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# Alternative Energy Based Electric Vehicle Charging Station

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**Abstract:** Nowadays, Using electric vehicles are becoming popular transportation in many countries such as U.K., U.S.A. and India etc. According to reduce of the environment impact and cost problem from conventional vehicles which consume energy base on oil and gas. Consequently, the requirement of electric vehicles in the future will significantly increase. However, the electric vehicles charging station which is important element of using electric vehicles seem to not sufficient for these demand in many areas. The problems of the growth electric vehicles charging station is not only increase electrical grid demand but also increase high level emission from petroleum-electrical generation instead of reducing. Hence the aim of this project is optimization the alternative energy system for electric vehicles charging station. In this project using hydro electric energy from metro water pipeline generator as source for charging the vehicles. This device has the ability to charge batteries during both day and night. Proteus simulation verifies the boost converter circuit and other hardware implementation.

**Keywords:** Alternative energy, Water flow turbine, Electric vehicles, Boost converter, Proteus.

## I. INTRODUCTION

India was the first country in the world to set up a ministry of non-conventional energy resources, in early 1980s.India has the fifth largest power generation portfolio in the world and its current renewable energy contribution stands at 44.812 GW which includes 27.441 GW of Wind power and 8.062 GW of Solar power installed capacity in the country (As on 31.07.2016). Ambitious target of 175 GW of renewable power by 2022 which will include 100 GW of Solar power, 60 GW from wind power, 10 GW from biomass power and 5 GW from small hydro power [1].

### 1.1. National Electric Mobility Mission Plan (NEMMP)

2020 was launched by Indian government in 2013. The objective of this plan is to achieve national fuel security by promoting hybrid and electric vehicles in the country. Its objective is that 6-7 million of different types of electric and hybrid vehicles should be sold by 2020, which will result in 2.2-2.5 million tons of liquid fuel savings and a decrease of 1.3-1.5% in carbon dioxide emissions [2].

The government of India announced the list of 20 cities which would be developed into smart cities in the first phase of an ambitious plan to make over 100 smart cities by 2022 [3].

India ratified the Paris Agreement on Climate Change with UN on Oct 2, 2016. A major goal of the Paris agreement is to keep global temperature increase "well below" 2 degrees Celsius and to pursue efforts to limit it to 1.5°C.

Based on the following survey, India's future power demand will be increase dramatically. Alternative energy is the only way to meet the power demand. Aim of the project is Design alternative energy system that is used for charge the Plug-in electric vehicles. This proposed system can provide power both in day and night time. Proteus simulation verifies the boost converter circuit and other hardware implementation.

## II. EXISTING SYSTEM

Figure 1 shows existing system for charging the Electrical vehicles. This system not only increases the electrical grid demand but also increase high level of emission from petroleum-electrical generation also. Thus using only electricity from the grid is not best solution for charging vehicle station. For example here is a study on the energy demand for a residential apartment having 1000 homes. Consider the peak load of a single house to be 5 kWh at night. Thus total load including common amenities will come up to 5050 kWh. Taking factor of safety as 1.5, the required transformer rating will be 7.5 MVA (10 × 750 kVA). Suppose 50% of the houses are having EVs. If all

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the EVs are charged at a time with 3.45 kWh, the charging load comes up to 1725 kWh. Total load is revised to 6775 kWh. The required transformer capacity will rise to 10.1 MVA (14 × 750 kVA) giving rise to an additional investment of around 70 lakhs (Figure 1).

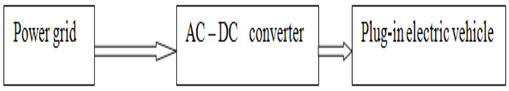


**Figure 1: Existing systems.**

## III. PROPOSED SYSTEM

Figure 2 shows proposed system of this project. In this system we can get power for charge the Plug in Electrical Vehicles from alternative energy. Solar panel converts light energy into electrical energy. But solar panel does not always provide power to the station. Because in night time, cloud and rainy seasons panel does not convert energy. So, constant power source is needed to ensure the working condition of the station. Therefore, hydroelectric generator is connecting to the system. This hydroelectric generator is place in urban water pipeline, turbine convert water pressure into electric energy (Figure 2) [4].

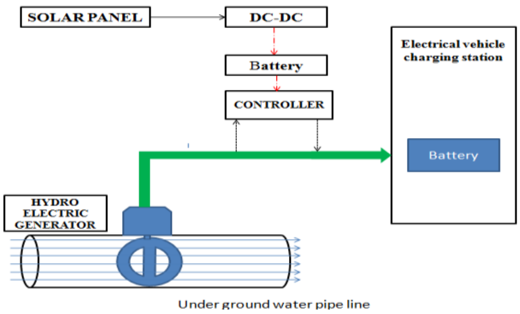


**Figure 2: Proposed systems.**

## IV. SYSTEM DESCRIPTION

### 4.1. Solar Panel

A photovoltaic (PV) cell converts sunlight into electricity, which is the physical process known as photoelectric effect. Solar energy is most advantage for countries having very less space to produce energy efficiently and having very large population like India. In this project we using the solar energy for power the controllers, monitoring devices, lights etc. (Figure 3) [5].

**Figure 3: Solar panel.**

### 4.2. Water Flow Generator

All cities are served by pressured piping grids systems to supply water where it is needed for drinking, domestic or industrial use, while drain and sewage systems are usually gravity fed. Hydro turbine used to generate electricity from the pipe water. There are two types of system available for generate the energy from pipe line.

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1. Internal system
2. External system

Figure 4 shows internal systems, where the runner is wholly inside the pipe section. This system can be place in future pipelines.

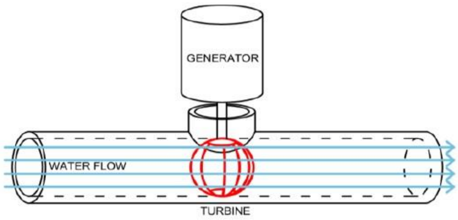


**Figure 4: Internal system.**

Figure 5 shows external system, where the runner is wholly outside the pipe section. This system can be implemented in pre-installed pipe lines.

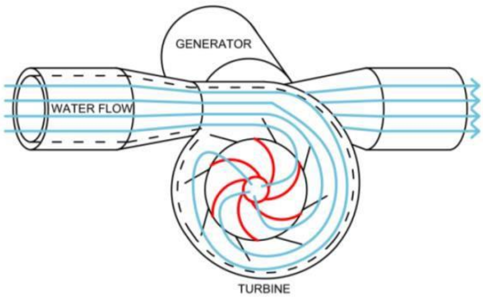


**Figure 5: External system.**

### 4.3. DC-DC Converter

A DC-DC converter converting regulated DC output voltage from an unregulated DC input voltage. In this project Boost converter is selected due to, It is a step up DC/DC converter, it boosting the input voltage and gives that voltage to the output (Figure 6).

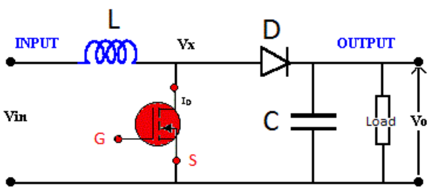


**Figure 6: Boost converter.**

Figure 7 shows how the proposed system can be works. Controller sense power generate by the pipe line water flow generator. If anyone of the generator fails, controller disconnects the generator from bus connection using relay [6] (Figures 7-9).

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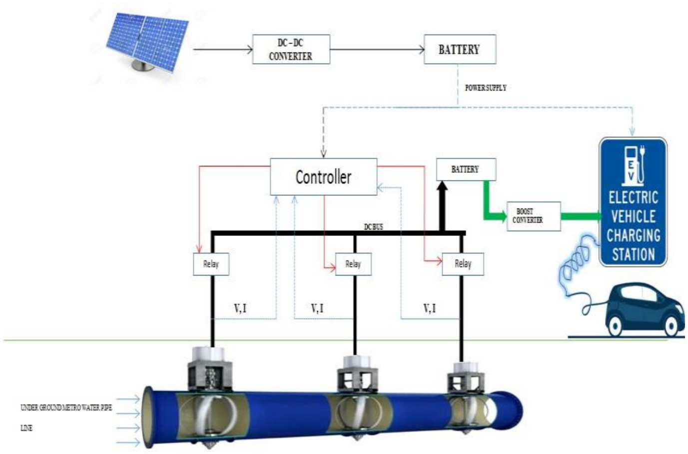


**Figure 7: System description**.

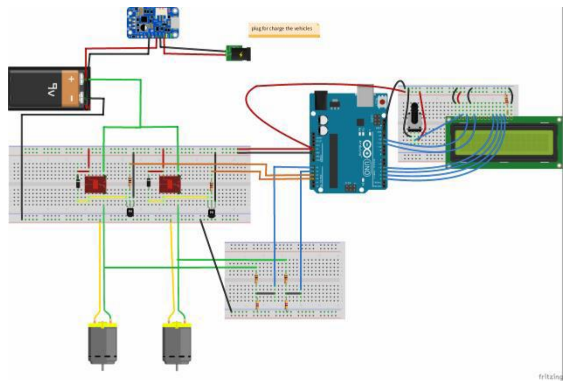

**Figure 8: Circuit connection of demo project.**

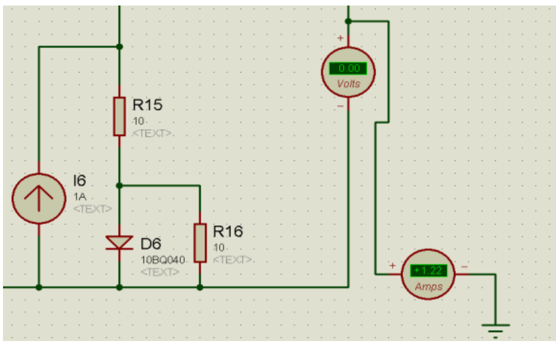


**Figure 9: Circuit connection of demo project.**

## V. SIMULATION

### 5.1. Simulation of 12v Solar Panel

#### 5.1.1. Solar cell (Figure 10):

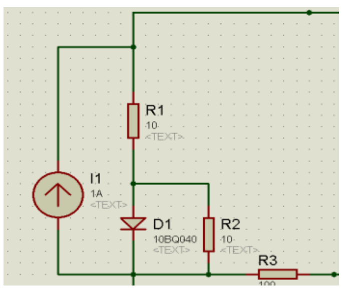


**Figure 10: Solar cell simulation circuit.**

**5.1.2. Solar panel (Figure 11):**

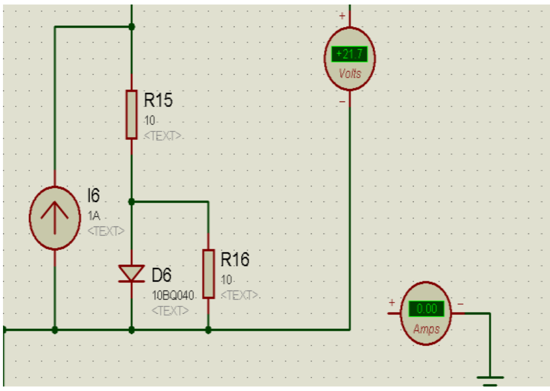


**Figure 11: Open circuit voltage (21.7 V).**

**5.1.3. Short circuit current (1.22A) (Figure 12):**

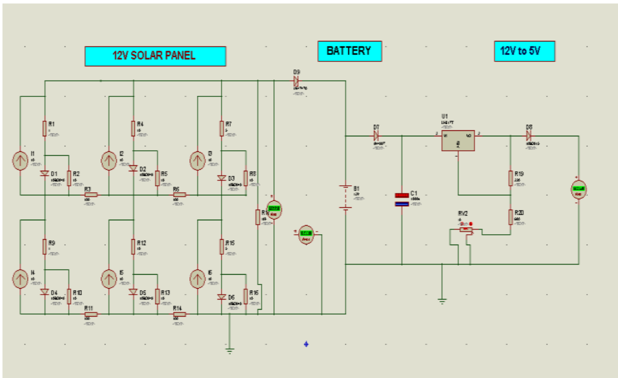


**Figure 12: Solar panel charging circuit simulation.**

**5.2 Simulation of Water Flow Generator**

There is no exact modeling for simulate the water flow generator in Proteus. Sousing Variable Power Supply (VPS) as a model for water flow generator (Figure 13).

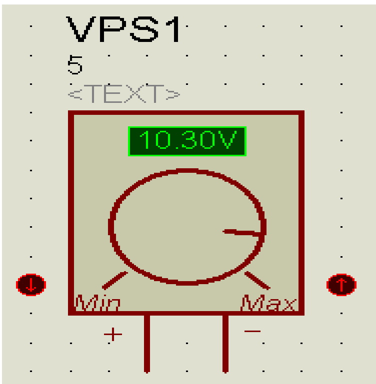


**Figure 13: VPS in proteus.**

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**5.3. Simulation of Boost Converter (Figures 14-18)**

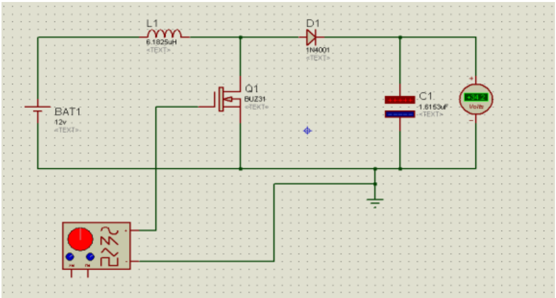


**Figure 14: Boost converter simulation.**

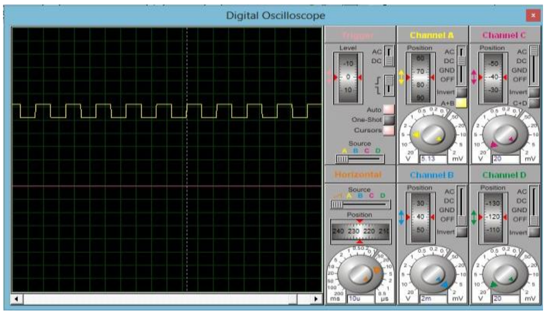


**Figure 15: Wave form of boost converter.**

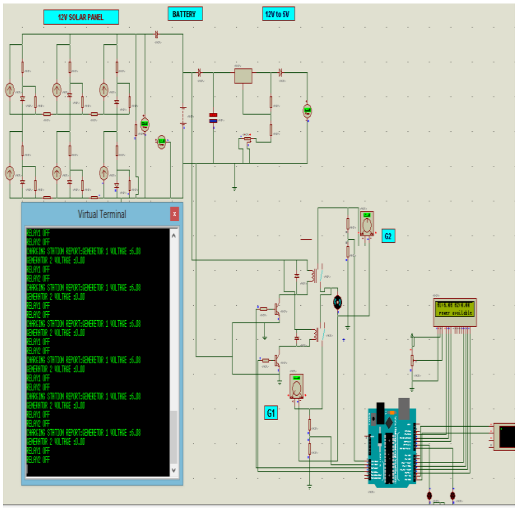


**Figure 16: Full system simulation.**


**Figure 17: Electric vehicle charging station report.**

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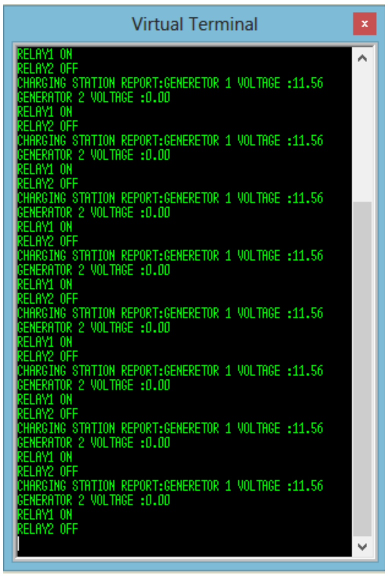


**Figure 18: Generator status report.**

## VI. CONCLUSION

To fulfill the increasing energy of the people, and making the pollution free environment alternative energy harvesting system should be implemented in India to provide electricity without the problem of power cut and the extra energy can be provided to the grid. India as the 2nd largest country of the world in the increasing demand of the energy and try to find a way from which efficient and abundant source of energy cab be available. Electric vehicles charging stations not only increase the electrical grid demand but also increase high level of emission from petroleum- electrical generation also. Thus using only electricity from the grid is not best solution for charging vehicle station. For improving ability and performance of the electric vehicles charging station, of alternative energy resources should be integrated to their systems as well. This will also have the added benefit of making EV with greener credentials as their environmental impact depends on the primary source of energy.

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