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OR-DEV System (On Road Dynamic Charging for Electric vehicles)

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Abstract - *In this system, an inductive wireless charging lane for electric vehicles and battery swapping/charging station is introduced. In recent years, under the background of global warming, electric vehicles (EVs) using clean energy are getting more attention among the developed and developing countries, since they can help reduce the emission of carbon dioxide. However the traditional electric cable charging for EVs brings up some problems. For instance, EVs have to be parked in the charging station equipped with electric chargers with cables in order to get powered and it usually takes at least a couple of hours to get full charged. To avoid the limitation of position and time, the wireless power transmission (WPT) is proposed for an alternative solution for EVs charging. Through inductive coupling effect, EVs can be charged continuously as long as they drive along the roadway, under which coupled coils are laid. The basic WPT system only consists of two coils, one connected to a load while the other connected to a source. In addition, most of the research only discusses about the structure of either the single transmission coils or single receiving coils. In the efficiency of wireless power transmission of inductive coupled coils is calculated in the condition of vertical and horizontal deviations. The complete system is smart and Internet connected so user and the owner can easily monitor or track the system using Web application.*

Key Words: *Electric Vehicle, Street Light Station, Solar Energy, Wireless Charging, Wireless Power Transmission.*

1. INTRODUCTION

In recent years, under the background of global warming, electric vehicles (EVs) using clean energy are getting more attention among the developed and developing countries, since they can help reduce the emission of carbon dioxide. However, the traditional electric cable charging for EVs brings up some problems. For instance, EVs have to be parked in the charging stations equipped with electric chargers with cables in order to get powered and it usually takes at least a couple of hours to get full charged. To avoid the limitation of position and time, the wireless power transmission (WPT) is proposed for an alternative solution for EVs charging. Through inductive coupling effect, EVs can be charged continuously as long as they drive along the roadway, under which coupled coils are laid. The basic WPT system only consists of two coils, one connected to a load while the other connected to a source. In addition, most of the research only discusses about the structure of either the single transmission coils or single receiving coils. In, the efficiency of wireless power transmission of inductive coupled coils is calculated in the condition of vertical and horizontal deviations. For multiple transmitters and multiple receivers systems, some progresses have been made in. In, a formula on two-transmitter-single-receiver system is derived and simulation results are presented. Based on the basics mentioned above, this paper aims to propose a small prototype of a "charging-on-the-way" lane, which consists of multiple spiral coils. The coupling performance as the moving receiver coil moves along the designed wireless charging lane is investigated.

The Green Vehicle or Clean Vehicle is the global demand in today's automobile industries. The Electric Vehicle is the most suitable alternative of conventional vehicles i.e. Petroleum Vehicles. The large capacity, weight, expensive price, short life span and charging time of the battery to get fully charged interrupt the commercialization of Electric Vehicle. Dynamic Charging of Electric Vehicle is the solution over these problems. Our proposed OR-DEV SYSTEM reduced the waiting time to charge the Electric Vehicles and increases the mileage of the Electric Vehicle by Dynamically Charged the Electric Vehicles.

Electric Vehicle is comparatively new concept in the transportation sector. Due to several benefits i.e. less environmental pollution, cheaper mode of transportation, use of less petroleum, Electrical Vehicles becomes very much attractive now-a-days. There are mainly three types of electric vehicle available in world-wide i.e. Plugin hybrid electric vehicle, Hybrid electric vehicle and Battery electric vehicle. Like other developed country, use of Electrical vehicle like Easy bike, auto-rickshaw and electric bike in India are also increasing rapidly and it is more than 7.28% of the total registered vehicle up to March 2018. All of these vehicles are using electric motor to run these vehicles with the energy from batteries. According to the newspaper, Electric Vehicle penetration in India requires more than 450MWof electricity daily. The huge power demand creates a serious problem with the existing demand. Charging of Electrical Vehicle requires high power and large time but their range is not satisfactory. In addition, there is no sufficient charging station in India. Thus, the Electric Vehicle owner has to charge their batteries from residential connection illegally which becomes a cause of system loss in the power sector. To promote Electric Vehicle

penetration, it is necessary to establish sufficient charging stations located at various suitable places.

2. EASE OF USE

The Green Vehicle or Clean Vehicle is the global demand in today's automobile industries. The most suitable alternative for Existing Vehicles which uses the fuel is the Electric Vehicle. The large capacity, weight, high rate, minimum life and charging time of the battery to get fully charged interrupt the commercialization of Electric Vehicle. Dynamic Charging of Electric Vehicle is the solution over these problems. Our proposed OR-DEV SYSTEM reduced the waiting time to charge the Electric Vehicles and increases the mileage of the Electric Vehicle by Dynamically Charged the Electric Vehicles.

3. RESULTS AND DISCUSSION

"OR-DEV Efficient Approach to Increase the Mileage of Electric Vehicle Using Wireless Charging", used to charge the Electric Vehicle dynamically such as:

Equations

- ***Input:***

  System set = {I, O, S, F}

  Where,

  - *I = Input*
  - *O = Output*
  - *S = Success*
  - *F = Failure*

$I = \{I_1, I_2, I_3, \ldots, I_n\}$
Here, I is the inputs from the voltage sensors.

- ***Output***

  As shown in below fig. input from voltage sensor provides the functions of controller to display the charging status on LED Display.

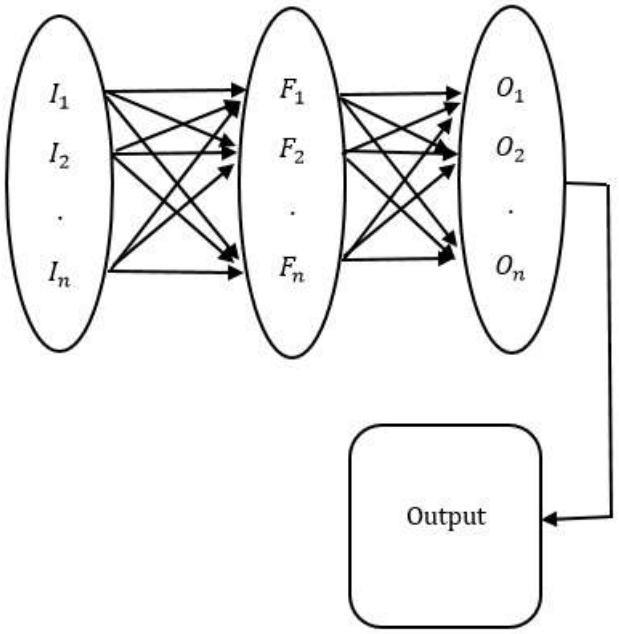

Fig. 1: Success Condition

4. SYSTEM ARCHITECTURE

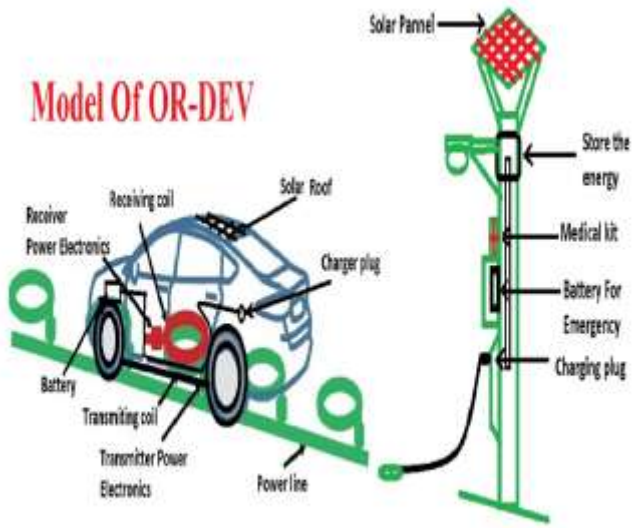

Fig. 2: System Architecture

5. LITERATURE SURVEY

For the study of dynamically charged the Electric Vehicles we studied following papers.

Jiang, W., Xu, S., Li, N., Lin, Z., & Williams, proposed an inductive coupled wireless charging system for 48V light electric vehicle. The wireless power flow can be effectively controlled by the load matching converter. The proposed system achieves 250W charging power under 70mm air-gap

with 65% efficiency. The efficiency can be further increased with a smaller air gap or larger coil size or both [1].

Werachet Khan-ngern and Heinz Zenkner, presents wireless power charging to an electric vehicle (EV) focusing on resonant topology. The charging system is described and set up using the resonance coupling effect and single-ended primary-inductor converter (SEPIC) for a low DC charging. The resonance coupling at 6.78 MHz was applied to avoid the EMC issue, electromagnetic emission limitation. The wireless power charging system was designed with the transmitter and receiver on selected magnetic materials to aim the lower loss in the component [2].

Luke Hutchinson , Ben Waterson1, Bani Anvari, Denis Naberezhnykh describes current traction battery technologies, conductive and inductive charging processes, DWPT system requirements, and the international standards and codes associated to EVs. It conducts a detailed survey on dynamic wireless charging infrastructure fundamentals and their implementation issues. It highlights the current barriers and potential issues for supporting and accelerating EVs' growth, with emphasis on the need for standardization [5].

In-Soo Suh, Jedok Kim, The innovative on-road dynamic wireless charging technology for electric vehicle, called OLEV, is introduced. The fast charging in the range of 100 kW of power capacity and wireless dynamic charging concept are described. Also the design concept, system architecture and development process of optimizing the magnetic flux field for the higher power transfer efficiency are described [3].

Kraisorn Throngnumchai, Akihiro Hanamura, Yuji Naruse, Kazuhiro Takeda has presented the design and evaluation of a wireless power transfer system with road embedded transmitter coils for dynamic charging of an EV. The system described in this paper has been designed and optimized only for unidirectional electric power transfer from the road to the vehicle. A study on bidirectional power flow between the infrastructure and the on-board battery, which is essential to facilitate a vehicle to-grid (V2G) concept, is also planned for future work [7].

Liu Shuguang, Ye Zhenxing, a wireless power supply method for electric vehicles with multi-guideway power supply mode is presented, the structure and principle of the system are described in detail, the design method and loss of the guideway are analyzed. It is verified that the system can effectively reduce the damage of the guide way to the stability of the system and the loss of the guide way to the effect of the system efficiency. The conventional wireless charging technology for electric vehicles (EV) has the disadvantages of non-running charging, long charging time and frequent charging, etc. To solve the above problems, a novel wireless power transfer (WPT) for road-embedded running EV charging using multi-parallel primary coils is proposed in this paper [4].

Mustapha Debbou, Francois Colet, presents an overview of inductive wireless power transfer (WPT) technologies for the application of electric vehicles (EVs) wireless charging. An efficient design of WPT charging system is proposed and the innovative solution is an optimized magnetic coupler associated with the use of new semi-conductors components the most challenging EV charging application's requirements. Different wireless power transfer techniques are reviewed on the perspective of EV charging application. The coupled magnetic resonance and magnetic gear technologies are chosen out for detailed reviews, due to their suitability for EVs charging application in both power and range level[6].

6. CONCLUSION

Dynamic Wireless Charging of Electric Vehicle approach revolutionizes the changes in Electric Vehicle Industry. Dynamic Wireless Charging of Electric Vehicle reduces the cost and size of the battery, thereby reducing the cost of electric vehicle. Simulation of Dynamic wireless charging system with transmitter and receiver coils and efficiency of 94% have been achieved. Simulink models High frequency 23 kHz resonant inverter and solar panel with Boost converter are developed at transmitter end. Simulink models of rectifier with filter and traction motor have been developed at receiver coil end. Simulation results of state of charge (SOC) of electric vehicle battery at different alignment and mis-alignment positions of coils have been achieved. The Electric vehicle batteries which use to take 2-3hrs to charge up to the rated value will be charged with in 40min as their battery capacity is reduced. With reduced new battery capacity using dynamic wireless charging system electric vehicles can be charged under motion.

7. ACKNOWLEDGEMENT

The main aim of this project is to reduce the waiting time require to charge the Electric Vehicle. Also to increase the mileage of the Electric Vehicle by providing the Dynamic Charging to the Electric Vehicle while Vehicle is in motion. This system is useful to reduce the valuable time of people.

REFERENCES

[1] Jiang, W., Xu, S., Li, N., Lin, Z., & Williams, B. W. (2015). Wireless power charger for light electric vehicles. 2015 IEEE 11th International Conference on Power Electronics and Drive Systems.

[2] Khan-ngern, W., & Zenkner, H. (2014). Wireless power charging on electric vehicles. 2014 International Electrical Engineering Congress (iEECON).

[3] Suh, I.-S., & Kim, J. (2013). Electric vehicle on-road dynamic charging system with wireless power transfer technology. 2013 International Electric Machines & Drives Conference.

[4] Shuguang, L., Zhenxing, Y., & Wenbin, L. (2018). Electric Vehicle Dynamic Wireless Charging Technology Based on Multi-parallel Primary Coils. 2018 IEEE International Conference on Electronics and Communication Engineering (ICECE).

[5] Hutchinson, L., Waterson, B., Anvari, B., & Naberezhnykh, D. (2018). Potential of wireless power transfer for dynamic charging of electric vehicles. IET Intelligent Transport.

[6] Debbou, M., & Colet, F. (2016). Inductive wireless power transfer for electric vehicle dynamic charging. 2016 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (WoW).

[7] Throngnumchai, K., Hanamura, A., Naruse, Y., & Takeda, K. (2013). Design and evaluation of a wireless power transfer system with road embedded transmitter coils for dynamic charging of electric vehicles. 2013 World Electric Vehicle Symposium and Exhibition.