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Based On GSM Effects of Stand Alones Solar – Wind Power Generation

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Abstract: **Hybrid wind-solar power generation is an unpolluted energy. MPPT algorithm is used for hybrid power generation. This MPPT algorithm gives more efficiency of power generation in wind-solar energy, but this MPPT algorithm does not give the constant voltage and current. Because exact sun angle is not located in solar panel. This mechanical model requires high electrical power, which may not be efficient. The proposed system of this paper is using a high frequency charging system (HFCS) and multilevel charging system (BESS). This BESS stands for battery energy storage system in our scheme whatever voltage collect from wind-solar that can be applied whose charging to the battery equivalent to the collected voltage. The HFCS system is applied for high efficiency of voltage from the wind-solar power generator such as switching circuit, relay and polarity controller are used. In this paper we are implementing GSM modem to monitor and control the power generation in wind-solar. The GSM modem is interfaced by using the Embedded microcontroller to monitor the power generation in remote devices. The remote device controls the AC load in power generation.**

***Index terms*- Bess battery, GSM modem, Hybrid power generation, HFCS, Embedded controller.**

I. INTRODUCTION

Energy is one of the major inputs for the economic development of a country. In case of developing countries, the energy sector assumes a critical importance in view of the ever increasing energy needs requiring huge investments to meet them. The growth of the world's human population has created several problems. One of them is global warming caused by the abundance of CO_2 in the atmosphere. Many of these gases are produced from electrical plants burning fossil fuels all over the world.

To reduce these emanations out into the atmosphere alternative sources of energy must be used. In the last two decades solar energy and wind energy has become an alternative to traditional energy sources. These alternative energy sources are non-polluting, free in their availability and renewable. In recent years advance materials, better manufacturing processes have decreased their capital costs make them more attractive. Another way to attempt to decrease the cost of these systems is by making use of hybrid designs that uses both wind/photovoltaic. Hybrid, wind turbine and photovoltaic modules, offer greater reliability than any one of them alone because the energy supply does not depend entirely on any one source. One source for example, on a cloudy stormy day when PV generation is low there's likely Enough wind energy available to make up for the loss in solar electricity.

II. DESCRIPTION OF THE PROPOSED SYSTEM

The block diagram of our proposed system shows the overview of how it works and generate power efficiently. Here the wind and solar energy is acquired from respective systems and sent through uni-directional polarity controllers to the switching circuit.

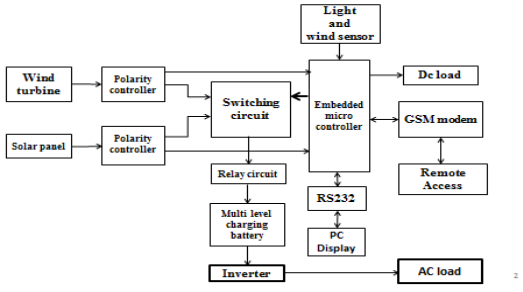


Fig.1 over all Block Diagram

2.1 Wind Turbine

To collect wind energy, we are using wind

turbines made up of D.C generators with mechanical model. The wind turbine is capable of rotating for small amount of wind change from the ambient. The maximum output of the turbine will be 24W. This can further be enhanced to larger value for real time implementation [4].

The common wind turbine with a horizontal axis is simple in working and it produce the electrical power economically. The kinetic energy in the varying wind is converted into rotary mechanical energy by the wind turbine rotor. The rotor blades are made up of reinforced glass fiber, which is mounted on the steel shaft [5] The turbine may be stall - regulated or pitch - regulated. For stall - regulated machines the pitch angle is fixed at the time of installation whereas in pitch - regulated machine it varies from various wind velocities to maintain the output power constant at rated value.

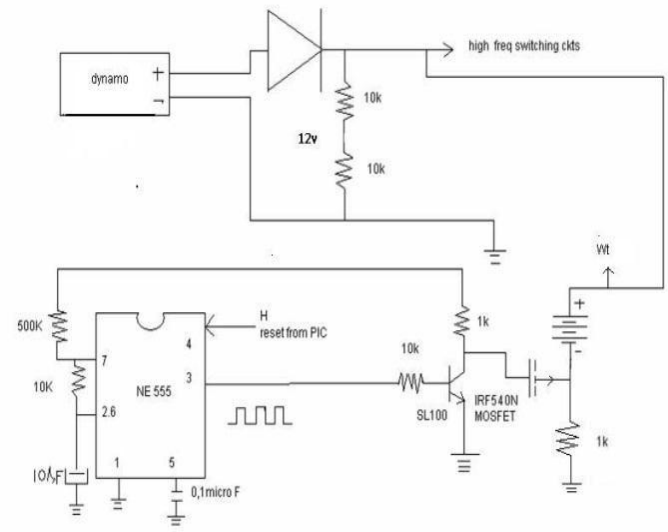


Fig.2 Circuit model of the wind turbine

2.2 Solar Panel

To acquire solar energy for this application, a photo-voltaic cell made up of amorphous silicon module, which is very rigid with high thermal stability can be utilized. The energy received in terms of power will be 12 W. The photo-voltaic cell will be installed below the wind turbine and works according to the quantity of light. The output power circuit of the photo-voltaic cell, is amplified and applied to the high frequency switching circuit which is similar to the wind turbine output power circuit.

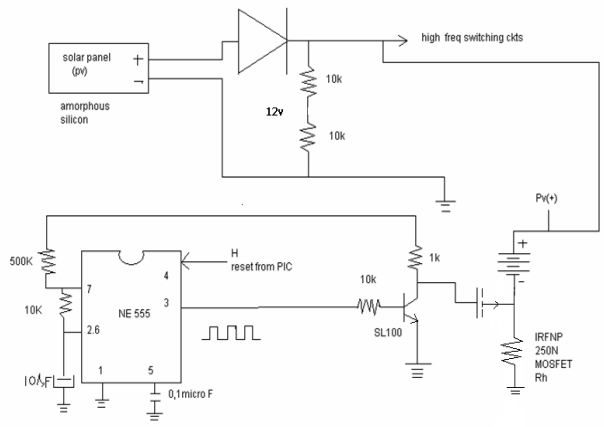


Fig.3 Circuit model of the Solar panel

2.3 Polarity Controller

Polarity controller is a diode with two electrodes called the anode and the cathode. Relative to the anode when the cathode is negatively charged at a voltage greater than the minimum level of voltage called forward breakdown voltage, then the current flows through the diode. If the cathode is positive with respect to the anode, is at the same voltage as the anode,or negative by an amount less than the forward break over voltage, then the diode does not conduct current.

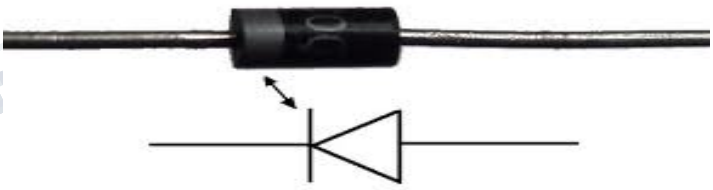
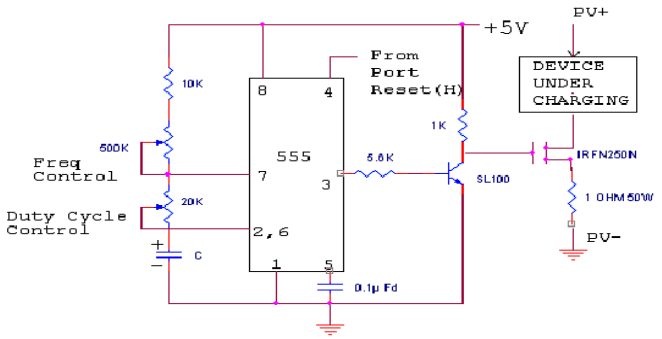


Fig.4 Polarity controller

2.4 Switching Circuit

The technique used in switching circuit is photo-voltaic cell. This method reduces the charging time. For example cell phones are charged using pulse charging technique. This is Trickle method in boost charging system. A high end high frequency charging technique will be employed to charge the battery without loading the turbine. Using this way, the cell phones will not get heated up. The switching circuit consists of the 555 timer and a MOSFET. The 555 timer works as the astable multivibrator which produces pulses of required frequency.

Fig.5 Switching Cricui



2.5 Relay

Relays are electromagnetic switches used as protective devices, indicating devices and as transmitting devices. Protective relay protect good component from the effects of the circuit components that have failed. Transmission relay are used in communication systems. Indicating relay may be used to identify a component which has failed. Transmission relay may be used to identify a component which has failed. A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. Relays bridge the gap, making it possible for small currents to activate larger ones. That means relays can work either as switches (turning things on and off) or as amplifiers (converting small currents into larger ones).here it is used as switch. The relay is one of the most widely used components in industrial electronic. Relays are electro magnetically operated remote controlled switches with one or more sets of contacts. When energized, the relay operates to open or close its contacts or to open some contacts and close others. Contacts which are opened when energized are called Normally open (NO) or simply open contacts. Contacts which are closed when energized are called Normally closed (NC) or simply open contacts. Normally open contacts are referred to as all contacts. Normally closed contacts are sometimes referred to as contacts.

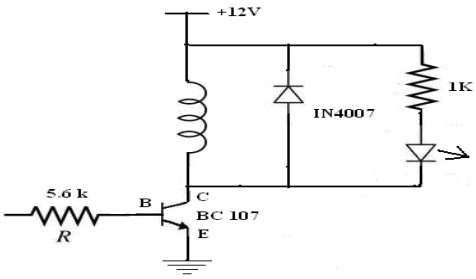


Fig.6 Relay Circuit

2.6 Multi Level Charging

According to our scheme whatever the voltage we collect from the photovoltaic cell and the dynamo that can be applied to a battery whose charging voltage is equivalent to the collected voltage. E.g.: If we receive 4 volts, we can charge 3volts battery. If we receive 7 volts, we can charge 6 volts battery respectively. To achieve this function we are measuring the output from both the solar panel and wind turbine using the Embedded Controller and generating various outputs to switch relays where batteries are connected.

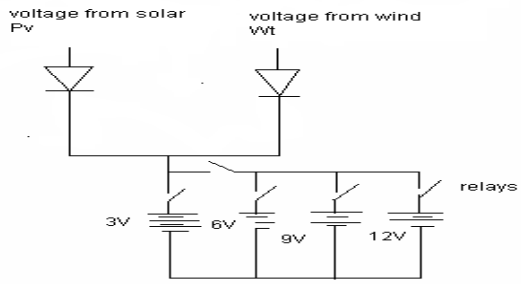


Fig.7 Multi Level Charging Battery

2.7 .Embedded Micro Controller

To perform the various operations like conversions required to switch, control and monitor the devices a processor is needed. The processor may be a microprocessor, micro controller or embedded controller. In this paper an embedded controller has been preferred because of its industrial advantages in power electronics like built in ADC, RAM, ROM, ports, USART, DAC. This leads to lesser space occupation by the circuit and also the speed of embedded controllers are more compared to other processors.

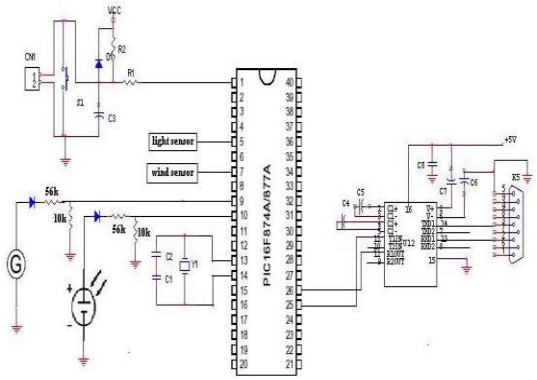


Fig.8 Circuit model of Overall Block

2.8 RS232 Interface

The most common communication interface for short distance is RS-232. RS-232 defines a serial communication for one device to one computer communication port, with speeds up to 19,200 baud. Typically 7 or 8 bit (on/off) signal is transmitted to represent a character or digit. The 9-pin connector is used. The pin detail is given below. The Max 232 is a dual RS-232 receiver / transmitter that meetsall EIA RS232C specifications while using only a +5V power supply.It has 2 onboard charge pump voltage.

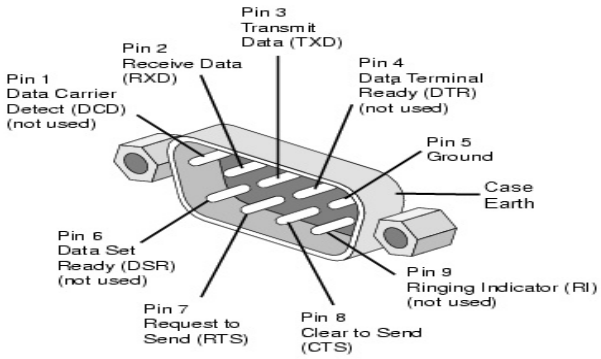


Fig.9 RS232 Pin configurations

2.9 GSM Technology

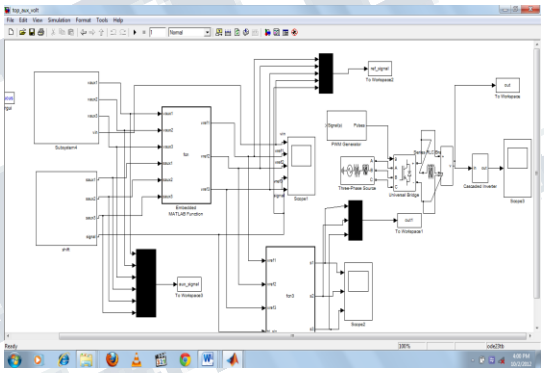
According to the proposed scheme the research knowledge (Development of Solar Photovoltaic Remote Monitoring System) will be hoped to help implementation of the Hybrid technology. Furthermore each renewable energy wind-solar system plants needs the monitoring and control the control systems. Same as hybrid system, where the performances and parameters must be closely monitored and controlled, thus allow adequate data acquisition system. The data acquisition system requires large number of measured data where very frequent recording necessary needs to be automated to eliminate the probability of human error as well as to save time.

This paper is mainly about computer, based on real time monitoring and control system center which use Visual Basic as Graphic User Interface (GUI) to provide graphical display output chart, graph or pie chart. With VB software the solar researcher can display the measured value from Photovoltaic house. To collect the data from Power generation (wind & solar) to the main measured data, storage data, control the system derived by microcontroller board and to interface the computer, the system require interfacing board which consist of microcontroller serial port board. It reads the microcontroller board through main computer using the serial port. For the convenience of researcher, the Global System for mobile communication (GSM) technology was attaching in the monitoring system to overcome data transfer. Usually the location of Hybrid wind and solar power generation is different with the places where we work. So, a remote monitoring system using GSM technology has been used in this research. Besides that, the power generation can be monitored everywhere.

III. SIMULATION RESULTS

3.1 Simulation Module

In this paper the simulation modules are shown in MATLAB version 7.0 for hybrid wind and solar power generation. The output of the simulation modules shown below are using three different stages scopes 1,2 and 3. This simulation process shows the power generation output variation by calculating time and amplitude.

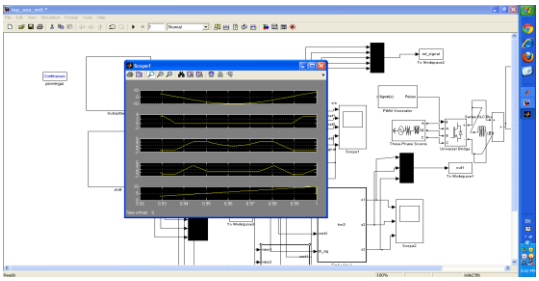


In simulation module we shown the wind and solar power generation . In the multiplier we get the input signal from wind and solar energy. By using this simulation we can calculate the time and amplitude of power generated. The reference signal is given to mux to generate signal without any error.

The multiplier process is used to mux both the wind and solar power generation and the generation of input is taken by scope1 and scope2's output. The pulse width modulation (PWM) is to maintain the pure ac signals from the output side and to generate continuous wave forms. In the final output stage the inverter block is connected to convert dc to ac signals to the load.

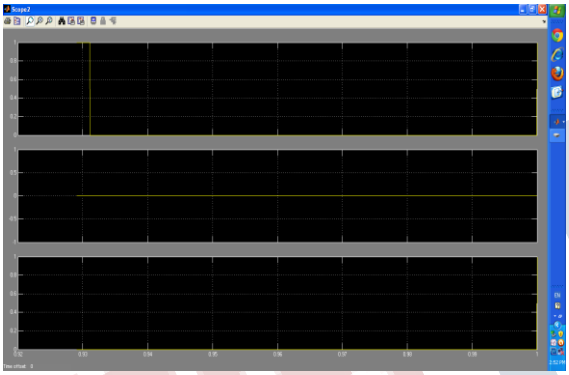
3.2 Simulation For Scope 1(wind power generation)

This simulation output is generated from wind and solar power after the section in switching cricuit block and digtal MUX. For scope1 we are giving five input signals and the output wave form is generated in scope1.

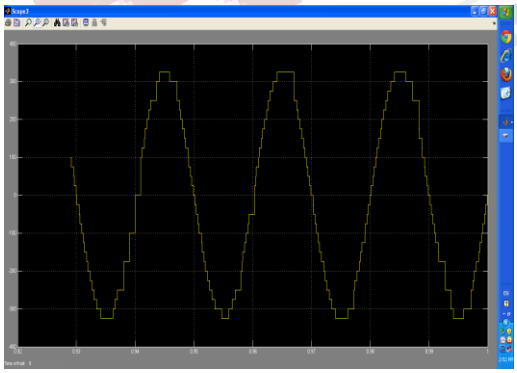


3.3 Simulation for Scope 2(Solar power generation)

This simulation output is generated by three phase source in which battery is connected through the bridge and PWM waveform are generated in scope2. The scope2 waveform shows DC and AC pulse.



3.4 Simulation for Scope 3(Output AC power generation)



The final output is given to the scope3 which generate the AC waveform. In this section the inverter converts the DC to AC. The output waveform of power generation module is shown.

IV. CONCLUSION

The hybrid power generation process is to overcome the disadvantages of the existing model of solar panel and the wind turbine. The integration of both the solar power generation and the wind power generation is the one which helps us to increase the efficiency of the overall system, consistency of the power generation can be improved, the interruption of the power flow could be avoided. The systems are complementary. Greater output can be obtained from the wind turbine during the winters and during the summers the solar panels would produce their peak outputs. Hybrid energy system features lower fossil fuel emissions and produces continuous power generation at all times thus being environmental friendly and reducing pollution. The required generating capacity of the basic solar and wind energy conversion units can be reduced since the total load is shared. The cost for generating 1KW power is Rs.50,000/-. The wireless GSM modem is used to monitor and control the power generation at anywhere in remote areas. This is a single time investment and this system is easy to operate and maintain. It improves the quality and availability of power.

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