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CHARGING ELECTRIC VEHICLE THROUGH HYBRID SOLAR WIND RENEWABLE ENERGY SOURCES

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ABSTRACT

Solar and wind energy based charging mechanism for electric vehicle is described in this paper.The wind generator and solar photovoltaic is contained in the charging station.It will greatly reduce the co carbon-di-oxide emission and also fossil fuel requirement.They have been modeled using single diode model and analytical modeling.For the proposed system simulation is done in the MATLAB-simulink.The pv module and wind turbine is connected with DC-DC converters.The bidirectional DC-DC converters connected to ten charging points that provides charging to Electric vehicles through invertor.The proposed system is connected to the grid inorder to balance the load demand.This provides pollution free environment.

Solar and wind energy charging mechanism with efficient MPPT DC-DC converter is presented.The load demand,power flow from different sources, the battery is charged by injecting surplus power from the grid when pv panel has insufficient power,with the help of relay connected to microcontroller it is achieved.From wind generator transformer coupled bridge convertor is used to generate power where as from solar Buck-Boost convertor is used to generate power.The battery connected to the relay,when energy is generated from solar,the relay acts as open circuit if not it act as closed circuit.This method provides pollution free environment.

KEYWORD: Buck-Boost converter, charging station, MPPT, Battery, solar wind energy, PV panel.

INTRODUCTION

The combination of solar and wind power is combined inorder to uplift the use of electric vehicle and to reduce the power demand.Renewable energy sources are encouraged inorder to reduce depletion of fossil fuel resources,to reduce energy demand and also protect the environment.solar is one of the popular energy source and fragment by nature.so stable power supply is quite difficult.By integrating with some other energy sources it can be done effectively.so the solar and wind energy system is coupled with dc-dc converter.our proposed system is inorder to reduce the power demand and overcome power interruption renewable sources are integrated.

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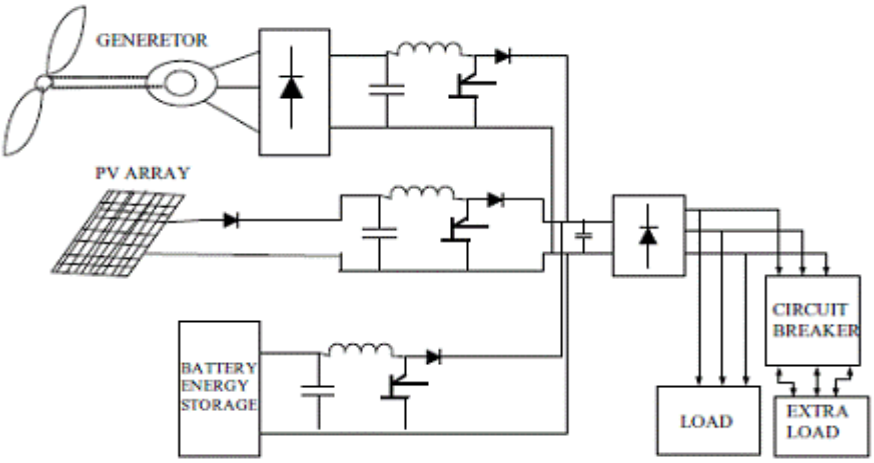

FIGURE 1 BLOCK DIAGRAM

WORKING

MPPT act as a buck boost is connected to the PV panel. MPPT act as a boost convertor when power supply from solar panel is not sufficient[1].If the supply of energy from PV panel exceeds the optimal voltage then MPPT acts as a buck converter and it is fed to battery which is rechargeable.The voltage rating are monitored through the microcontroller.The values are displayed through LCD.The system has rectifier that converts AC-DC and give to relay module to open contact.

The invertor is supplied through battery or rectifier in order to convert DC to AC supply[1].From the pv panel the voltage is monitored by microcontroller.If not adequate then relay is on to charge the battery and then Invertor is given supply.230v output produced by inverter.Electric vehicle is charged using adapter.

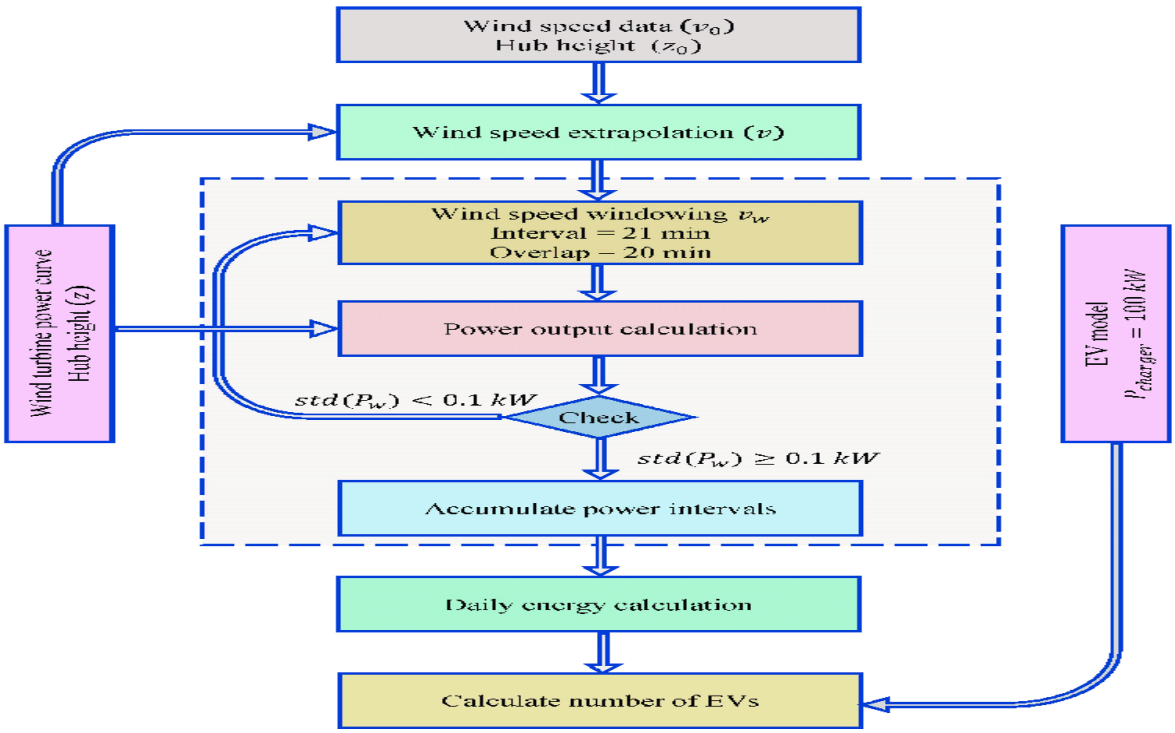

FIGURE 2 FLOW CHART

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METHODOLOGY

Voltage rating is calculated through MPPT(Maximum power point tracking).Based on MPPT algorithm for solar system Incremental conductance is developed. Load is non-linear so load can fluctuate.Non-linear examination is required for steady operation[2].

MPPT act as a buck-boost which is connected to pv panal.If power supply is not enough then MPPT act as boost converter.If the voltage rating is maximum then it act as a Buck converter.It is given to battery.The voltage rating is monitored through Microcontroller and displayed in LCD.

The rectifier converts AC to DC and given to relay module.If battery voltage is low,the relay is triggered by microcontroller to open contact[2].

The inverter converts DC to AC where supply given from battery.Microcontroller monitor the voltage rating if not sufficient the relay is on,afterthat battery gets charged and supplied to inverter.According to the capacity of battery vehicles the Electric vehicle is charged using separate adapter.According to owners requirement the charging characteristics are framed.

Excess energy stored in battery during day time and they are used when pv panels do not absorb energy.The main is to ensure battery charging cycle to prevent overcharging and deep discharging[3].

Due to heavy demand for electricity and less usage of EV,the power demand can be managed through hybrid source where as existing system have grid supply which is quite difficult.

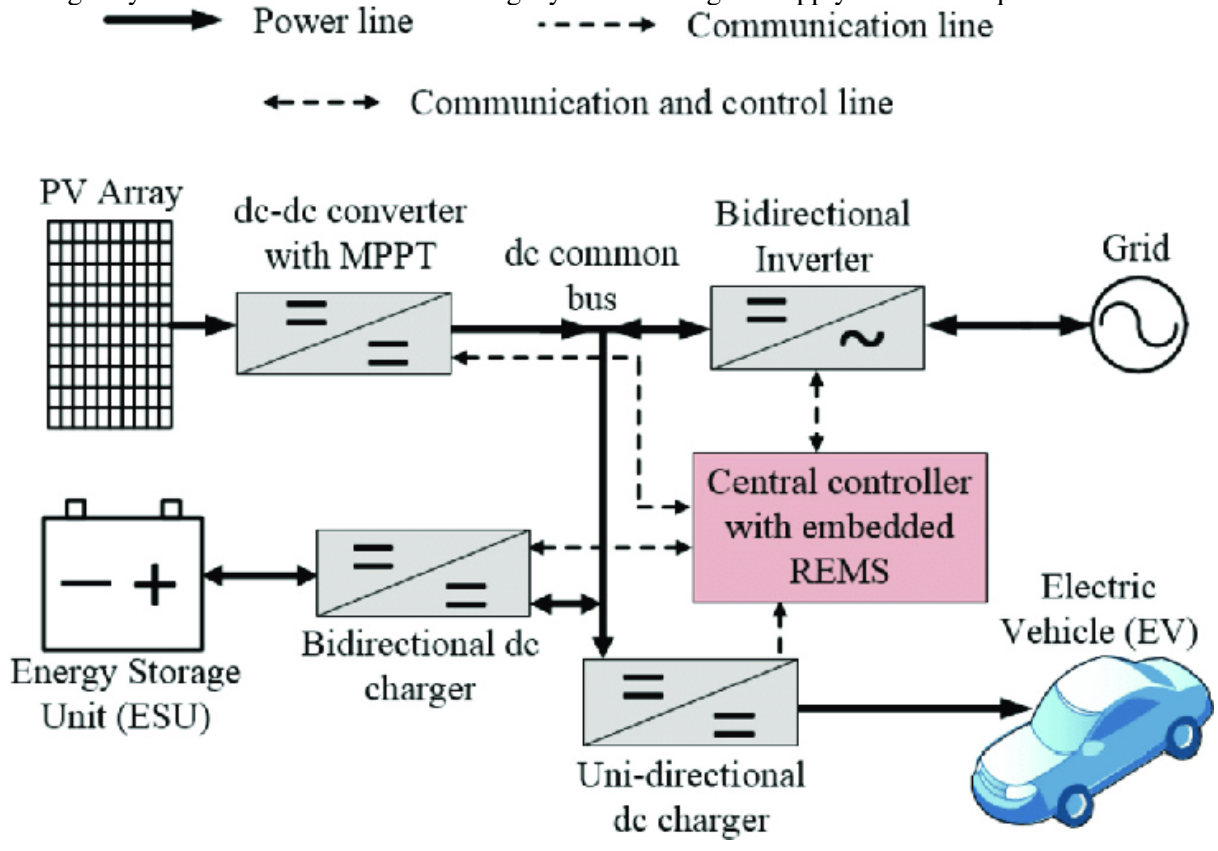

FIGURE 3 HYBRID CHARGING STATION

PROPOSED SYSTEM

During the day excess electricity is stored in batteries and they are used to power the appliances when sufficient energy is not absorbed by pv panels.The battery should function properly inorder

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to prevent deep discharge so it should be ensured.

The limitation of existing electronic charge controller is the battery which is charged by single power source or through renewable or non-renewable[3].It can be overcomed by using hybrid electronic charge controller that have been developed where as multiple sources to charging source such as AC grid power and pv power.

For proper utilization of multiple charging source most controllers lack in techniques.where as MPPT is used.

To switch ON or OFF THE power supply,timer is used to charge the controllers.so that it will take long time for charging.This paper discuss about the hybrid charge controller development for the battery[3].Its main purpose is the continuous supply of charge to the battery.It is also developed to shorten the charging time period of the battery.when solar heat is more solar energy is utilized.when the irradiation is low, the power is consumed from the grid.The studies have been identified regarding the design,simulation for electric vehicle and also implementation of energy generation system.

IMPLEMENTATION

The power supply is composed with rectifier in which 220v AC s filtered as DC by using full-wave bridge network.capacitor,op-amp,resistor,transistor,light emitting diode are the electronic component where charge controller circuit is comprised of.At the charging terminal the presence or absence of battery can be detected where as the charge controlled circuit is co-occurred with microcontroller[4].The status of the battery weather it is wrongly connected,fully charged or float charge can be determined.

The battery charge status is monitored through Arduino microcontroller.The current and voltage are constant to the batteries that is connected across the 12v batteries.

At the charging terminal the presence or absence of battery can be detected where as system is handled by the co-occurrence of charge controller circuit with microcontroller.The electric current is forced through the secondary cell by battery charger[5].

The batteries should be charged properly and safe to prevent from deep discharging.

The circuit consist of Arduino, step up Transformer,12-230v and two MOSFET,voltage regulator.

The voltage regulator is connected with the capacitor as filter inorder to convert DC to AC.

The capacitor provides immunity against sudden voltage fluctuation.300 watt power are employed with MOSFET. By ON and OFF of MOSFET alternating flux is produced and AC generated.center tapped step-down Transformer is used.The maximum output power is decided by the Transformer’s voltage and current.

PV PANEL

As solar electric system grows the manufacturers are adding solar photovoltaic as option[6-10].PV system can be implemented for residential or commercial building.Arrays are mounted on roof top,they can be mounted at ground level or building wall also. PV array is parallel to roof and above the roof surface it is stood off several inches and airflow allowed

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FIGURE 4 CHARGING STATION

POWER SUPPLY

Power supply is provided with inverter and microcontroller.The output voltage is positive and negative with DC power supply[11-17].Set-up transformer is used.Relay are mechanically operated as switch.Relay is necessary to control a circuit.The Electrical characteristics of PV panal is listed.

COMPARISION TABLE

PARAMETER	REFERENCE PAPER(3)	CURRENT PAPER(8)	CURRENT PAPER
SIZING	Depends upon the parking area	Depends upon the parking area	Depends upon the parking area
BATTERY(KwH)	40	34	65
BATTERY VOLTAGE	435v	140v	320v
TYPE OF BATTERY	NiCd	MiMH	Li-ion
CHARGING METHOD	AC,DC	AC,DC	AC,DC,Solar,wind,Battery
TOTAL TIMING	8hours	10hours	2hours

BATTERY

According to EV parking manager and EV'S chargers the charging schedules are determined. According, to the Distribution Network theKW loading capacity is limited where the charging Infrastructure is conected[18-19].The EV batteries are resistive loads that charge at constant power rating.

MPPT

The non-linear output efficiency is produced due to complex Relationship between Temperature and Total resistance in a solar cells. The MPPT can be integrated with electric power system that provides voltage or current conversion.

MPPT which is otherwise called power point Tracking that is used commonly with wind turbines and photovoltaic solar system,power extraction is maximized in all conditions.

DC-DC boost converter is co-operated by MPPT where the dutycycle is controlled.MPPT algorithm for PV system is developed and it can be driven by basic power equation.

Digital storage oscilloscope is used to monitor loading capacity limits.EV batteries are resistive

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where power rating are constant.The battery charging is scheduled by EVPM in a first come first serve basis . According to the requirement of the owner .the electric vehicle charging schedules are calculated [9]. The charging characteristics are energy requirements, connection duration , electric vehicle battery efficiency, chargers efficiency. During day time excessive electricity is stored in batteries . when PV panel do not absorb energy the battery is used to power.

SIMULATIONS AND RESULTS

PV SYSTEM WITH MPPT SIMULATION:

The PV system simulation consists of PV panel,DC-DC converter and the load system.The load voltage,load current,and load power in watts are shown as output in PV simulation.

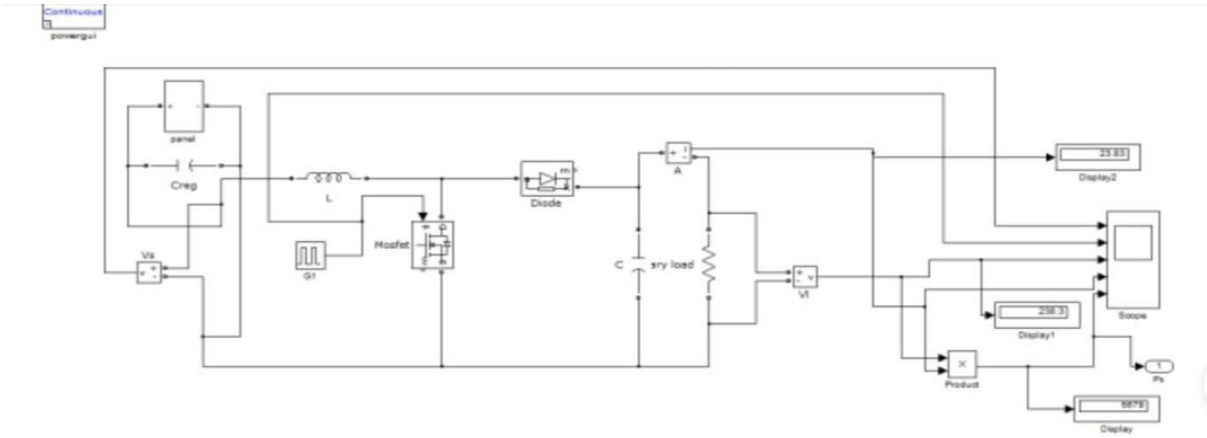

FIGURE 5 PV WITH MPPT SIMULATION DIAGRAM

OUTPUT

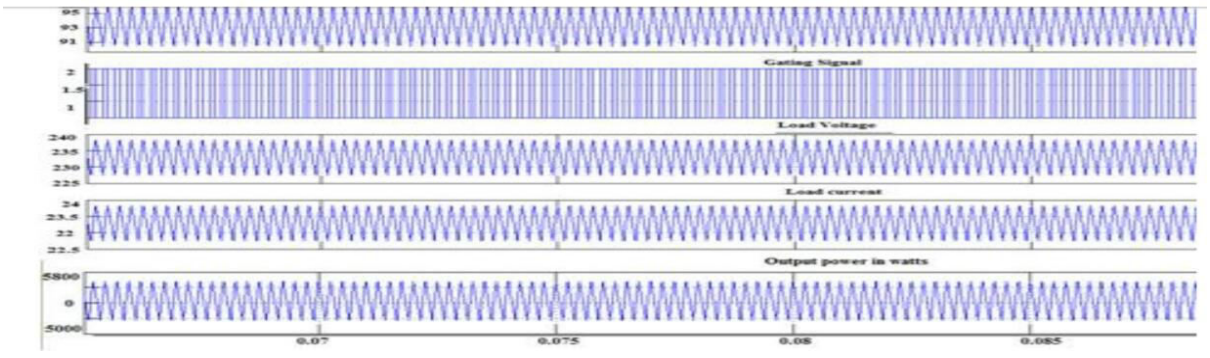

FIGURE 6 OUTPUT WAVEFORM OF PV SYSTEM

WIND ENERGY CONVERSION SYSTEM SIMULATION

The wind turbine is coupled to the generator in the wind energy conversion system, uncontrolled Rectifier unit and DC-DC boost converter. The Load voltage,load current and load power are shown in Output waveform.

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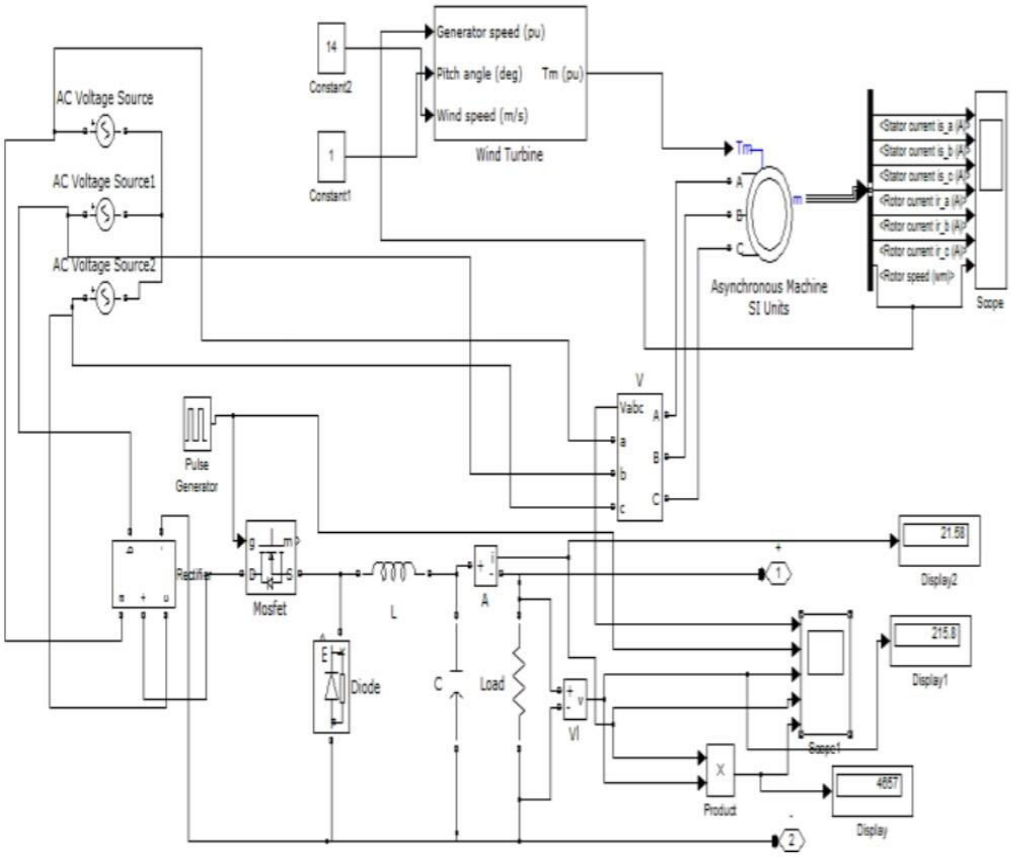

FIGURE 7 WIND ENERGY CONVERSION SYSTEM SIMULATION

OUTPUT

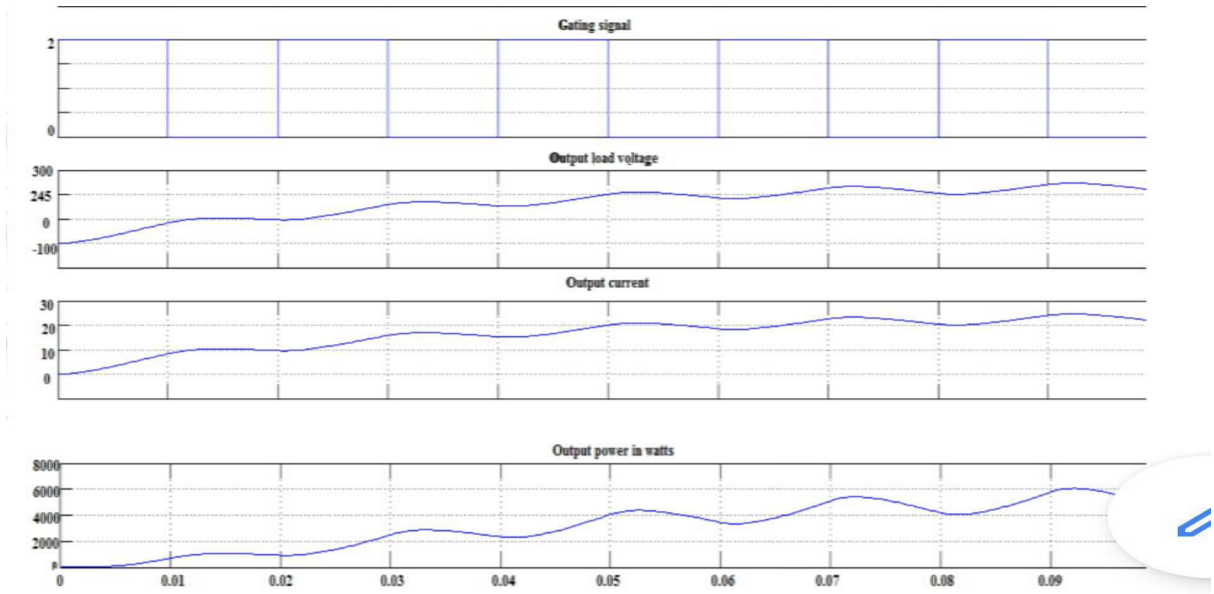

FIGURE 8 OUTPUT WAVEFORM OF WIND ENERGY

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SIMULATION OF BATTERY

The battery with bidirectional DC-DC converter is consisted in the battery simulation.

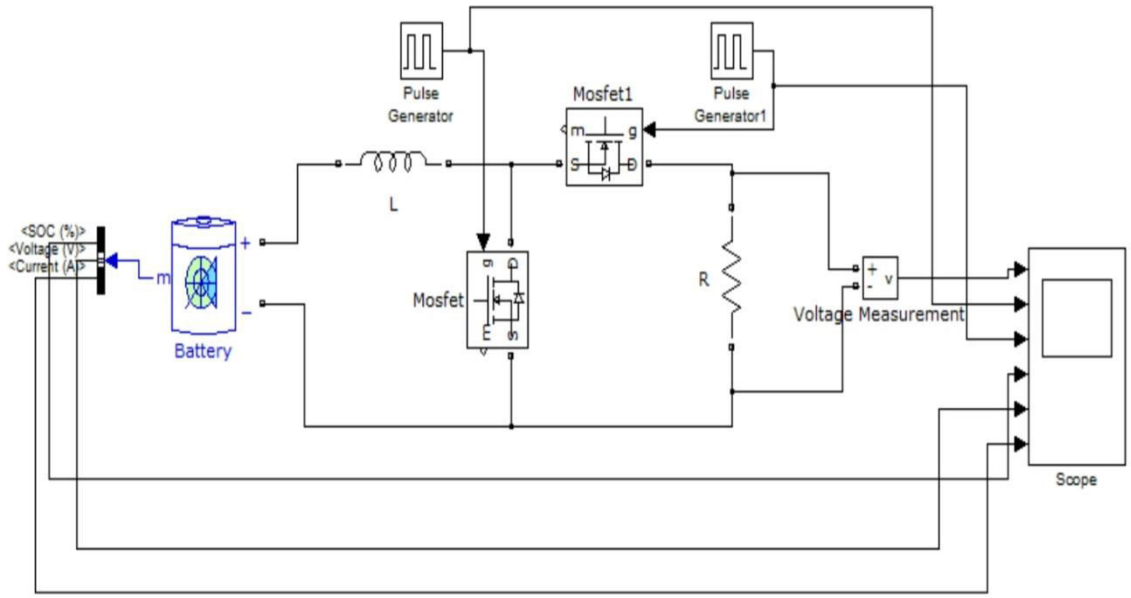

FIGURE 9 SIMULATION DIAGRAM OF BATTERY

OUTPUT

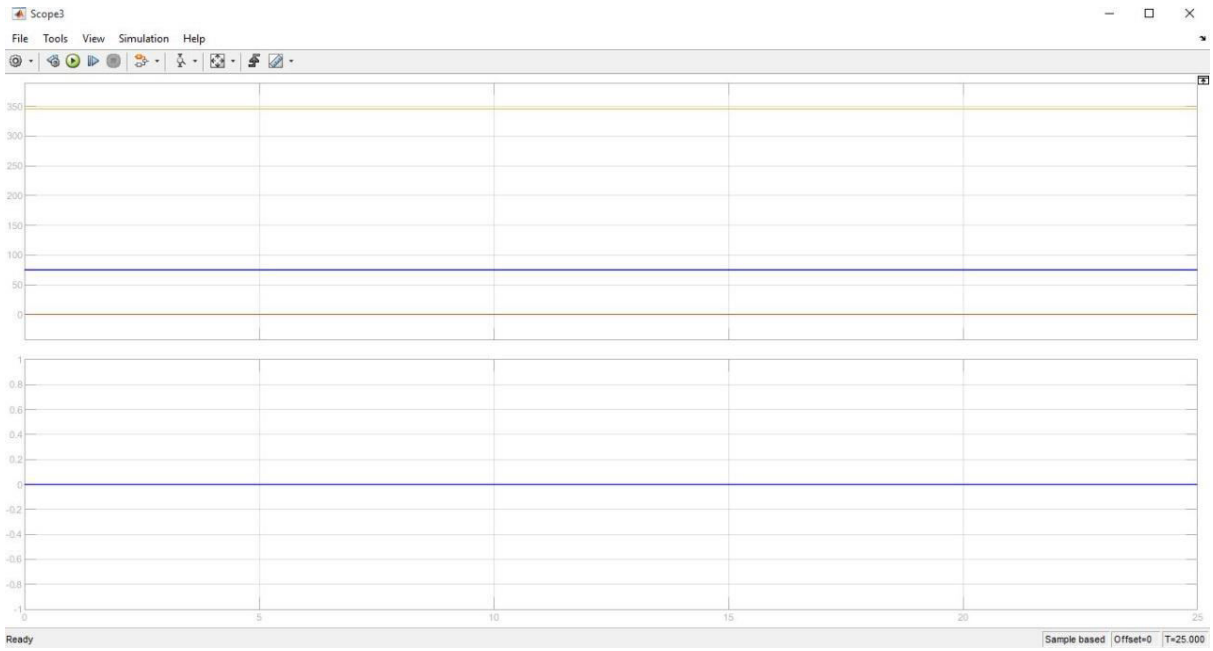

FIGURE 10 OUTPUT WAVEFORM OF BATTERY

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SIMULATION DIAGRAM

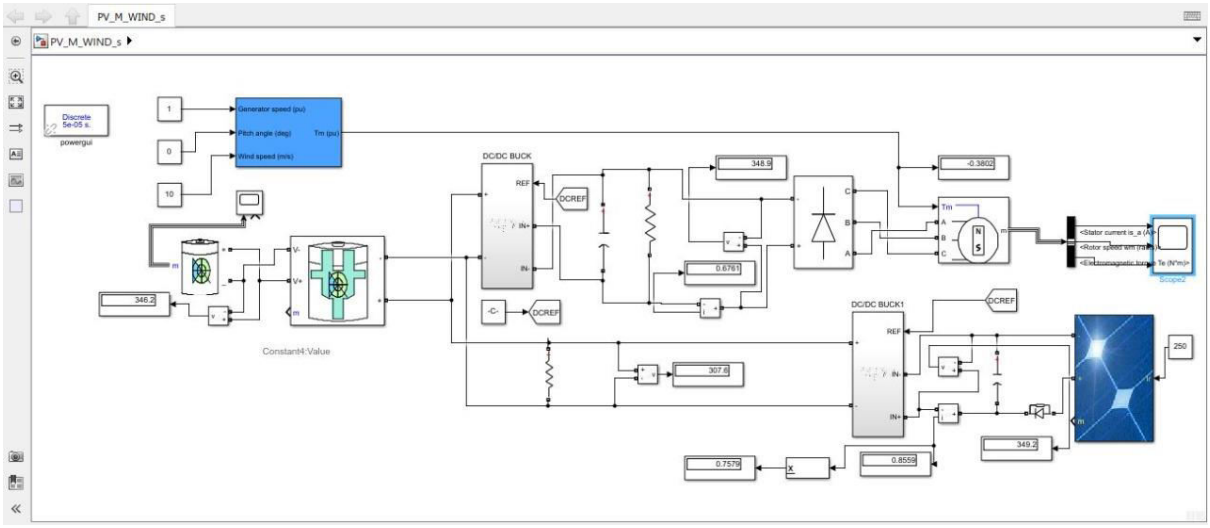

FIGURE 11 SIMULATION DIAGRAM OF INTEGRATED SYSTEM

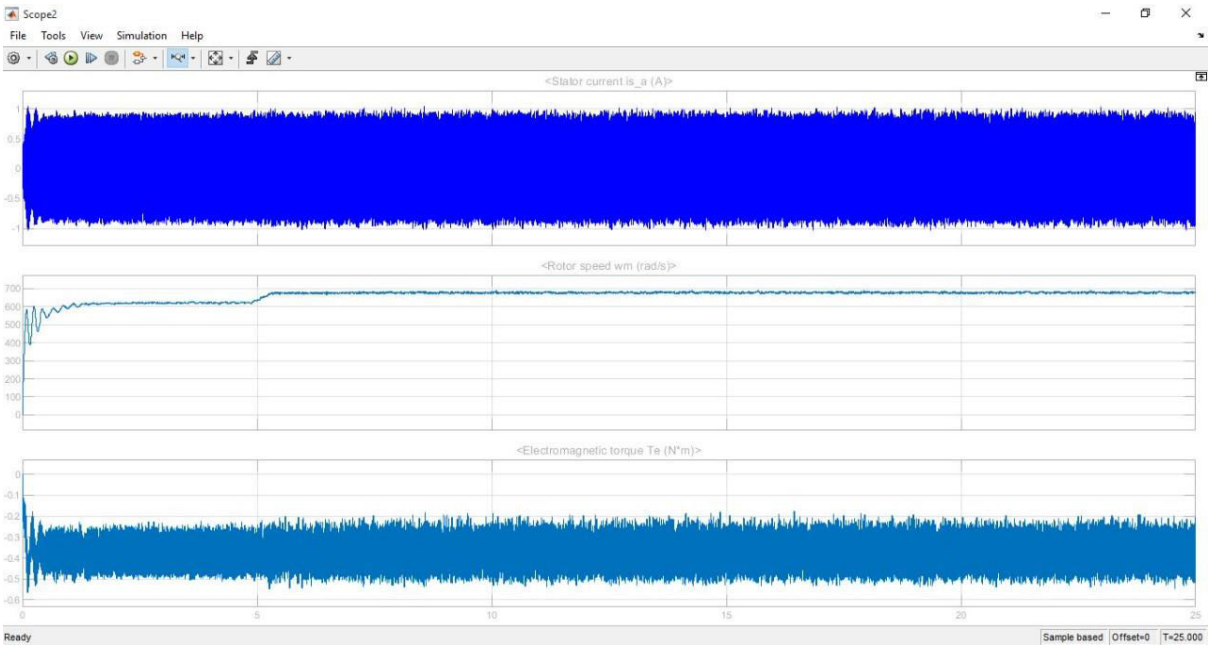

FIGURE 12 OUTPUT WAVEFORM

CONCLUSION

New charging Mechanism for Electric vehicle is proposed.EV charging station is necessary for longer drive vehicles.Based on the Energy storage present in the vehicle the travelling distance may relay.The proposed system provide enough power for recharging the Electric vehicle and time taken for charging can be avoided by battery storage.The system control,electricity estimation,Electric vehicle charging load projection are executed.Integrating PV with Electric vehicle can reduce the power demand in peak condition since energy is stored in a battery.The accuracy of PV electricity can be estimated by various forecasting models.If current charging station have one outlet,it will affect the result of load demand projection. Onelarge energy storage

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with multiple charging outlets is best for energy management strategy. It is concluded the pollution is reduced through this approach at the same time Environment is also protected.

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