteries or at least of reducing their capacity. Wireless charging of the EV batteries offers a number of advantages compared to the wired counterpart; indeed, wireless charging makes it i) unnecessary any plug, cable or outlet, ii) friendly the charging process, iii) fearless the transfer of energy in any environmental condition, and so on. For these reasons, WPTSs are expected to play a major role in the future charging process for the EVs. Three different technologies can be utilized to arrange a WPTS, exploiting the properties of the electric, magnetic and electromagnetic fields. Magnetic-field technology, adopted in the so-called inductive WPTSs, is the most convenient one because it transfers much higher energy per unit of volume than the electric-field technology, and does it with much higher efficiency than the electromagnetic-field technology. As a matter of fact, low-power inductive WPTS with closely coupled coils are around since a few years. In recent times, however, interest is arisen in transferring energy at medium-high power to equipment at a somewhat far distance. For these applications, inductive WPTSs with resonant topology (shortly, resonant WPTSs) are used.

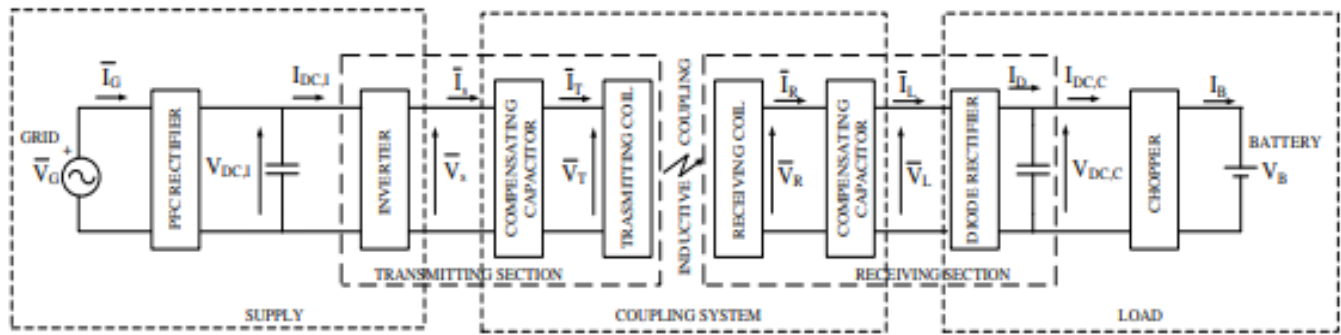


Fig.1 . - General scheme of a resonant WPTS.

It consists of two sections: transmitting and receiving, each of them including a coil that is coupled to the other one with a large air-gap in between. Both the WPTS sections are equipped with power conversion circuitry. On the transmitting section, the grid feeds the relevant coil through a diode rectifier with output capacitor and an in-cascade inverter operating at high frequency. Grid, rectifier and battery constitute the supply of the transmitting coil and are equivalent to a sinusoidal generator with an in-series resistance, where the frequency of the generator is the inverter frequency. To achieve a good power factor, the diode rectifier is normally substituted for by a PFC rectifier. On the receiving section, the voltage induced across the receiving coil charges the battery pack through another capacitor-output diode rectifier and an in-cascade chopper, which adapts its output current/voltage to the battery charging requirements. Rectifier, chopper and battery constitute the load of the receiving coil and are equivalent to a resistance. Coupling structure crucially affects the performance of a WPT system. Various coil arrangements are documented in literature but two arrangements are frequently used in EV charging applications, namely helix and spiral. Spiral coils can take many forms with rectangular and circular turns, and offer more flexibility for optimizing the coil geometry, what makes them particularly attractive for EV charging applications. Coil alignment is one of the major issues for WPT. Because of the tolerance in the vehicle parking manoeuvre, the receiving coil may be not perfectly aligned with the transmitting coil during EV charging process. This reduces the coupling coefficient compared to that one in aligned conditions with a consequent decrease of the efficiency in the power transfer. By the resonant topology, the inductances of the coils are compensated for by capacitors inserted either in series or in parallel to the coils and tuned to make resonant the coil capacitor branches at the supply frequency. Four basic topologies of resonant WPTSs can be found: series-series (SS), series-parallel (SP), parallel-series (PS) and parallel-parallel (PP), depending on the connection (series or parallel) of the capacitors with respect to the coils in the two sections of the WPTS. Operation of a WPTS requires power electronics circuitry. The power circuitry supplying the transmitting coil includes a high-frequency inverter and a diode rectifier that also works at high frequency. High-frequency operation is conveniently implemented by using new generation devices like SiC/GaN to keep high the efficiency of the system. DC voltage across the output capacitor of the rectifier in the receiving section is controlled by acting on the magnitude of the output voltage of the inverter placed in the transmitting section. Emerging issues in wireless power charging of the EVs are i) dynamic (or on-line) charging, ii) shielding the magnetic fields nearby the WPTSs, and iii) standards under issue to regulate the

setup of the WPTS. Online charging is a technique to charge the battery of an EV while the vehicle is in motion, with the transmitter that is formed by tracks embedded in the ground. The Korean Advanced Institute of Science and Technology (KAIST) introduced dynamic charging, termed by its researchers as On Line EV (OLEV) charging technology, in a commercial application (the zoo of Seoul). Shielding of the magnetic field out of the transmitting coil is a significant issue to be faced in a WPTS to protect the biological organs from its effects; two types of shielding are commonly used for this purpose, i.e. passive and active shielding.

II. WIRELESS POWER TRANSFER SYSTEM (WPTS): BACKGROUND

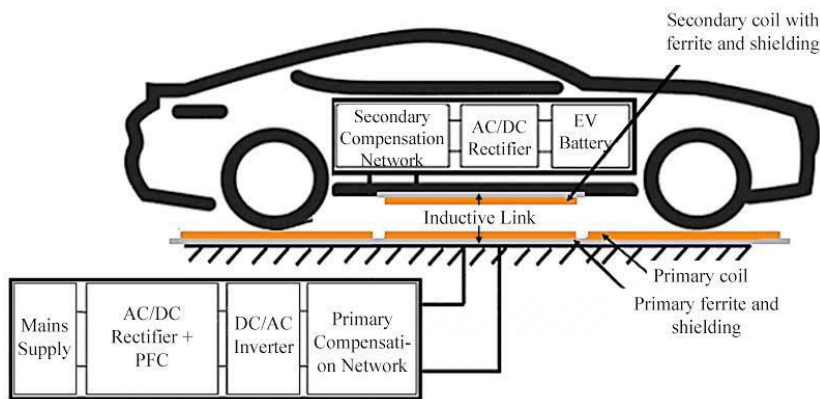


Fig.2 - Schematics of WPT for electrical vehicle battery charging

It is made of two power sections electrically insulated: the transmitter and the receiver. The transmitter is buried into the pavement and is fed by the mains, the receiver is embedded into the electric vehicle and delivers power to the battery pack on board the vehicle, the latter one constitutes the load of the WPTS and is represented by a resistor in Each section of WPTS consists of a coupling device and a power converter. The coupling device of the transmitter (briefly, the transmitting device) generates an alternating field that can be either electric or magnetic or electromagnetic. Actually, any alternating electric field is associated to an alternating magnetic field and vice-versa so that the above distinctions may not seem correct, in practice, when the frequency of the oscillations is relatively low, quasi-static field conditions prevail and the field can be considered either electric or magnetic depending on the transmitting device. On the other side, the coupling device of the receiver (briefly, the receiving device) is intersected by the alternating field generated by the transmitting device and, acting as a pick-up, takes the energy transported by the field.

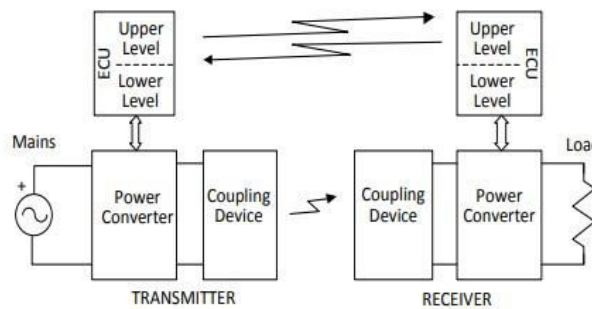


Fig.3 - Structure of WPT for electrical vehicle battery charging

The power converter of the transmitter (shortly, the transmitter converter) comprises of front-end PFC rectifier cascaded by an inverter that feeds the transmitting device with an alternating voltage. The power converter of the receiver (shortly, the receiver converter) draws the energy from the receiving device, working as a rectifier that recharges the batteries with the required values of voltage and current. Each power section of a WPTS includes one electronic control unit (ECU). The two ECUs govern the WPTS operation. The governing tasks are divided into two layers: the upper level provides to the management of the power section whilst the lower level controls the power converter. The upper levels of the two ECUs exchange the information needed for the management of the power sections through wireless communication ports.

III. WIRELESS POWER TRANSFER SYSTEM (WPTS) TECHNOLOGIES

Three technologies differing in the type of the involved field are used to transfer electric energy. These three technologies are termed as capacitive, inductive and radiant; they exploit the coupling property of the electric, the magnetic, and the electric and magnetic fields combined together into an electromagnetic wave respectively. A common feature of the WPTSs is that the transmitting device energizes the surrounding space. In capacitive and inductive power transfers, the respective energy stored in a unitary volume of space is

$$W_e = \frac{1}{2} \epsilon_0 E^2$$

$$W_m = \frac{1}{2} \mu_0 H^2$$

Where, E and H are the intensity of the electric and magnetic fields and, ϵ_0 and μ_0 are the permittivity and the permeability of the free space. On account of the values of ϵ_0 and μ_0 , and the acceptable voltages across and current into the coupling devices, the energy density achievable with the magnetic field in the free space is about 104 times greater than with the electric field. In the radiant power transfer, the energy is concentrated along the transmission path where the electromagnetic field reaches very high values.

Capacitive WPTSs

The coupling devices of the capacitive WPTSs are two plane capacitors with the plates on the transmitter side facing the plates on the receiver side as indicated in Fig. The main advantages of the capacitive WPTSs are low losses, insignificant electromagnetic emissions, and ability to transfer power through metal shields without originating eddy currents [2]. On the other hand, the energy density that can be stored in the free space between the plates is comparatively low and consequently the use of the capacitive WPTSs is limited to very low power applications.

Inductive WPTSs

The coupling devices of the inductive WPTSs are two coils mutually coupled as shown in Fig. The transmitting coil is excited by an alternating current at high frequency, generally between 10 kHz and 150 kHz. Because of the greater energy density of the magnetic field in the free space, inductive WPTSs are able to handle much higher power than the capacitive ones and can operate at higher power levels. In contrast to these advantages, they suffer from losses in the coils resistances, do not operate if a metallic body is interposed between the coils, and produce appreciable electromagnetic interferences. The inductive WPTSs utilize two topologies for transferring power and the relevant systems are termed as inductive coupling and resonant coupling WPTS.

Radiant WPTSs

Radiant WPTSs are able to transfer power with high efficiency over a distance several times longer than the size of the coupling devices. This is obtained by executing a directional transmission of the electromagnetic waves. In the radiant WPTSs, the size of the coupling devices is proportional to the wavelength of the electromagnetic waves and hence, in order to maintain it within practical limits, high-frequency waves are used such as microwaves and lasers. Power transmission via radio waves can be made more directional, allowing longer distance power beaming, with shorter wavelengths of electromagnetic radiation, typically in the microwave range. A rectenna is used to convert the microwave energy back into electricity. The microwave source consists of a microwave oven magnetron with electronics to control the output power. The output microwave power ranges from 50 W to 300 W at about 3GHz. A coaxial cable connects the output of the microwave source to a coax-to-waveguide adapter. This adapter is connected to a waveguide ferrite circulator which protects the microwave source from reflected power. The circulator is connected to a tuning waveguide

section to match the waveguide impedance to the antenna input impedance. In the case of radiant WPTS closer to visible region of spectrum (10s of microns (um) to 10s of nm), power can be transmitted by converting electricity into a laser beam that is then pointed at a solar cell receiver. This mechanism is generally known as "power beaming" because the power is beamed at a receiver that can convert it to usable electrical energy. There are quite a few unique advantages of laser based power transfer that outweigh the disadvantages.

- Collimated monochromatic wave front propagation allows narrow beam cross-section area for energy confinement over large ranges.
- Compact size of solid state lasers-photovoltaic semiconductor diodes allows ease of integration into products with small form factors.
- Ability to operate with zero radio-frequency interference to existing communication devices i.e. Wi-Fi and cell phones.
- Control of Wireless Power Access, instead of unidirectional transfer where there can be no authentication before transferring power.

These allow laser-based wireless power transfer concept to compete with conventional power transfer methods. and Its drawbacks are:

- Conversion to light, such as with a laser, is moderately inefficient
- Conversion back into electricity is moderately inefficient, with photovoltaic cells achieving 40%-50% efficiency.
- Atmospheric absorption causes losses.
- As with microwave beaming, this method requires a direct line of sight with the target.

IV. ON-LINE ELECTRICAL VEHICLE (OLEV)

One of the biggest issues around the world in recent years are the environmental problems. Every country tries to adopt green technologies which offer the potential to improve the air quality in currently polluted environment and which will save money by reducing fossil fuel consumption. The use of electric cars is expected to significantly reduce the aforementioned problems of air pollution and fossil fuel consumption costs. Numerous studies on electric vehicles have been performed over a long period of time and some electric vehicles are currently sold by several vehicle manufacturers worldwide The On-line Electric Vehicle (OLEV) developed by Korean advanced institute of science and technology (KAIST) is an electric transport system, in which the vehicles absorb their power from power lines underneath the surface of the road. Even though the basic concept was invented in 1970's, the circuit system and power transfer system are completely different. Rather than relying on battery technology, OLEV picks up a charge using a wireless charging method in which a power source is placed underneath the road surface and power is wirelessly picked up by the vehicle itself.

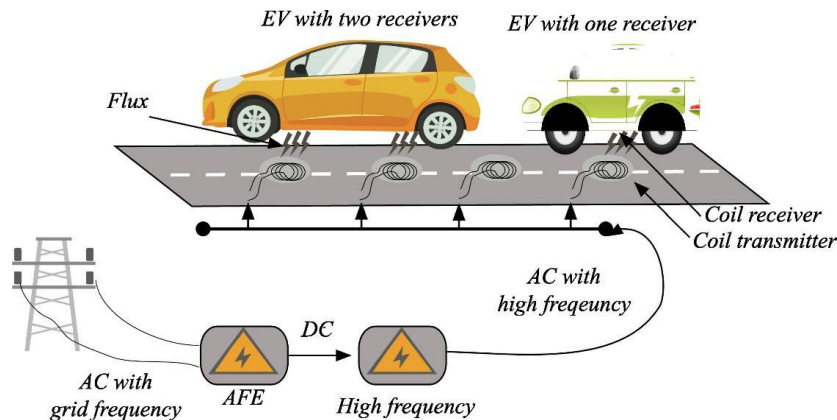


Fig.4 - charging Concept of online electrical vehicle

KAIST has introduced a novel OLEV, in which the vehicle constantly recharges via power lines beneath the surface of the road. The OLEV has a minimal battery capacity (about 20 % compared to that of conventional battery-powered electric vehicles), which minimizes the weight and price of both the vehicle and the power station. The OLEV power transfer system consists of an inverter, power lines, pick-up modules, rectifiers, regulators, batteries, and motors, as shown in Fig. The inverter converts 60Hz power from electric grid to 20 kHz, 260A current. The inverter is designed to provide consistent current. The power lines carry the current and generate magnetic flux which links with pick-up modules. The pick-up modules which are at 25cm higher than power lines capture the magnetic flux from the power lines and generate AC power. The rectifiers convert AC power to DC power and the regulators control output voltage which is input voltage of the batteries and the motors. Some of the generated power is used to operate the motors, and the remaining is used to recharge the batteries. When OLEV bus is stops and the motors do not need any power, all of the power is consumed to recharge the batteries. The design of the power lines and pick-up module determines the performance of the power transfer system and leakage in the electromagnetic field. One of the key design requirements is suppression of the leakage of magnetic flux from power lines and the pick-up module in order to maintain high efficiency of the system and meet the OLEV’s total power needs. This chapter introduces the wireless power transfer technology applied to OLEVs, and show the techniques for improving electrical performance. Optimization methodology of the coils design and the shielding of the electromagnetic field are analysed. The design of the power lines and pick-up module determines the performance of the power transfer system. The magnetic flux generated from the power lines is gathered at the pick-up module to generate DC power for the vehicle’s motor. The non-contact power transfer that occurs between the power lines and the pick-up module generates a huge magnetic flux. Therefore, the proper design of the power lines and the pick-up module are the key technologies for effective power transfer and solving the electromagnetic field (EMF) problems. OLEV system consist of two types of power transfer –mono type power transfer and dual type power transfer with opposite current directions beneath the road surface forming a current loop. Due to the current in the power lines, a magnetic flux is induced around each power line.

V. GENERAL BLOCK DIAGRAM FOR A WIRELESS POWER TRANSFER FOR EV

In recent trend, wireless power transfer is initializing to seek more and more attention. The block diagram comprises of Grid, rectifier, inverter, LC filter, linear transformer, super capacitor and battery. The low frequency AC supply is supplied by grid, is rectified and inverted to high frequency AC supply. In order to evict the harmonics, LC filter is brought into use. The high frequency AC supply is provided to transmitter coil and an emf is induced in the Receiver coil and the emf is recast from AC to DC. DC supply is used to charge to EV battery through of super capacitor. In this system we are used a control system to self-regulate the transmitter coil for different types of EV’s. The control system has a MOSFET, inductive filters and Saw tooth reference signals to get desired output. A general block diagram for the wireless power transfer for EV is shown in Fig

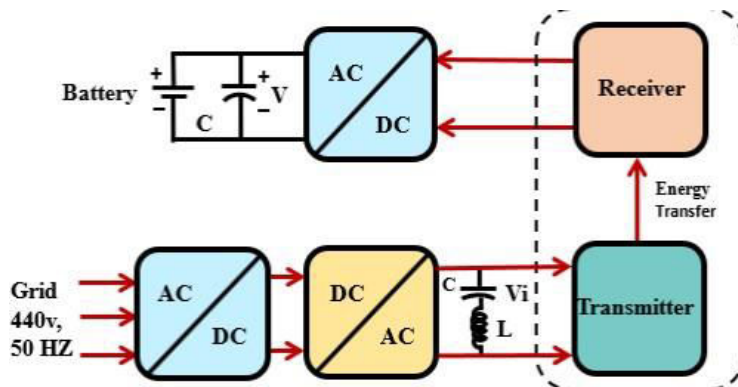


Fig.5 – Block Diagram for WPT For EV

VI. FUTURE SCOPE

In Future, EV charging roads have the potential to revolutionize the way we think about electric vehicles. Not only do they offer increased range and reduced charging times, but they also have the potential to greatly reduce carbon emissions and improve air quality. As technology continues to advance, it is likely that we will see more and more of these charging roads being implemented in cities around the world. While there are still some challenges to overcome, such as the cost of implementing these roads on a large scale, the benefits are clear. By investing in this technology now, we can help pave the way for a cleaner, more sustainable future. Despite these challenges, the potential benefits of EV charging roads are too great to ignore. In the future, we could see entire highways and transportation networks equipped with this technology, making it easier than ever for people to drive electric vehicles

VII. CONCLUSION

In this material, an authentic method is portrayed to handle different ground clearance in wireless power transfer systems. The measurements used for the above parameters show reliable results for proposed theme. In the prototype zero visible heating of the used relays was notified. Several simulations were performed. Regardless of previous studies, we inspected with some real-world charger placement limitations in the surveillance area such as walls, ground clearance. The above delivered system is economical and highly beneficial because it uses inverters, rectifiers and filters to handle a different coupling factor. Separate control system is enrolled, where, the transmitter coil is automatically tapped for transferring the power to the battery based on the ground clearance within 200mm. eventually, and this paper contributes to the typical hindrance of varying ground clearance. The wireless charger was procedurally verified for the battery at 4.5 kWh, super capacitor at 3.8KWh with a peak efficiency of 86%.

REFERENCES

- [1] Kang Miao, Bidirectional battery charger for electric vehicles, Asia (ISGT Asia) 2018
- [2] SagolsemKripachariyasinh, T. S. Hasarmani, and R. M. Holmukhe wireless transmission of electrical power overview of recent research and development, International journal of Computer and Electrical Engineering, Vol.4, No.2, April 2019.
- [3] M.Bertoluzzo, K.N.Mude and G.Buja, "Preliminary investigation on contactless energy transfer for electric vehicle battery recharging", Proceedings of IEEE International Conference on Industrial and Information Systems (ICIIS), pp.1-6, 2012.
- [4] K.N.Mude, H.Dashora, M.Bertoluzzo, and G.Buja, "From Wired to In-moving Battery Chargers for Electric Vehicle", Proc.of DEEE'14, 2014, pp.33-40.
- [5] K.N.Mude, M.Bertoluzzo and G.Buja, "Inductive Characteristics of Different CoilCoupling Set-ups for Wireless Charging of an Electric City-Car," Proceedings of IEEE IEVC 2014, 2014, pp.1-7.
- [6] M.Bertoluzzo, and G.Buja and K.N.Mude, "Characteristic Evaluation of Wireless Battery Chargers for Electric Vehicles", Proceedings of 10th Jubilee International Symposium on Advanced Electromechanical Motion Systems, 21-22 October 2013.

BIOGRAPHY



Er. Loveneesh Talwar Presently Working as Head of Department in the Department of Electrical Engineering. He Worked as Head of Deptt. in the Department of Electrical Engineering at IECS Polytechnic, Purkhoo Camp, Domana, Jammu , He Worked as Lecturer in Electrical Engg. Deptt. at Govt. College of Engg. & Technology(G.C.E.T.) Jammu. He also worked as Maintenance Engineer at Berger Paints India Ltd, Industrial area Growth Centre Samba, Jammu. He had done his M.Tech. in Energy Management from Shri Mata Vaishano Devi University (SMVDU) Kakrayal Katra in 2010 and B.E. in Electrical Engineering from MBS College of Engineering and Technology, Jammu in 2006. In addition to own duties & responsibilities as HOD (Electrical Engineering Department) at YCET he is also Working as Controller of Examination for the smooth conduct of examinations being conducted in the college. He is presently working as club Secretary for NDL Club of YCET and also the Convener of IIC Cell of YCET. He worked as Co-Convener for International Conference Riset- 2015. He is Editorial Board Member for 2nd International Conference Riset- 2020. His area of specialization is Network Analysis, Principles of Electrical Engineering, Control Systems, Power Systems,

Power Electronics, Design of Power Apparatus (DOPA), and Electrical Machines. He had Published 25 Research Papers in National and International Journals having very good Impact Factor and attended More than 50 National and International Conferences. He had Attended 100 Webinars/FDPs/Workshops to strengthen the knowledge especially during Lockdown period. He is Editorial Board Member of International Journal IRJAES. He delivered talk on Energy Conservation Techniques adapted for the conservation of Energy in Domestic Sector organized by IET local Chapter Kanyakumari, Energy Conservation Opportunities organized by Er. Perumal Manimekalai College of Engineering ,Koneripalli, Hosar , Save Energy for Future Generation organized by Karpaga Vinayaga College of Engineering & Technology, GST Road, Chinna Kolambakkam, Padalam, India and Efficient Utilization of Electrical Energy organized by Jayalakshmi Institute of Technology ,Dharmapuri, India. He had been invited as a keynote speaker to deliver talk in International Conference on Emerging Trends in Science and Circuit Engineering (ICESCE-2021) which was organized by ADHI college of Engineering & Technology, Kanchipuram ,India. He had also published 20 articles on different topics in Various Local Newspaper. He had Done Energy Audit of various Projects like 230KV/132KV/33KV Barn Grid Station, Hindustan Coco-Cola Beverages, Pvt Ltd, Gangyal, Jammu, DPS School Jammu.



Ms. Purvi Mathur, Student of B.E Final year, Electrical Engineering, YCET Jammu. She had Attended EV Workshop at Govt polytechnic College Jammu. She had got Certificate for the Completion of Arduino Training in Spoken Tutorial Project from IIT Bombay. In addition to that she worked as Student Co-Coordinator for the college Fest Nirvikalapa-2K23 and performs various duties and responsibilities to make a grand success for the Fest.



Mr. Roshanshu Wadhwa Student of B.E Final year, Electrical Engineering, YCET, Jammu. He had Attended EV Workshop at Govt polytechnic College Jammu. He had got Certificate for the Completion of Arduino Training in Spoken Tutorial Project from IIT Bombay. In addition to that he worked as Student Coordinator for the college Fest Nirvikalapa-2K23 and performs various duties and responsibilities to make a grand success for the Fest.



Mr. Sudhanshu Najawan, Student of B.E Final year, Electrical Engineering, YCET, Jammu. He had Attended EV Workshop at Govt polytechnic College Jammu. He had got Certificate for the Completion of Arduino Training in Spoken Tutorial Project from IIT Bombay. In addition to that he worked as Student Co-Coordinator for the college Fest Nirvikalapa-2K23 and performs various duties and responsibilities to make a grand success for the Fest.



SJIF Scientific Journal Impact Factor

Impact Factor: 8.423



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details