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HYBRID SOLAR-WIND CHARGING STATION FOR ELECTRIC VEHICLES AND ITS SIMULATION

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Abstract - *In the world of electrical technology Electric vehicles play a essential role in energy saving and emission reduction of harmful greenhouse gases. The electrical power industry is undertake rapid change. The rising of energy cost , the mass electrification of everyday life, and global warming are the major drivers that will be determine the speed at which such transformations will happen. Nevertheless of how quickly various utilities acceptance clever grid concepts, technologies, and systems, they all agree on the inevitability of this huge change. Charging station, as one of the most important feature of electric vehicle industry, must be able to accommodate the fast development of electric vehicles. In this activity, a hybrid solar-wind powered charging station is planned to deliver electricity for the electric vehicles.*

The new hybrid vehicle charging station brings with it completely different sources like PV systems, wind systems, the AC delivered, batteries area unit used as a main energy storage system, kind DC little grid for always energy carry out. This Paper explain relative accomplishment Hybrid Solar-Wind powered charging station using Buck and Zeta converter to balance the DC voltage. Proposed system analyze in MATLAB Simulink environment.

***Key words:* MATLAB Simulink, PV System, Wind System, DC grid, Charging Station, Electric vehicle**

1. INTRODUCTION

Any new Hybrid charging Station machine is planned for the smart power delivery. Since electric vehicles have been used in the 1990s, their scattering into the vehicle business has not been up to the mark because of the reason that it is shortened cost effectual and these vehicles needful to recharge once in 60 to 70 km drive. In these days, the park stations, roadside units, and the standard house outlets are used to charge the battery packs of EVs. Hybrid renewable energy based power generation become more famous because of anxiety over the atmosphere. To eliminate the transmission loss and grid connectivity problems, renewable energy based power generation is carried out. The wind power generation system has a little harmful impact compared to fossil fuels. The wind energy potential and electricity production for recharging the storage system present in the Electrical vehicles.

The planned charging Station system is connected with 230V AC power source, and integrating the renewable power sources of wind electricity and photovoltaic power, as well as the electric vehicle together. In addition, the advance DC grid system adopts the battery. Thus, grid offers decent quality of power to three different hundreds notably 110v AC single-phase output ,100v DC output. The grid is at 230 V rms with 50 cps connected isolator in relation to the DC bus. The three-part output of the grid is regenerated to the rippled DC by used of Diode Bridge Rectifier. The regenerated DC voltage is fed to graphic mark device that might be a DC-DC device, making the surge DC to constant DC with the use of a buck device, this paper justifies relative performance hybrid charging station mistreatment buck and letter convertor to maintain the DC voltage planned system analysis in MATLAB Simulink.

For PV electricity branch, the maximum issue chase (MPPT) manage is contracted to draw in the maximum sun power through the calibration duty cycle of the DC/DC device. For wind electricity branch, the current magnificence of permanent-magnet brushless gismo is also familiar seize the alternative energy for the micro-grid machine. The AC deliver module presents the 230V AC electricity administer for the 170V DC micro-grid. Through embracing the duplex AC/DC device, the DC micro-grid power can also be fed more to the AC electricity feature. The sustainable module accommodates the wind electricity and the PV electricity administer, which could be modify to the DC 170V through the DC/DC and AC/DC device.

2. CONTROL TECHNIQUE

2.1 Pulse Width Modulation Technique

A full bridge inverter with s IGBTs can be used to convert DC to three phase AC. The pulses are to be given to the IGBTs are generated with a fundamental waveform compared with a triangular waveform. Each phase has shifted to each other by 1200 and has to be in synchronization with the grid to which it is being connected. The frequency of the grid and the three-sided or carrier waveform has higher frequency to create a alternation signal. The generated pulses are fed to the Voltage source Inverter is shown in fig.

Due to the impedance load, the load current gets desists during sudden switch OFF of the IGBT switch and create high voltage peaks in the output voltage. To avoid an anti-parallel diode is attached to the switch (IGBT) so that the inductor current from the impedance load can pass through the diode.

The rating of IGBT is taken as:

Internal resistance Ron = 0.001 Ω

Snubber resistance Rs = 100 kΩ

Snubber capacitance Cs = 1F

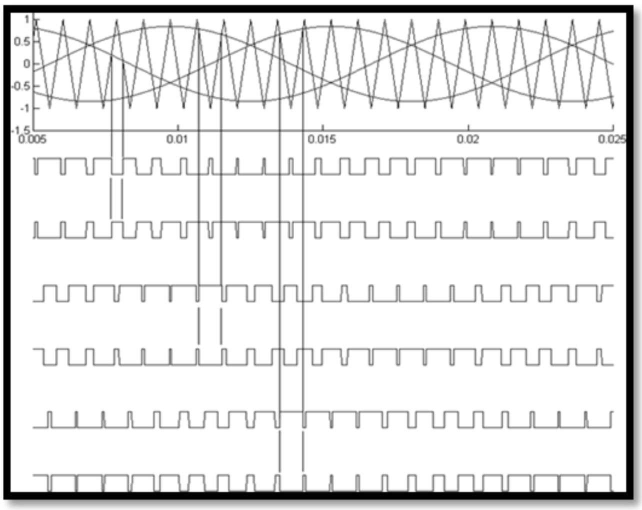

Fig. 1 : Generation of pulses with fundamental waveforms.

2.2 Maximum-Power-Point-Tracking (MPPT) Algorithm

MPPT algorithms are essential in PV applications because the MPP of a solar panel varies with the irradiation and temperature, so the use of MPPT algorithms is essential in order to gain the maximum power from a solar array. Among all the algorithms P & O and Inc Con algorithms are most familiar as they have the advantage of an freely implementation. In natural conditions the P-V curve has only one maximum point.

The DC-DC converter exploit as a part of the MPPT can be either a Cuk converter or a Buck Boost converter. The voltage yield of the PVA either must be extended or decreased as for the yield power of the PVA. The converter build the voltage stable with the modification in the temperature or the light. MPPT scheme to track most extreme power amongst any light and air conditions. The outline of PVA is done in MATLAB with Simulink cramp, with numerical representation.

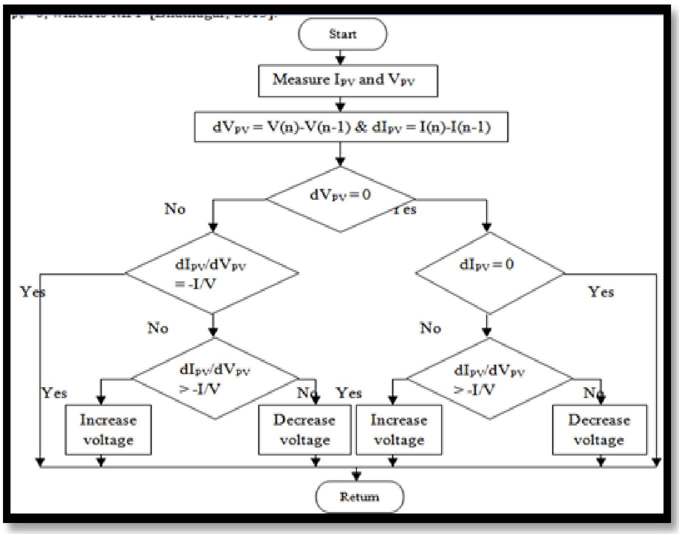

Fig. 2 : MPPT algorithm

3. METHODOLOGY

3.1 Photo-Voltaic Array (PVA) Modeling

For productive indefatigable power age PVA is apply to generate power from sunlight-based light. As the load demand is increasing day by day and the generation of electrical energy also has to be increased, but due to the conventional way of power generation is causing global warming. Due to this, the productivity of the PVA has to be increased by adding silicon surface. For efficient renewable power generation PVA is used to power generation from solar irradiation[2]. The design of PVA is done in MATLAB with Simulink block, with mathematical portrayal.

Voltage of PVA totally depends on solar irradiation (Sx) and ambient temperature (Tx). PVA is a mixture of series and parallel solar cells arranged in an array to generate the required voltage and current. Equation for voltage of each cell is given below.

$$V_c = \frac{AkT_c}{e} ln\left(\frac{I_{ph} + I_o - I_c}{I_o}\right) - R_{sc} I_c$$

Where,

k = Boltzmann constant (1.38 × 10−23J/K).

Ic = cell output current, Amp.

Iph= photocurrent

Io = reverse saturation current of diode

Rsc= series resistance of cell

Tc = reference cell operating temperature

Vc = cell voltage, V.

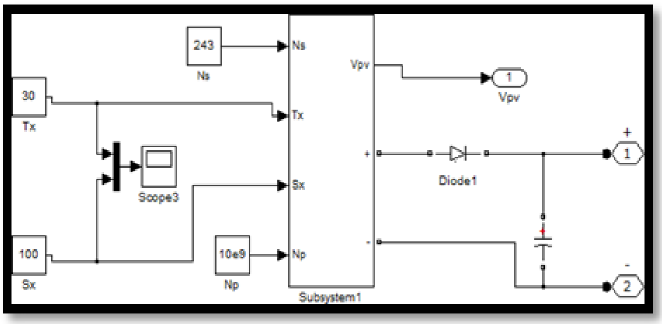

Fig. 3 : Complete diagram of PVA

3.2 Permanent Magnetic Synchronous Generator (PMSG) Wind System

There are many kinds of unpredictable speed generators used for wind turbine. In spite of the fact that doubly fed induction generator (DFIG) is more mainly used than permanent magnetic synchronous generator (PMSG) today, PMSG has some advantages which are tally as experts.

Principally, PMSG is direct drive, has slow rotation speed, does not have rotor current, and can be used without gearbox. The high efficiency and low maintenance will reduce the cost that is the most anxiety to invest.

However, PMSG still has requires electromagnetic field with the flexible structure, which leads to the high standard of the manufacture as well as of the performance. Wind energy system are considered as the most beneficent energy systems in renewable power source. The model system and control scheme contain a PMSG wind turbine model, a pitch angle control model, generator-side inverter control model, and grid-side inverter control model[2].

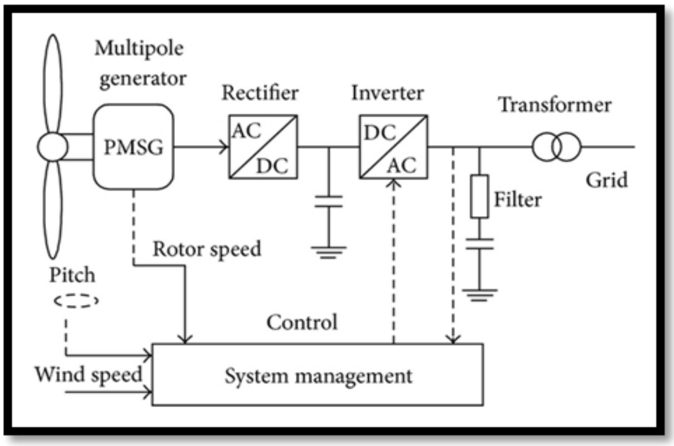

Fig. 4 : General wind turbine PMSG system

4. RESULTS

The testimonial DC link voltage is set to 170V which is the peak value of 110Vrms AC load connected to the DC link.

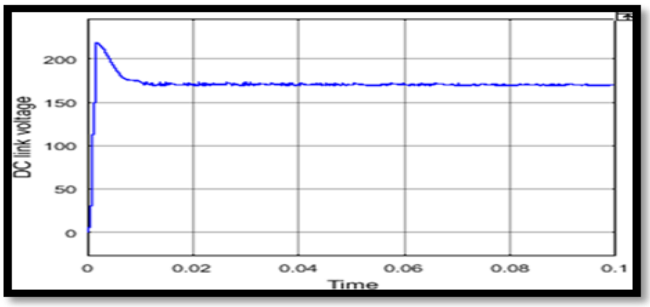

Fig. 5 : DC link voltage

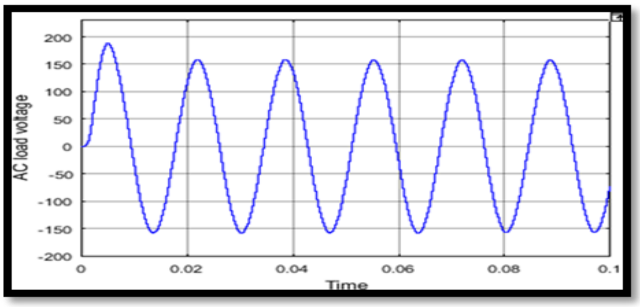

Fig. 6 : Inverter Output Voltage for AC Load

5. CONCLUSIONS

EV (Electric vehicles) is expected to be one of the inevitable of our future. They will be more popular than internal combustion engine vehicles. As a first step the charging time of the EV (Electric vehicles) should be less and they should be able to cover a long distance. This is reason for the expected reason of the fast-charging stations. We conclude that this system proceed towards minimize the pollution. It will also increase the usage of electric vehicles (EV) as it will create pollution free environment.

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