An Energy Management Scheme for EV'S Charging Stations

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Abstract— This paper represents cost-effective and small electrical vehicle charging methodology that has renewable energy sources that is solar. The proposed method has many benefits including reducing peak pressure delivering cost savings to the consumer and reducing battery degradation and preventing overcharge increasing battery lifetime. The approach introduces solar energy forecasting as well as EV charging demand projection to optimize the energy management of the electrical vehicle charging station.

Keywords: Electric Vehicles (EVs), EV Charging stations, Energy management, Optimizing Energy

I. INTRODUCTION

Renewable energy sources such as photovoltaic generation and wind power generation are becoming widespread to realize sustainable energy supplies since they do not emit CO2 in operation. However, it is often pointed out that these technologies will cause difficulties in supply-demand balancing in a power system, due to the generation fluctuation of the renewable energy sources. Therefore, given a high share of renewable and a low share of thermal generation, which take up the main supply-demand balancing capability in many of the existing power systems, demand response will play an important role in guaranteeing the supply-demand capability in a power system.

To reduce the carbon emission into the environment the world focus is changing towards clean energy resources. Because of unpredictable nature of renewable energy sources (RES), the energy storage system & ESS is becoming an important part of the system. The ESS deals with the unpredictable RES and use in supplying peak load demand management. The power flow and energy storage management in EV is very much controlled by ESS. This increases the reliability of the system in terms of power supply. The expected shortages of fossil fuel, as well as the growing environmental challenges, are the main reason behind the rise of EVs. For the transportation problem, the electric EVs are emerging as a green solution for carbon emission. The running cost for EVs are also low compared to other fuel cars. Though the EVs are a good solution but it creates many problems in the electricity grid as they act like load on the distribution system. It also increases the unbalance between the supply side and demand side [1].

The main points of the proposed method are as follows: We prescheduled each EV charging time by considering a different period to increase or decrease demand and the other non-critical periods when the EV is plugged-in. We switch on/off chargers of plugged-in EVs that are selected in order of charging priority within the target total load established by the prescheduling [2].

II. LITERATURE REVIEW

The "Paper [1]" says that the increasing use of electrical vehicles (EVs) raises the need for more charging stations. An increase in the number of charging stations increases the power demand to high rate. The control scheme is used to improve the overall system in case of a grid or failure of charging stations.[1].

The "Paper [2]" represents a two-layer control scheme that is used to improve the reliability of the overall system in case of a grid or any other charging station failure. Over the past decade, there has been a growing interest, bordering on enthusiasm, for electric vehicles [2].

III. BLOCK DIAGRAM

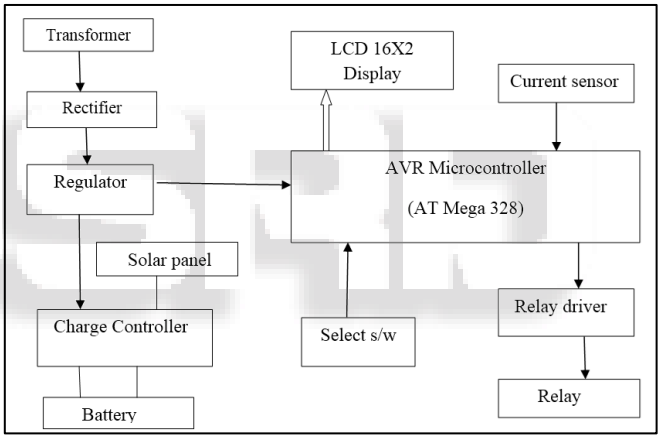

Fig. 3.1: Block Diagram of Proposed System

A. Block Diagram Description

In our project, we use AVR (atmega 328) as a key component in our project automatic voltage regulator (AVR). It uses automatic voice recognition, its ability of any electronic devices to identify and understand the human voice. Also, various sensor interfaces with AVR microcontrollers.

B. Power Supply

In this project we use battery as power supply .it is an electronic device that used to provide electrical energy to the system.

C. Solar Panel

Solar energy uses captured sunlight to produce photo voltaic power (PV) or concentrated solar power (CSP) for solar heating. This energy conversion allows solar to be used to power auto motives, lights. This solar light energy is used to charging the battery.

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D. Battery

Commonly used in Uninterruptible power system that is used with computer. These batteries can also use as portable power sources to run amplifier on outdoor situation. These are also used in small vehicles and sometimes power the self-start type generators.

E. LCD

Liquid Crystal Display is a flat panel display it produces the digital image. LCDs are used to display the message on the screen, for example, TVs, cell phones portable video games.

F. Select Switches

In our project, two select switches play a very important role they are charging the EV battery provided in time.

G. Transformer

A transformer is a passive electrical device that transfers electrical energy between two or more circuits. A varying current in one coil of the transformer produces a varying magnetic flux, which, in turn, induces a varying electromotive force across a second coil wound around the same core.

IV. FLOW CHART

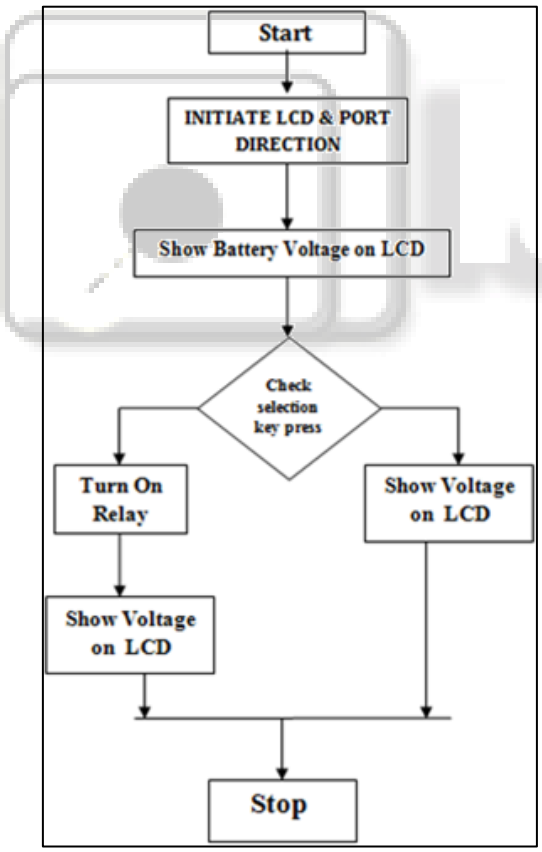

Fig. 4: Flow Chart of Proposed System

V. WORKING

The main purpose of our system is to generate energy using renewable sources like solar panels and non-renewable source AC mains. But the main focus of our system is to generate energy using solar panels. For this, we are using the current sensor module INA219 (26v-3amp) for increasing a current rating because we use 12v battery and at the output, source required 1amp current. For power mode use transformer (AC) next for converting AC to DC using a bridge rectifier and filter capacitor. All operations are controlled by AVR microcontroller (ATmega328-8bit) having power supply 5, so we used a 7805 voltage regulator, then crystal oscillator 16MHZ for providing external clock pulse to AVR, also use the reset button. Next use LCD for showing battery parameters like o/p voltage, current mA, state of charge, etc. Two selection switches (30sec,10sec) provided for charging operation. A voltage divider circuit used for checking output voltage which consists of 2 resistors R1(100k) And R2(10k). At the output side, we use DC pin socket for charging, which means any external battery connected to that socket gets charged and parameters related to this battery displayed on LCD.

VI. CONCLUSIONS

This paper presents the energy management scheme for electrical vehicle charging station. In this project solar panel is used as a renewable energy source using which energy is generated and at the output, side battery is charged. Also, various parameters related to the battery like o/p voltage, current, state of charge, shunt voltage and bus voltage can be observed on an LCD. Alternatively, the AC source can also be used for charging the battery.

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