"SOLAR BASED EV CHARGING STATION"

Aashish Kasar, Sagar Godse, Santosh Barhe, Chaitanya Mondhe,
Prof. Siddhant Patil (Project Guide)

Department of Electrical Engineering Shatabdi Institute college of engineering (Pune University) Nashik, India

ABSTRACT

Electric vehicles are a new and upcoming technology in the transportation and power sector that have many benefits in terms of economic and environmental. This study presents a comprehensive review and evaluation of various types of electric vehicles and its associated equipment in particular battery charger and charging station. A comparison is made on the commercial and prototype electric vehicles in terms of electric range, battery size, charger power and charging time. The various types of charging stations and standards used for charging electric vehicles have been outlined and the impact of electric vehicle charging on utility distribution system is also discussed.

Keywords: *Battery charger, charging station, electric vehicle, standards*.

1. INTRODUCTION

Energy in the form of electricity plays a very important role in the life of a normal man. Electricity is one of the greatest wonders of science. Next to man, it is the most important and revolutionary creation in this world of ours. It has practically revolutionized the world .The gradual but excessive use of electricity has come to bring about stupendous changes in industry. With it our modern gigantic tools are worked. Computers as also calculators sum up totals and make other calculations with the utmost accuracy. Newspapers and books are printed in millions overnight. There is not a single phase of human life that is not indebted to electricity for its progress .The modern age has, therefore, been truly called the "age of electricity."

We do many things with electricity now days. We warm our homes, we drive the machines in factories, we run our trains and buses. Electricity has completely revolutionized the methods of travel and transport .It has enabled us to travel in aero planes and fly into cold atmosphere of the sky. We also have electric trains in our country.

The infrastructure element that provides the crucial link between an Electric Vehicle (EV) with a depleted battery and the electrical source that will recharge those batteries is the Electric Vehicle Supply Equipment or EVSE. This report provides a review of the current and emerging EVSE technologies and an assessment of the common codes and standards associated with EVSE. The report also evaluates the barriers and challenges of deploying an expanded

An electrical vehicle battery recharging system composed of a set of photovoltaic solar panels connected to the electrical power grid. Thus, the energy generated by the solar panels is preferably used to recharge the electrical vehicle where the generated energy is injected into the power grid. In things where the generation of energy by the panels is but the demand of the electrical vehicle, the grid complements the specified energy.

An electrical vehicle battery recharging system composed of photovoltaic solar panel connected to the electrical power grid. With the help of Solar panel, energy will be stored into the battery. When vehicle is parked at the charging station, vehicle battery will be charged by charging station battery. After full charging the supply will be cutoff by the relay. Also using NODE MCU, Battery voltage will be continuously monitored on android application through Wi-Fi. LDC is used to display battery voltage and percentage of battery charge.

LITERATURE REVIEW

1. **Solar Charger for Electric Vehicles, 2018 International Conference on Emerging Trends and Innovations in Engineering and Technological Research (ICETIETR):** In this paper, authors have designed and developed a solar charger for electric vehicle. A dc-dc boost converter is employed to boost the solar panel voltage to station battery voltage and Maximum Power Point Tracking (MPPT) is done to optimize the output from solar panel. A buck converter is used to step down the station battery voltage to electric vehicle battery voltage. The constant voltage and constant current methods of charging are used to charge the vehicle battery. A complete simulation study of the system is carried out in the SIMULINK environment of MATLAB. To optimise the power output from solar panel, Maximum Power Point Tracking (MPPT) is implemented. MPPT maintains the operation of the panel at maximum power point so that the efficiency of the panel is increased. By implementing solar power as a source to charge the batteries Such a system would also help to expand the grid since the of electric vehicles, non-renewable resources like fossil fuels, which are used in conventional vehicles can be conserved.

2. **Fast EV charging station integration with grid ensuring optimal and quality power exchange, 2018 Engineering Science and Technology, an International Journal:** In this paper, authors have been proposed Different strategies for the deployment and integration of public fast charging, emphasizing on the power quality aspects and charging load management techniques. This paper presents the model of a fast electric vehicle charging station connected to the grid ensuring quality power transfer with reduced harmonic currents. The charging station consists of a converter connecting grid to a DC bus where EVs get connected through battery chargers. The proposed model is also effective in reducing the impact on grid by reducing the net energy drawn from the utility. The advantage of the coordinated operation of Electric utility, solar PV generation and available reserve capacity is highlighted in terms of the net profit earned by participation in the energy market. The proposed power flow management using renewable energy source like solar PV would prove to be beneficial to the utility as well as to the aggregator of the charging station. Proposed energy management scheme also minimizes the conversion losses and is effective in reducing the overall load on the grid.

3. **Shared Solar-powered EV Charging Stations: Feasibility and Benefits, 2016 IEEE:** In this paper, we explored the benefits of integrating renewable solar energy with EV charging infrastructure placed at car-sharing service's parking lot. We formulated a Linear Programming approach that maximized both solar energy utilization and customer satisfaction. Comprehensive evaluation of our algorithm was performed using real-world EV charging traces. They demonstrated the feasibility of a grid-isolated solar-powered charging station and show that a PV system proportional to the size of a parking lot adequately apportions available solar energy generated to the EVs serviced.

4. **System design for a solar powered electric vehicle charging station for workplaces, 2018 Applied Energy:** This paper analyses the PV system design and EV charging in a holistic manner considering the above aspects. The new contributions of the work compared to earlier works are as follows: 1. Determination of the optimal orientation of PV panels for maximizing energy yield in Netherlands and comparing it with the use of tracking systems. 2. Possibility of oversizing the PV array power rating with respect to the power converter size based on metrological conditions of the location. 3. Dynamic charging of EV using Gaussian charging profile and EV prioritization, which is superior to constant power charging. 4. Determination of grid impact of two different types of workplace/commercial charging scenario considering 5 days/week and 7 days/week EV load by running round-the-year simulation. 5. Optimal sizing of local storage considering both meteorological data and smart charging of EV.

SYSTEM DEVELOPMENT

1) Introduction

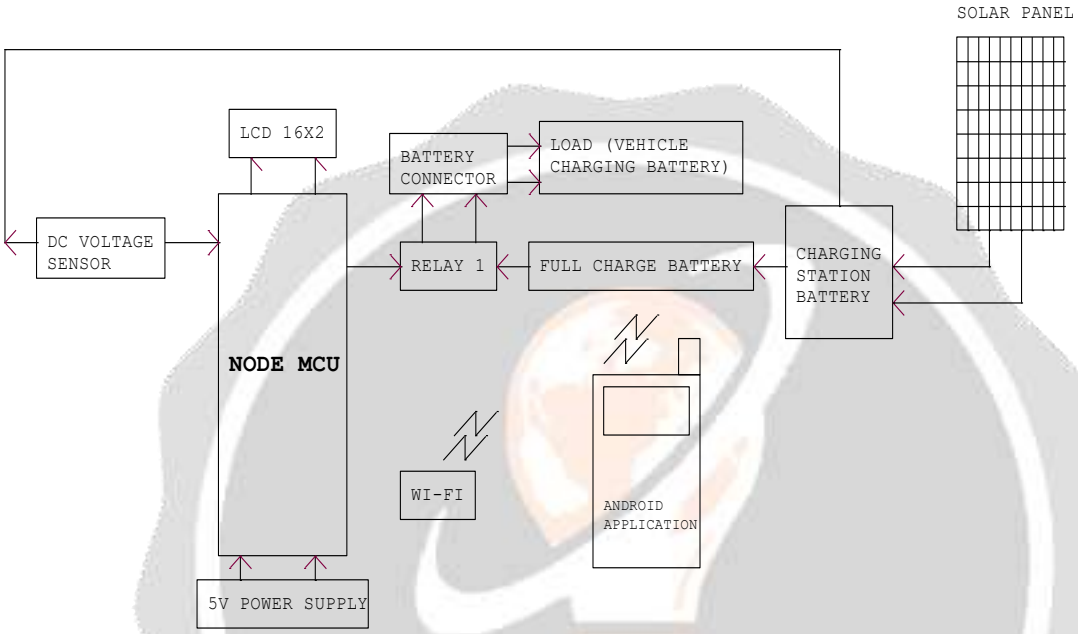
As shown in the fig. below, two microcontrollers are used. i.e., ATMEGA328P and Node MCU. As shown, the whole system will be operated on 12V DC which will be fed from solar panel. Relay will operate as per customer's requirement to charge their own EV battery.

2) Proposed Methodology

In this project, we are going to develop a system using IoT based technology and renewable energy source i.e. solar energy. Whole system will be operated on 12 V supply using battery. Battery will be charged by solar panel. We will be using Node MCU microcontroller for interfacing Voltage sensor and to monitor voltage level.

Voltage sensor gives analog output to Node MCU. Percentage of battery will be displayed on LCD 16X2. We can have customized control from Android App to ON and OFF the relay for charging the battery with time.

3 Block Diagram



CONCLUSION

The prototype of EV charging station with renewable energy source is successfully implemented. We have successfully studied interfacing of LCD and Voltage sensor with Node MCU microcontroller. We have designed a prototype model for the implementation of EV charging station. The use of hardware and software along with the android app also will be studied.

REFERENCES

[1] Revathi B, Sivanandhan S, Vaishakh Prakash, Arun Ramesh, Isha T.B, Saisuriyaa G, "Solar Charger for Electric Vehicles", *Proceedings of 2018 International Conference on Emerging Trends and Innovations in Engineering and Technological Research (ICETIETR)* 2018 IEEE.

[2] Wajahat Khan, Furkan Ahmad, Mohammad Saad Alam, "Fast EV charging station integration with grid ensuring optimal and quality power exchange", *Engineering Science and Technology, an International Journal* 2018.

[3] Stephen Lee, Srinivasan Iyengar, David Irwin, Prashant Shenoy, "Shared Solar-powered EV Charging Stations: Feasibility and Benefits" *2016 IEEE*

[4] G.R. Chandra Mouli, P. Bauer , M. Zeman, "System design for a solar powered electric vehicle charging station for workplaces" *ELSEVIER http://dx.doi.org/10.1016/j.apenergy.2016.01.110*