Advance Wireless Charging Station For Electric Vehicles Using Solar Energy

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Abstract- *The human society keeps making advancement in all the life areas with the help of knowledge and research for the betterment of civilization. Important part of economic growth & globalization is transport, but most of its types cause air pollution, health issues & shortage of conventional energy sources. To reduce the fossil fuel degradation & greenhouse gas emission the Electric Vehicles (EVs) are introduced. Thus efficient battery charging plays key role for success of EV's commercial adoption. This paper introduces the solar energy powered charging stations for EV's. The proposed system enables EV charging with reasonable cost which enhances user convenience and economy. Hence it contributes in development of electric power management infrastructure, an energy management system which then help regulate supply-demand variance. The smart charging station is the vital and intrinsic part of the EV & its user's life cycle while transportation. As EVs are emerging the transportation industry & getting commercialized in the society worldwide, smart charging stations then become next crucial part of the process. Proposed smart charging stations for EV can be deployed according to user's need. Hence, it can be installed in the apartment, parking slots of a house, a company or parking near shopping malls. Also, this system can be independently deployed on the ways of the vehicle routes by which the user can charge their EVs on the go.*

Keywords- Charging Station, Electric Vehicle, Renewable Energy Sources, Solar Energy, Wireless power transfer

I. INTRODUCTION

Climate changes and extreme weather conditions are eminently related to the Greenhouse Gases (GHGs) emission, have been a critical issue across the globe. Data collected recently indicate that transportation and electricity generation are two of the major contributors to the GHGs and also have an increasing impact.

Electric Vehicles (EVs) are a significant way to encourage the sustainable energy development and address the air quality and climate change issues. Solar energy is a renewable energy source, clean and green, so using Photovoltaic Power (PV) to charge EVs is promising, especially for the workplace parking lots thanks to their large space for installing the PV system and long available daytime for EVs to get charged. Using solar energy alone may not satisfy the EV charging requirements due to its fluctuations and limited amount. To fulfill the EV charging requirements, the combination of the solar energy and the power grid, namely the PV–Grid, becomes essential. The productive economic operation objective of the domestic or parking lot charging station is to increase the utilization of solar energy. As it's low cost and smooth approach to the load on the power grid to avoid the peak load penalty. However, due to the time varying EV charging requirements and the inconsistent solar energy the management of charging processes become more difficult.

It is necessary to design an optimal charging scheduling scheme based on the real-time information of the EV charging requirements and the solar energy availability. The charging scheduling difficulties with various goals for the charging system, powered by the power grid with or without renewable energy sources, have been widely studied, such as reducing the cost and guaranteeing system stability, maximizing total benefit, smoothing the charging load on the power grid, improving operational efficiency, and other objectives. These results are generally based on a combination of the current data and the estimated data in future. Thus the highly dynamic EV charging requirements and discontinuous renewable energy sources, how to optimize the scheduler to respond quickly to real-time information remains an open and critical issue.

II. LITERATURE REVIEW

In this section of related works firstly there are mentioned various technologies in the EV industry and then stated the researches that have been similar to this topic.

[1] OLEV SYSTEM: OLEV stands for on-line electric vehicle. This smart and useful technology is introduced by Korea Advanced Institute of Technology (KAIST).It is a new type of electric transit bus (ETB) system that uses the innovative wireless power transfer technology which is used to charge the transit bus. In this ETB system, there is a

wireless-charging infrastructure installed under the road to save space and time at the same time which charges the active bunch of electric buses that are travelling over that path. As the power transfer for charging ETB happens while the vehicle is on the way moving over charging infrastructure, this revolutionary technology is an achievement. To intertwine the two main components of an automobile industry i.e. the vehicle and the road to form a road–vehicle integrated system. Here the conventional EV electric vehicle system is remodeled to perform efficiently. Since charging occurs while the vehicle is operational, the tight coupling between charger and vehicle infra will be beneficial.

[2] ROUTE OPTIMIZATION OF EV's: Driving range of an electric vehicle becomes a noticeable barrier for the adoption of electric vehicles (EVs) and hence it is the anxiety around the limited driving range. There is going a research and also proposed ways of charging EVs on the move, using dynamic wireless charging which enables power exchange between the vehicle and the grid while the vehicle is travelling. In this methodology, we consider to make most efficient use of the so-called mobile energy disseminators (MEDs) which operate as mobile charging stations to provide power to the EV's by intelligent routing. Here we present a method for routing EVs around MEDs on the road network, which is based on the constraint logic programming and their optimization using a graph-based shortest path algorithm. Hence the stated method builds inter-vehicle communications in order to eco-route electric vehicles.

[3] EVCS(Electric Vehicle Charging Station): For making a transportation sector use sustainable energy sources, it is mandatory to take a step toward electrification i.e. electrical energy by renewable energy sources. This will have an advantageous impact on this industry, such as: minimize the oil consumption, reduce gas emissions and integrate renewable energy resources into the power grid. In this era of fast technological advancements the encouragement to adopt electric vehicles followed by deployment of electric vehicle charging stations (EVCS) will help to reduce 'range anxiety' concern regarding the distance the EV could travel before the battery runs out. This work proposes, an optimal design of the electric vehicle charging station which integrates renewable distributed generation will be designed for cost cutting and emission reduction. Both an isolated micro grid EVCS and an EVCS connected to the grid were studied in different cases, where energy sources such as PV, wind, and diesel generator are considered to supply the EVCS demand. The model was designed using HOMER software and designed based on realistic input data in terms of physical, operational and economic characteristics.

[4] Dynamic Wireless Charging (DWC): Dynamic wireless charging (DWC) technology is a new technology of supplying vehicles with electric energy which allows the vehicle battery to be recharged remotely while it is travelling over power tracks, which are actually the charging infrastructures installed below the road. DWC systems try to remove the range limitation of electric vehicles by using the power tracks as additional sources of electric energy. By using this conceptwe are able to build a real model and algorithm for optimally designing (EV) with DWC electric vehicle systems, specifically which are operating in a multiple-route environments. Multiroute system is basically made up of few single routes that share common road segments, and those vehicles operating on that specific route are installedwith batteries having same specifications. Here a general model is developed to optimally allocate power tracks and determine the vehicle battery size for each route. Then, we apply a particle swarm optimization algorithm to solve the given multi-route DWC-EV system optimization problem. A numerical example is solved to illustrate the characteristics of the multi-route model, and we show that the proposed modeling approach and algorithm are effective, compared with a mixed integer programming-based exact solution approach. We also conduct a sensitivity analysis to examine the solution behavior of the problem

III. PROPOSED SYSTEM

The suggested system for the theory of this idea can be easily explained by using following block diagram.

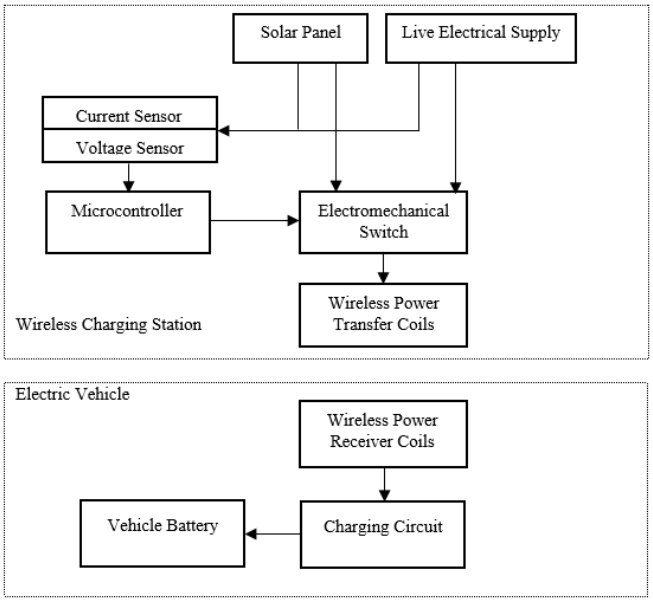

Fig. 1 System block diagram

A. Electric Vehicle:

An electric vehicle is the key part of this system as it is proposed to wirelessly charge the EV. Here the EV is installed with a charging circuit along with a set of wireless power receiver coils. The receiver coils and charging circuit are interfaced together to enable the wireless charging process. Charging circuit is connected to vehicle battery for further transfer of power.

B. Wireless Charging Station:

A wireless charging station consists of following components-

1) Solar Panels: In this approach combine all your researched information in form of a journal or research paper. In this researcher can take the reference of already accomplished work as a starting building block of its paper.
2) Live electrical supply: This could be used as a backup energy source if needed.
3) Sensor Nodes: A current sensor and a voltage sensor take signals from solar panel and mains supply to examine according the energy availability. The data collected is then given to the microcontroller for decision making.
4) Electromechanical Switch: It is interfaced with both energy sources and the microcontroller to switch between solar energy and mains supply with the help of sensor's feedback collected at microcontroller.
5) Wireless Power Transfer Coils: These are the key element to wireless power transfer. It is connected to electromechanical switch which will convey the energy to the coil. Then coils will transfer the power through electromagnetic induction to the receiver coils placed in the EV.

IV. IMPLEMENTATION

As the process of implementing a theoretical concept for a technology into the reality needs a pathway to characterize the particular components. Hence to utilize most of the available resources to give a sustainable system that works efficiently on the described concept is the ultimate goal of every project.

Most important part of this project development cycle is to start with the flow of the development process. Here we have stated the flowchart to indicate the function executed in each and every step. So the entire logical activities become clearer and it will help to design the module easily.

panel and a wireless charging coils are the key elements of this wireless charging station. To examine the efficiency and performance measures we have built this system on a small scale first. The efficiency of the charging station can be improvised by using latest versions of solar cells such as thin film, organic solar cells, nanowire tandems junction solar cells or inverted polymer solar cells etc.

The better the wireless coils winding material and also induction process the charging will get faster and reliable.

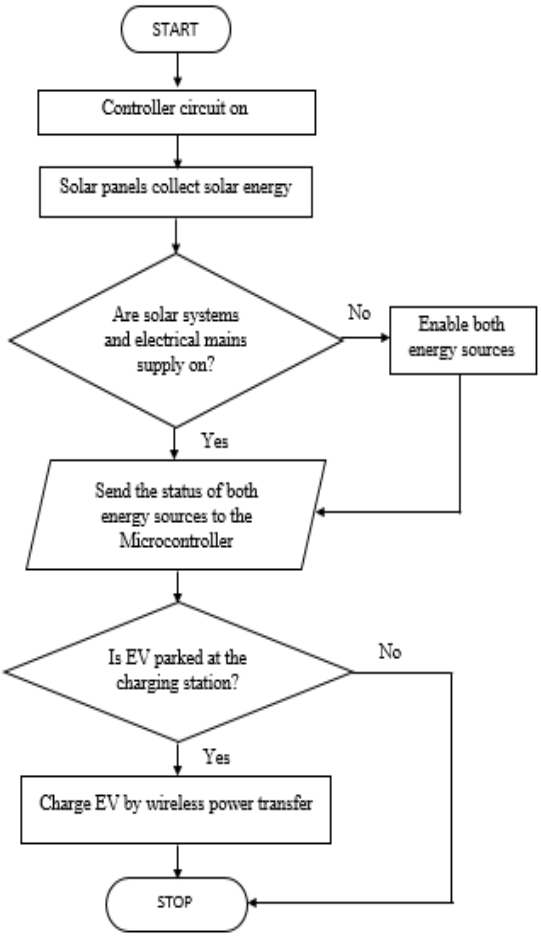

Fig. 2 Flowchart

RESULT

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V. CONCLUSION

The solar energy powered charging station for EV's is an exceptional way to enhance the energy resource capability for charging EV and also minimizing the dependency on conventional energy sources.

This idea will help commercialization of the use of electric vehicles due to use of solar energy and wireless technology. As the system seems deployable on multiple platforms such as workplace parking lots, parking area of shopping malls, apartments etc.

Hence this proposed system will be beneficial to reduce the greenhouse effects, air pollution, noise pollution, thermal pollution which cause environmental degradation, human health issues, global warming.
Car emission control and solar energy utilization is one of the many ways to reduce negative environmental effects.

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