MULTIPURPOSE SOLAR POWERED ELECTRIC CHARGING STATION

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***Abstract*— Now a days, Electric vehicles are becoming so popular. By using Electric charging station this Electric Vehicles will get charged. This will need power from utility. In our project we will develop a Electric Charging station from the solar energy. The main aim of our project is to develop multipurpose Electric - Charging station. To minimize the charging demands from the utility. The charging station is powered by solar panels and backed up by Battery bank. The E-Charging stations help us charge anywhere. Electric vehicles and Semi Electronic vehicles are emerging. Here we are using solar power instead of using power from the utility. Solar powered E-Charging station serves better for the consumer. This method create plenty of energy which will never affect the atmosphere and ecosystem.**

Keywords—solar power, charge controller, lithium ion battery, inverter,multipurpose load.

I. INTRODUCTION

Silicon remains the material of choice for photovoltaic because of its abundance, non-toxicity, the maturity of production infrastructure and the deep and widespread level of skill available in relation to silicon devices. Rapidly decreasing module prices mean that area-related balance of systems costs are an increasing proportion of photovoltaic. This places a premium on efficient cells. Many of these improvements are viable in mass production. The upper limit of silicon solar cell efficiency is 29%, which is substantially higher than the best laboratory (25%) and large-area commercial (24%) [2, 3] cells. Cell efficiencies above 25% appear to be feasible in both a laboratory and commercial environment silicon solar cell design and fabrication [1]

The global demand for electrical energy is constantly increasing while the production of fossil fuel based energy is declining. Therefore the obvious choice of clean energy source which is abundant and provide security for the future development is solar energy. This paper summarizes the modeling of PV module and characteristics under shaded conditions. The power voltage characteristic of photovoltaic array is non-linear and it exhibits multiple peak including many local peaks and one global peak under non-uniform irradiances. In order to track the global peak, MPPT is the important component of PV systems Commercialized in many countries due to its merits such as long term benefits, maintenance free and environmental friendly. The major challenge lies is using the PV power generation systems to tackle the non-linear characteristics of PV array. [2]

The widespread applications of plug-in electric vehicles established that there will be a massive inrush of EVs by the end of this century. There is a rising risk that this anticipation in the number of EVs will impose an extra burden in demand, especially at peak times and therefore, the stability of existing power. To satisfy the additional load of EVs, a smart charging station (CS) facility based on PV output power sensing due to the variation in solar irradiance and temperature. EVs offer several benefits and can be a strong substitute to the conventional vehicle due to the increase battery capacity. [3]

The performance analysis of two photovoltaic (PV) systems installed at the University of Iowa in mid-2011. We analyze the system performance. First system is a 39 kW-DC building-integrated amorphous silicon PV array. We use National Renewable Energy Lab System Advisor Model for the photovoltaic system performance analysis of the two systems and results of simulation are compared to measured energy yield. In addition, we compare PV system performance with the Iowa Energy Center Solar Calculator (IEC-SC) model for the Si PV system. One of the PV systems we analyze installed which is based on building-integrated flexible a-Si UNISOLAR PVL-136 modules with 22 cells in series and its total efficiency of 6.26% under standard test conditions. The system size is 39 kW-DC. [4]

In electric vehicles, lithium-ion batteries need an accurate state of charge (SOC) to enhance safety, improve efficiency, and extend lifetime. However, there are noises to disturb electric quantities in the battery, especially the battery current for SOC calculation. Based on an equivalent circuit model, the battery is well estimated by a residua-sequence-based on the battery current is polluted by colored noises environment. This adaptive filtering technique was implemented on the experiment data of a real lithium-ion battery pack. [5]

Charge controller is of two types. Here we are using MPPT controller. Maximum Power Point Tracking based Charge controller is a controller that could be used for charging the batteries after tracking maximum power for solar panel. This MPPT based charge controller using PIC microcontroller is less costly, more efficient, more precise and more reliable as compared to other charge controllers. Temperature sensor- It is used for sensing the room and battery temperature. LCD Display- It is used for displaying current, voltage, power, temperature and energy of solar panel. [6]

Plug-in electric vehicles to use electric motors as the prime means of power it will begin to be mass-production. The need for electric vehicle charging stations in industrial and commercial facilities is beginning and it will grow as the number of plug-in electric vehicles. The intent is to make the more familiar with electric vehicle charging stations by identifying and discussing the standards to which they are designed and built, and describing the common features. They can either be plugged in to for recharge or, in some cases, have their depleted battery exchanged for a charged one. [7]

In order to foster electric vehicle (EV) adoption, there is a strong need for designing and developing charging stations based on its technologies. By growing such charging station networks, the power grid becomes more congested and, therefore, controlling of charging demands should be carefully. This paper focuses on the EV charging network equipped with different charging technologies with its frameworks. This which the controlling the EV charging operations to prevent potential grid failures and resources efficiently. The second framework, on the other hand, is more appropriate for smaller networks, in which the objective is to compute the minimum amount of resources required to provide certainlevels of quality of service to each class. [8]

Environmental worries such as the fossil fuels reduction, harmful gases emission and climatic variations caused by such phenomena have become more frequent. Thus, the new studies, project and trends related to electric vehicles gained proportion. there is an expectation that the electric vehicles reach the equivalent of 10% of the world market in future. One area in which the electric vehicles have attracted attention in the rural area, from which the activities that require traction force, carried out mainly by tractors, still use combustion systems. [9]

Depending on charging locations and business interest, EV charging facilities can be classified into Commercial Charging (CC), Business Charging (BC), and Home Charging (HC). Thus, this work is to find out which one of these three charging facilities is technically and economically feasible for PV based EV charging station. Because of charging location and customers' behavior, the load profiles of EV charging under different circumstances can assume different distributions. Depending on its charging locations, EV load profiles as such can be divided. It gives plenty of energy. [10]

II .SOLAR PANEL

Figure 1. Solar Panel

Photovoltaic solar panels absorb sunlight as a source of energy for the electricity generation. Solar PV modules and two solar hot water panels mounted on roofs. A photovoltaic (PV) module is a packaged, connect assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules as the photovoltaic array of a photovoltaic system.

In our project we are using 600Watts solar panel. It will generate and supplies solar electricity in its applications. Here we are using silicon crystalline solar panel. It will receive energy from the sunlight for its operation.

PROPOSED SYSTEM

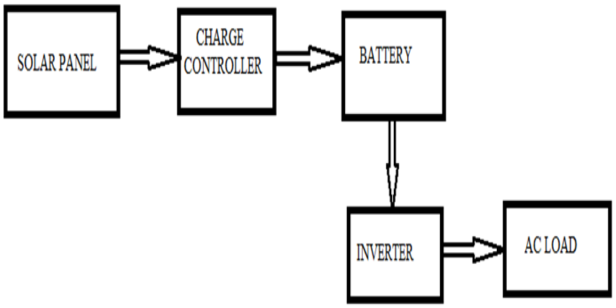

Figure 2.Block diagram

The elements are

A. Charge controller
B. Lithium ion Battery
C. Inverter

A .Charge controller

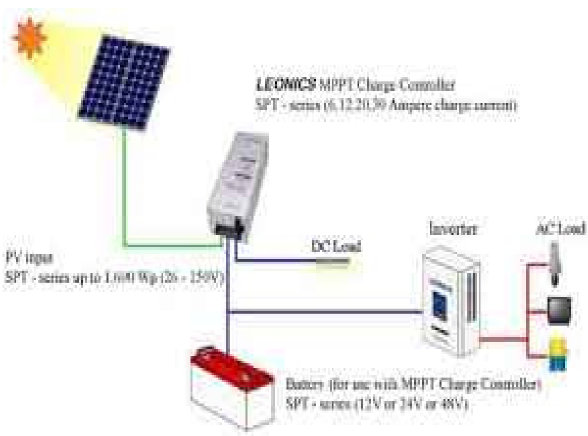

Figure 3. Maximum power point tracking system

MPPT or Maximum Power Point Tracking is an algorithm that includes in charge controllers used for extracting maximum output power from solar panel under certain conditions. The voltage at which PV module can produce maximum power is called 'maximum power point'. Maximum power varies with solar radiation, ambient temperature and solar cell temperature.

MPPT based Charge controller is a controller that could be used for charging the batteries after tracking maximum power for solar panel.

This MPPT based charge controller using pic microcontroller is less costly, more efficient, more precise and more reliable as compared to other charge controllers. Voltage sensor is used for sensing the solar panel and battery voltages. Current sensor- It is used for sensing the load and solar panel current for calculating the power. Temperature sensor- It is used for sensing the room and battery temperature. LCD Display- It is used for displaying current, voltage, power, temperature and energy of solar panel.

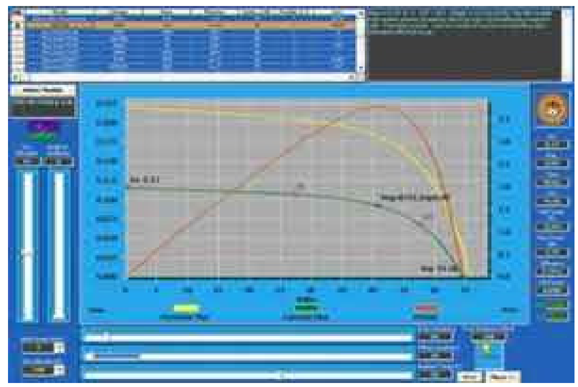

Figure 4. The I-V curves show maximum power from PV modules when exposed to irradiance 100 W/m2

B .Lithium ion battery

Figure 5. Lithium ion battery

A lithium-ion battery is a type of rechargeable battery in which lithium ions moves from the negative electrode to the positive electrode during discharge and when back to charging. This battery will get 48V/20A power from the solar panel. Li-ion batteries use an intercalated lithium compound as one electrode material, compared to the metallic lithium used in a non-rechargeable lithium battery.

C . Multilevel cascaded H bridge Inverter

In this system we had proposed a specialized inverter circuit as Three Phase Cascaded H – Bridge Multilevel inverter. Recently, cascaded H-bridge multilevel inverter topology has gained interest from many researchers for PV system applications. Some of the best advantages of multilevel inverters are,

- Producing the common mode voltage and reducing the stress of the motor and don't damage the motor.
- These inverters can draw the input current with low distortion.
- Selective harmonic elimination technique along with the multi level topology results the total harmonic distortion becomes low in the output waveform without using any filter circuit.

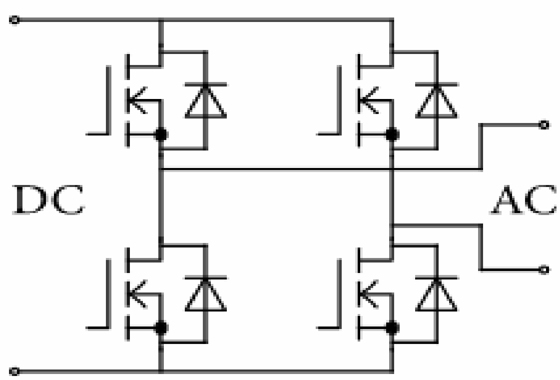

Figure 6. Multilevel inverter

Multilevel cascade inverters are used to eliminate the bulky transformer required in case of conventional multi phase inverters, clamping diodes required in case of diode clamped inverters and flying capacitors required in case of flying capacitor inverters. But these require large number of isolated voltages to supply the each cell.

A solar inverter is used to convert the Direct Current (DC) electricity by solar panels into a usable form of Alternating Current (AC). That power can be utilized to integrate with AC loads and appliance. Inverters are typically attached directly to individual photovoltaic modules in order to extract the maximum power from each module. Multi level Inverter are highly efficient and can potentially produce more power than other inverter, so it can add substantial cost to a solar project.

IV. RESULT AND DISSCUSION

Figure 7.Charging station

Initially we are using 600Watts solar panel. From that the battery will get charged at the range of 48V/20A. Battery will have its back up upto 8hrs.We are getting AC output power in our project with the use of solar panel and other components.

Hence we are using AC power for the multipurpose usage. Therefore the multipurpose usages are charging of electric vehicle, Wi-Fi booster, safety alarm, electronic gad jets (i.e.) laptops, multi meters, mobile phones etc.

S. No	Source	Specification
1	Solar panel	600Watts
2	Battery	48V/20A
3	Multi-Level Inverter	Rating 3 phase, 440 V

V. CONCLUSION

We developed e-charging station to encourage the electric vehicle in order to reduce the pollution. EV charging station will also used in industries and commercial power systems. EV charging stations are well defined by several standards based upon its operational characteristics and personal protection safeguards. Still there is a variety of features and options available which will depends upon its manufacture and its model. EV charging stations constitute a significant AC load. In serving a concentrated number of EV charging stations, the distribution system serving these loads will need to have a much higher capacity than previously used in charging station.

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