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Multiport Converter based EV Charging Station with PV and Battery

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***Abstract:** As a ecofriendly electrical vehicle, is vehicles that are used electric motor or traction motor. Are receiving widespread attention around the world due to their improved performance and zero carbon emission . The electric vehicle depend on photovoltaic and battery energy storage system . Electric vehicles include not limited road and railways. It consist of many electric appliances for use in domestic and industrial purposes that is electric car ,electric bike ,electric truck ,electric trolley bus , electric air craft ,electric space craft.The main Moto of this paper is a modelling of proposed system smart charging for electrical vehicle insuring minimum stress on power grid . The large scale development of electrical vehicle we need electric charging station for example fast charging station and super-fast charging station . During a peak demand load , large load on charging station due to the voltage sag , line fault and stress on power grid . At this all problem avoid by multiport converter based EV charging station with PV and BES by using analysis of MATLAB simulation. Result and conclusion of this paper to reduce losses improving efficiency of solar energy , no pollution (reduce) fast charging as possible as without any disturbance.*

***Keywords:** EV charging station, PV, BES, Grid, MATLAB.*

I. INTRODUCTION

The reduction of fossil fuel emission , uses of EVs will also help prevent economic damage due to climate change. Climate change causes a lots of damage to the global economy . The advantage of electric cars is not only fuel economic growth but also the reduce damage of a severe climate on the economy. .Now a days the pollution increase the environment , conventional vehicle emission carbon dioxide , carbon monoxide , sulphur dioxide , gases in environment due to greenhouse gases increases , ozone layer create in atmosphere causes fast acid rain .In india 27% pollution create through conventional vehicles .This all problem avoided by electrical vehicles . Now a day , the development of electrical vehicles become trends while increasing number of electrical vehicle we need electrical charging station . examples, fast charging station , super- fast charging station . The set of multiport converter based EV charging with PV and Battery energy sources and equipment used in this system is PV, BES, MPPT , DC link , AC grid and charging .

A. The set of multiport converter based EV charging with PV and Battery energy sources and equipment used in system photovoltaic (PV) , battery energy source (BES) , maximum power point tracking (MPPT) , DC link , AC grid and Charger.
B. The charging system of electric vehicles (EV) in method. AC Bus and DC Bus. In DC bus are more essential than AC Bus.
C. The advantage of DC Bus is increase efficiency of solar panel and reduces cost of converter and reducing losses.
D. Over view of current research is in minimum time large scale of vehicle charge in such a way that smooth.

II. METHODOLOGY

In this methodology of the proposed work consists of following.
Main component of this system is PV, BES, EV.
The type of project is software we used MATLAB Simulink software.
This technique used for method.

A. Case 1- PV TO EV

The main function of photovoltaic cell is produce electrical energy from solar radiation. During day time this generated electric power is directly delivered to charger of electric vehicle for charging purpose.

B. Case 2 – BES TO EV .

While photovoltaic cell generated electric energy and in the form store in the battery (Battery energy source) . when we need electric energy for charging of electric vehicle . Battery directly delivered energy to EV.

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III.MODELLING AND ANALYSIS

A. Circuit Diagram of Multiport Converter Based EV Charging Station

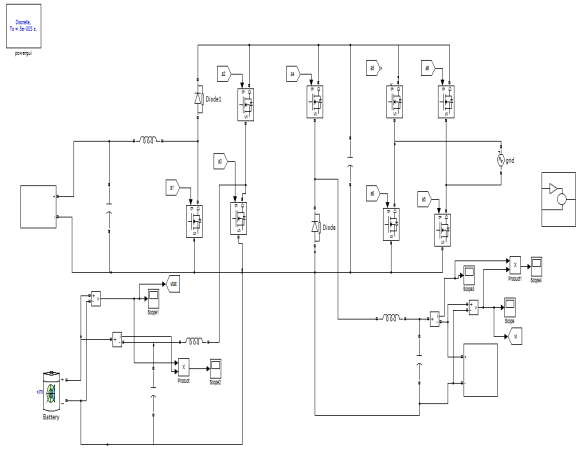

Figure 1 – MATLAB simulation of Multiport converter based EV charging station .

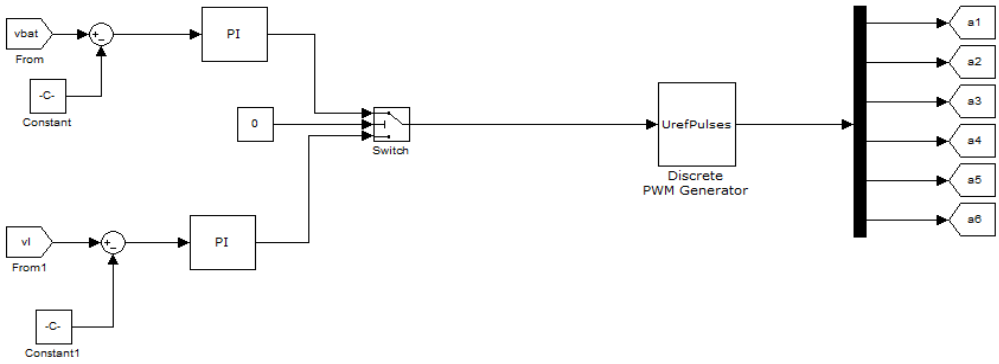

Figure 2 – To proposed MATLAB simulation of Multiport converter

IV. RESULTS

The simulation result of Multiport converter based EV charging station as followed .This result are mainly used in PV , EV , and Battery .Then PV model are delivered to the power and load are formed . And Battery energy sources are used in storing battery in the night time because day time use in PV generation .Therefore this the main advantage of this project. The simulation result 0 to 0.4ms , therefore EV charging demand is low and PV generation is sufficient. Then the second simulation time is 0.4 to 0.7ms, the panel can provide can provide 5.7kw after the charging demand increase .In second case at 0.4ms of the simulation time the irradiance drops from 700k/w square to 600k/w square, and at 0.7ms of the simulation time ,load should be varied.

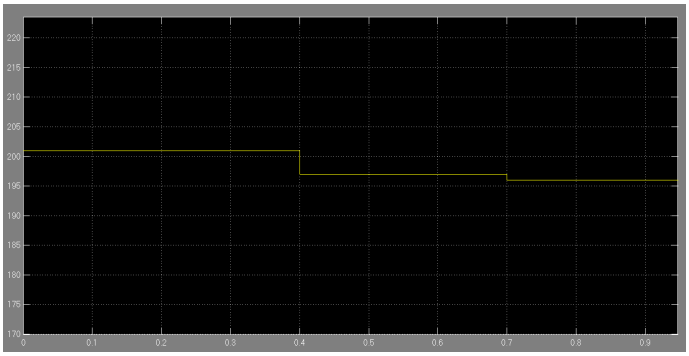

Figure 3(a) . The simulation result of the BES ,(a) the terminal voltage of Battery energy storage

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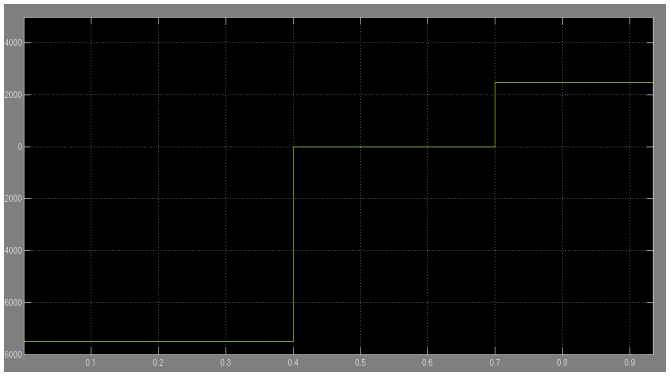

Figure 3(b) – The simulation result of BES, (b) the output power of Battery energy storage.

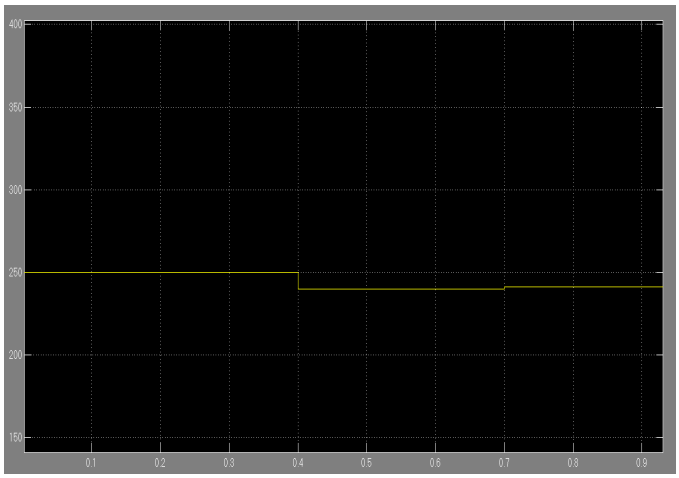

Figure 4(a) - The simulation result of EV charging station with voltage of the EV charging .

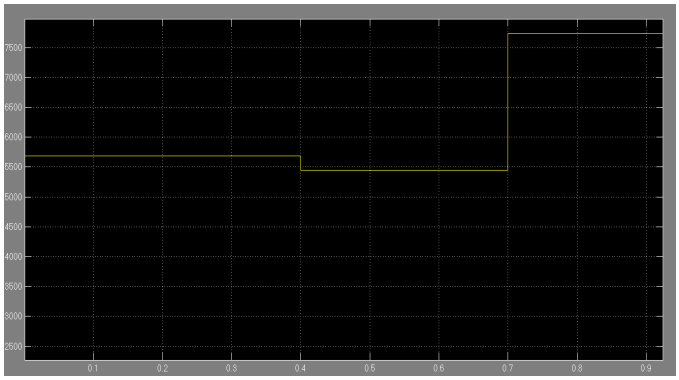

Figure 4(b) –The simulation result EV charging station with consumed power of EV charging .

V. CONCLUSION

In this paper, converter based EV charging station with PV and BES. For increasing to regulate the voltage drop, and balance the power break between PV generation and EV charging demand the BES control is used. , when PV is insufficient for local EV charging, then BES start to discharged .When the PV generation is more than our needs then BES start to charged,such as during night time. The main purpose of this paper is maximum vehicle charging in minimum time without any disturbance during a day time . Photovoltaic cell generate electrical energy in the form of dc charge to the electrical vehicle and remaining energy store in the battery use of emergency or night time .And supply feed from photovoltaic cell to AC grid through inverter. As a result ,at nominal operating condition the efficiency can be improved .

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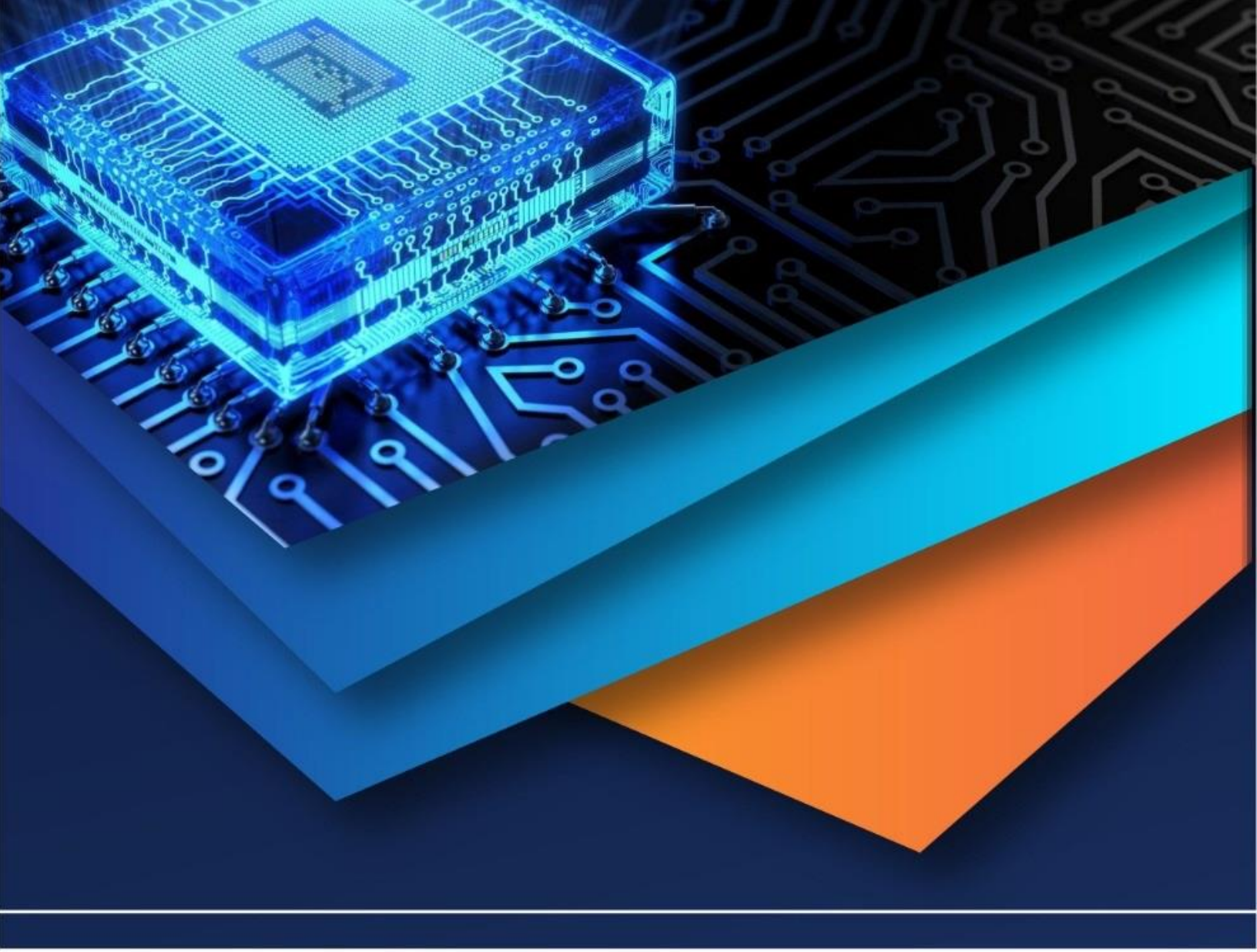

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