Literature Review on EV Charging Station

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Abstract- *Electric vehicles are a relatively recent technology that is seeking for its place in the market. It has several advantages, such as the reduced global warming, greenhouse emissions, no fuels required and its ease of use. The increase of the electric vehicles in the roads raises issues about their impact on the grid, in terms ofpower quality. This Literature Review paper presents the main considerations about power balance and the impact of an electric vehicle charge in the current, voltage, and total harmonic distortion. An experimental charging station prototype for Modes 2 and 3 is used to acquire data of voltage, current and active and reactive power for different charging profiles and battery state of charge.*

Keywords- Electric vehicle, Arduino, Solar, Relay.

I. INTRODUCTION

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 network of EV charging stations and makes recommendations to mitigate the challenges of deploying the infrastructure required to support the accelerating deployment of EVs. Refuelling stations for conventionally fueled vehicles are privately operated, competitive, revenue generating facilities.

The PEV population is growing rapidly; however, the current population of PEVs makes it extremely difficult to develop a rational business model that can justify the expense to install, operate and maintain an individual recharging station, much less a large network. Reimbursable governmental incentives tied to the deployment and ROI of the EVSE infrastructure should be explored. PEVs are ideally suited to the travel requirements of these areas, and the largest positive impacts to the environment and Indian energy independence will be realized in urban population areas.

II. EV CHARGINGINFRASTRUCTURE

According to a report by the Society of Manufacturers of Electric Vehicles, there has been a 37.5% rise in the sale of EVs in India in recent years.The market for electric vehicles is growing rapidly in India, thanks to the government's unceasing efforts to make India an all-electric nation by 2030.

Highlighting the need for a robust network of charging stations across the country, Jose Roman, Corporate VP and Global Head of Nissan-owned Datsun, said in a recent media interaction, "It's a fantastic plan. But it is not the responsibility of car companies alone.The government and customers have to play an equal role.The technology already exists. But the government has to put in place charging infrastructure. India is not a country, it's a subcontinent. Pan-India electric vehicle infrastructure might not be possible by 2030, but it is doable in at least major cities."

At present, the cost of setting up a rapid-charging outlet is around $38,245 (INR 25 Lakh), while that of a slow charging station will be around $1,529 (INR 1 Lakh). Once electric vehicles become more mainstream, an area of 3 km will need nearly 300 charging stations with four to five charging slots each. At this price, building an extensive network of charging stations across Delhi would require an investment of more than $504.7 Million (INR 3,300 Cr) over the course of five years.

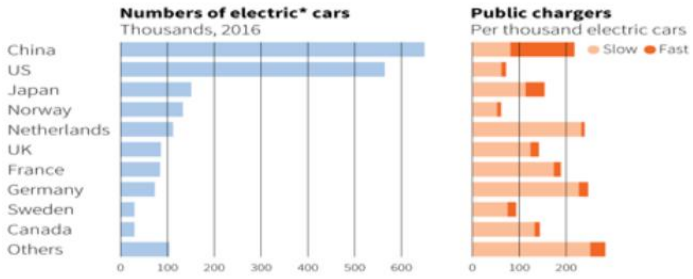

Fig: Comparison of EV vehicles used in various countries

The Increasing Use of Fossil Fuels in The World Is Causing A Deleterious Effect on The Planet. Increasing Population Has Caused Increased Use of Vehicles Running on Petroleum, Cng, Diesel (Crude Oil /Liquid Fuel). Co2

Emissions (Metric Tons Per Capital) In India Was Reported At 1.73 In 2014, According to World Bank Collection of Development Indicators, Compiled from Officially Recognized Sources.

Graph 1: -

Co2 Emissions from Liquid Fuel Consumption (% of Total) Is 22.97% Today, Crude Oil Is the Largest Energy Source, Accounting for Around 39 Percent of Fossil Energy, Followed by Coal and Natural Gas At 33 And 28 Percent, Respectively.

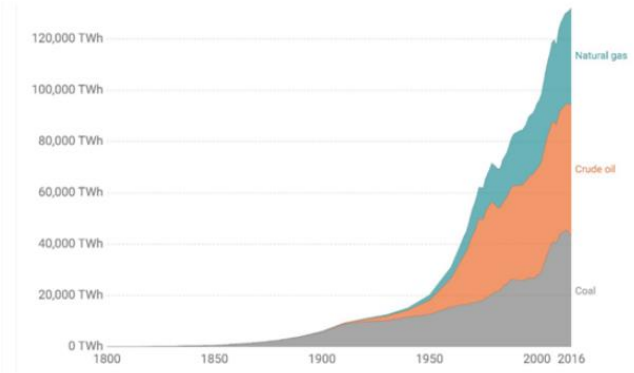

Fig: Growth of fuel consumption

Graph 2: -

All This Arguments Has Compelled the Development of EV Thereby There's A Need of Charging Station for EV.

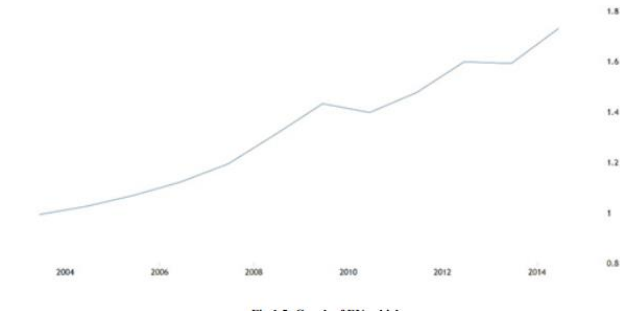

Fig: Graph of EV vehicle

III. MODELLING

Block Diagram

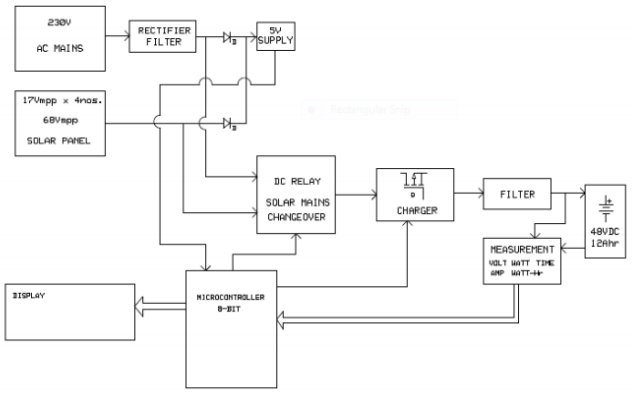

Figure: Block diagram of charging station

According to the circuit diagram there are two sources 230-volt A.C mains and solar, which are used to charge battery of electric vehicle. Solar is used as primary source of energy and 230-volt A.C is considered as secondary source of energy. Solar panel provides power during day time and 230-volt mains during the night period.

Centre tapped transformer is used to provide variable voltage (say 60volt). rectifier is used to convert 60volt A.C to D.C voltage.1k LED is used as an indicator after the π filter where the D.C output from rectifier is smoothened. Diode, an electrical component that allows the flow of current in only one direction which is represented by a triangle with a line across one vertex. LM7805 is a regulator which regulates the voltage and has output of 5volt which is provided to the Arduino as it requires 5 volts for its operation.

The voltage is compared at the relay where the solar and mains are compared by the program feed in the Arduino. By that program the primary supply is given first preference than the main supply and consequently the charging begins from it. The 16x2 LCD display is used to display parameters such as vehicle initial charging, charging time required, voltage, current, power consumption and rate per unit.

Step by Step Work Done for Making Prototype Model:

STEP 1: Planning-

Planning (Also Called Forethought) is the process of thinking about and organizing the activities required to achieve a desired goal. It involves the creation and maintenance of plan, such as psychological aspect that require conceptual skills. We have planned the basic model/ structure of prototype and also planned the basic flow or steps of our project.

STEP 2: Purchase of Materials-

Purchase of Materials The material which are planned at basic stage were brought which includes, Arduino, led, soldering iron machine, electric wire tap, nuts & bolts, resistors, capacitors, centre-tap transformer, PCB and so on.

STEP 3:Sort of Study and Tests on Prototype Model -

Sort of Study and Tests on Prototype Model As we were totally unaware about the ratings and exact functionality of the elements involved in our project, we had to perform certain tests and calculations along with it we also suffered with damage of some equipment's. In initial stages the main problem was to calculate the maximum voltage at different points on the circuit along with the devices that would be required. Before installing the devices on the board, we did their respective tests such as for transformer we had to check whether it is transferring enough power to the regulators by doing no load tests on itSimilarly we had to select a proper rating of the switch that is nothing but the MOSFET (p-channel Enhancement), it has been used because it is normally off unless a negative gate voltage is applied to it. The Arduino microcontroller can be considered as the heart of our system since it performs all the controlling tasks through programs. We had to write the programs ourselves and execute it many times as its syntax and logic posed a big problem to us. We used C programming language as it was easy to learn and understand.

The measurement device that is both the operational amplifiers were selected depending upon the maximum amount of current that our system may face while in use (10Amp). Depending on this we chose the wire size of 2.5 sq mm. The LCD display shows various important parameters one of them being the rate (Rs/unit). The display got damaged twice and thus display showed garbage values of the Arduino's memory. The part of level shifter had no problems as the requirements met with its standard circuit. We performed the test of the entire project on four batteries (completely discharged) of 12V/10AH each. It successfully charged the batteries to 100% within 3hours and 30mins.

STEP4: The Outer Body Design of the Model-

The Outer Body Design of the Model The outer body of model was deciding to make by using steel sheet and cut in suitable shape to look like a charging station. After cutting it in appropriate shape we painted it in black colour.

STEP5:Assembling the Prototype Model-

Assembling the Prototype Model The various parts devices viz. Outer body (steel sheet), PCB mounted with whole circuit, mounting of LCD display, led, switch, socket on outer body, different connection also included in this step.

IV. CONCLUSION

EV are a fundamental element in recognized plans to increase the Indian energy independence and improve the environment. EV owners do not enjoy the benefits of the standardized refuelling facilities familiar to the owners of conventionally-powered vehicles, and there is limited consensus on how to standardize and expand the EVSE infrastructure. Existing EV and recharging facilities are safe and effective to get to the next level of EVSE availability. The benefits of EV's and the need to support drivers of EV's will simulate the installation and use of EV charging stations in industrial and commercial power systems. EV charging stations constitute a significant 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 vehicle parking applications.

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