

Power Generation Using Hybrid Renewable Energy Resources GSM based Control Performance for Domestic Applications

R. Devarajan, M. Anandraj, G. Rameshkumar, S. Goplakrishnan, M. Subramanian

Abstract--- Renewable power source innovations offer spotless, copious vitality assembled from self-reestablishing assets, for example, the sun, wind, and so forth. As the power request expands, control disappointment additionally increments. In this way, sustainable power sources can be utilized to give consistent burdens. Another converter topology for hybrid wind/ photovoltaic energy system is proposed. Hybridizing sun oriented and wind control sources provide a sensible type of intensity age. The main consideration of this project is to control the performance of the domestic application using GSM. This setup enables the two references to supply the heap independently or at the same time contingent upon the accessibility of the vitality sources.

Keyword--- PV Solar, Wind, Controller, GSM, Relay, Fan, Light.

1. INTRODUCTION

Recent advancements and patterns in the electric power utilization demonstrate expanding utilization of sustainable power source. This perspective investigations sustainable power sources concentrate consideration increasingly. Sunlight based vitality and wind vitality are the two sustainable power sources most basic being used. Wind vitality has turned into the slightest costly sustainable power source innovation in the presence and has created the enthusiasm of researchers and teachers over the world. Photovoltaic cells change over the vitality from daylight into DC electricity. PVs offer included focal points over other sustainable power sources in that they radiate no commotion and require no support. Hybridizing sunlight based and wind control sources give a reasonable type of intensity power generation. The wind and sunlight based vitality frameworks are exceptionally questionable because of their unusual nature. In, a PV panel was incorporated with a diesel-electric power system to analyze the reduction in the

fuel consumed. When a source is unavailable or insufficient in meeting the load demands, the other energy source can compensate for the difference. They utilized a different DC/DC buck and buck-support converter associated imbue in the rectifier stage to play out the MPPT control for every one of the sustainable power source control sources. These systems have an issue that, because of the natural components impacting the Breeze turbine generator, high-recurrence current sounds are infused into. In this, another converter topology for hybridizing the breeze and sun oriented vitality sources has been proposed. In this topology, both breeze and sunlight based vitality sources are fused together utilizing a mix of CUK and SEPIC converters, so that on the off chance that one of them is inaccessible, at that point the other source can adjust. They can also support individual and simultaneous operations. The sunlight based vitality source is the contribution to the CUK converter, and wind vitality source is the contribution to the SEPIC converter. The normal yield voltage created by the framework will be the whole of the contributions of these two frameworks. Every one of these points of interest of the proposed hybrid system makes it profoundly productive and solid.

2. LITERATURE REVIEW

The Environmentally friendly solutions are becoming more prominent than ever as a result of concern regarding the state of our deteriorating planet. This presents a new system configuration of the front-end rectifier stage for a hybrid wind/photovoltaic energy system. The innate idea of this CUK-SEPIC melded converter; extra information sift are not important to channel through high-recurrence harmonics. Harmonics substance is impending for the generator life expectancy, warming issues, and proficiency. The intertwined multi-input rectifier organizes likewise permits Maximum Power Point Tracking (MPPT) to be utilized to separate the greatest power from the breeze and sun when it is accessible. A versatile MPPT calculation will be utilized for the breeze framework, and a standard bothers and watch strategy will be utilized for the PV framework. Operational examination of the proposed framework will be talked about. Reproduction comes about are given to feature the benefits of the proposed circuit. With increasing concern over global warming and the depletion of fossil fuel reserves, many are looking at sustainable energy solutions to preserve the earth for the future generations.

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Other than hydropower, wind and photovoltaic energy hold the most potential to meet our energy demands. However, by combining these two intermittent sources and

by incorporating maximum power point tracking (MPPT) algorithms, the system's power transfer efficiency and reliability can be improved significantly.

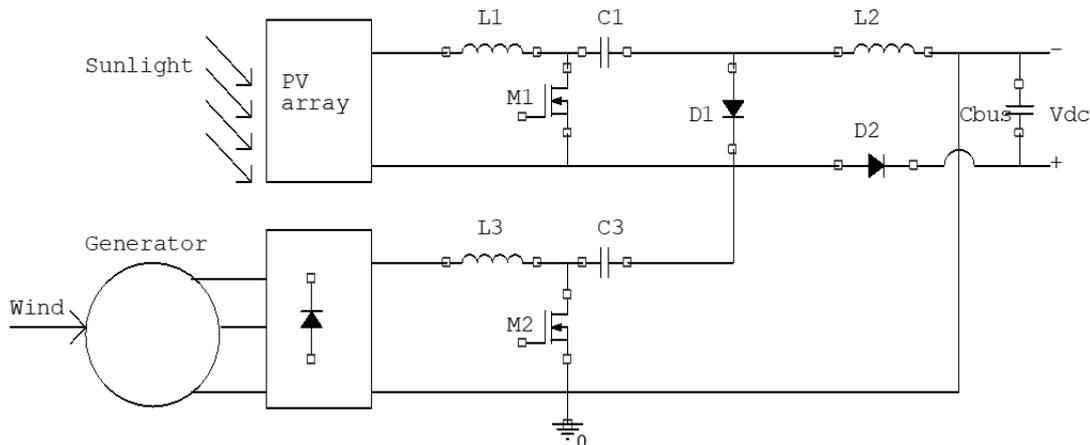


Fig. 1: A Hybrid Wind-Solar Energy System

The load demands, the other energy source can compensate for the difference. Several hybrid wind/PV power systems with MPPT control have been proposed and discussed in works. A simpler multi-input structure has been suggested by that combine the sources from the DC-end while still achieving MPPT for each renewable source. The structure proposed by is a fusion of the buck and buck-boost converter. The systems in the literature require passive input filters to remove the high-frequency current harmonics injected into wind turbine generators. The proposed configuration is a combination of the CUK and SEPIC converters. The highlights of the proposed topology are the inherent nature of these two converters eliminates the need for separate input filters for PFC it can support step up/down operations for each renewable source (can support wide ranges of PV and wind input) MPPT can be realized for each source individual and simultaneous operation is supported. The circuit operating principles will be discussed. Simulation comes about are given to check the possibility of the proposed system.

3. PROPOSED METHOD

The presents the dynamic modeling and coordinated control strategy for an integrated microgrid scheme using Photo Voltaic PV, Fuel Cell FC, and backup Diesel generation with additional battery backup system. The integrated scheme is fully stabilized using a novel FACTS based green filter compensators that ensures stabilized DC bus voltage, minimal inrush current conditions, and load excursions while ensuring that the diesel generator set is only utilized when the demand energy exceeds the PV, FC and battery sources capacity within a specified operational levels to ensure highest efficient operation of the integrated renewable energy sources with the diesel engine. The project presents a novel application of Multi-load controls the of the domestic utilities, In anywhere of the places based on the control using GSM.

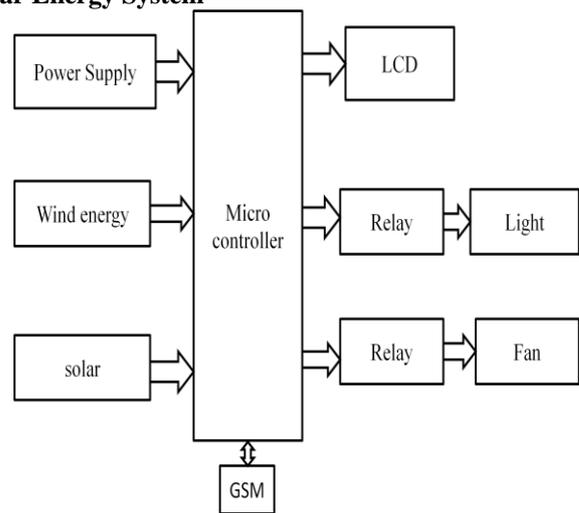


Fig. 2: Block Diagram of Proposed Method

3.1 Block Diagram Description

- The word photovoltaic combines two terms – photo means light and voltaic means voltage. The Photovoltaic energy is obtained from sunlight in the form of solar energy.
- Wind control is the utilization of wind stream through breeze turbines to mechanically control generators for electric power. Twist control, as a different option to consuming non-renewable energy sources, is abundant, sustainable, generally appropriated, clean delivers no ozone-harming substance outflows amid activity, devours no water, and uses the little land.
- Both the PV and wind system can be output improved by using micro control.
- GSM (articulated *hmm ess-em*) is the most prominent PDA standard and is utilized globally, so you've likely found out about it with regards to GSM telephones and GSM systems, particularly when contrasted with CDMA.

- GSM initially remained for Group Special Mobile however now implies Global System for Mobile correspondences.
- Finally, the improved voltage has been inverted and given to the ac grid.

3.2 Photovoltaic Energy

The word photovoltaic combines two terms photo means light and voltaic means voltage. The Photovoltaic energy is obtained from sunlight in the form of solar energy. The sunlight is made to be focused on solar panels which have the ability to convert the solar energy into electrical energy. Solar cells of the solar panel do the conversion of solar energy into electrical energy. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring.



Fig. 3: Photovoltaic

3.3 Equivalent Circuit

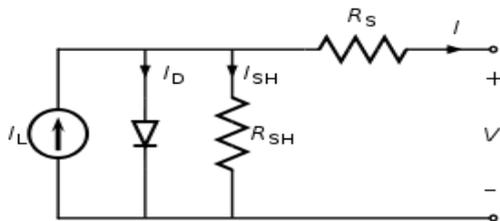


Fig. 4: Equivalent circuit

To comprehend the electronic conduct of a sun-based cell, it is helpful to make a model which is electrically equivalent, and depends on discrete electrical segments whose conduct a present source might display perfect sunlight based cell in parallel with a diode; practically speaking no sun oriented cell is perfect, so a shunt obstruction and an arrangement opposition segment are added to the model. The subsequent comparable circuit of a sun-oriented cell is appeared on the cleared out. The right is the schematic representation of a solar cell.

3.4 Wind Energy

Wind control is the utilization of wind current through wind turbines to mechanically control generators for electric power. Twist control, as a different option to consuming non-renewable energy sources, is abundant, sustainable, broadly dispersed, clean, delivers no ozone-depleting substance outflows amid task, expends no water, and uses the little land. The net impacts on the earth are far less dangerous than those of non-exhaustible power sources. Wind control gives the variable power which is extremely reliable from year to year yet which has the huge variety over shorter timescales. It is in this manner utilized as a part of conjunction with other electric power sources to give a dependable supply. In addition, weather forecasting permits the electric power network to be readied for the predictable variations in production that occur.

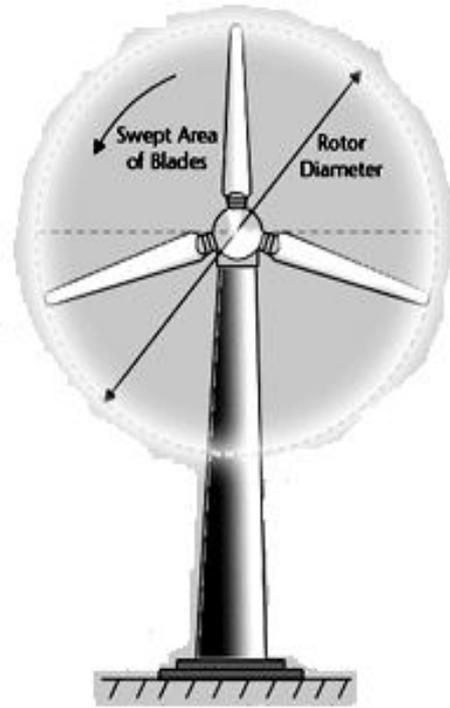


Fig 5: Wind Energy

3.4.1 Theory of Windmills

1. The vitality in the wind turns a few propeller-like sharp edges around a rotor. The rotor is associated with the primary shaft, which turns a generator to make power.
2. The terms wind vitality or wind control depict the procedure by which the breeze is utilized to produce mechanical power or power. Wind turbines change over the motor vitality in the breeze into mechanical power.
3. This mechanical power can be utilized for particular assignments, (for example, crushing grain or pumping water), or a generator can change over this mechanical power into power.

3.5 PIC Microcontroller

Peripheral Interface Controller (PIC) is microcontroller created by Microchip; PIC microcontroller is quick and simple to execute a program when we analyze different microcontrollers like 8051. The simplicity of programming and simple to interfacing with different peripherals PIC ended up fruitful microcontroller. We know that the microcontroller is an integrated chip which consists of RAM, ROM, CPU, TIMERS, and COUNTERS, etc. PIC is a microcontroller which also consists of ram, rom, CPU, timers, counter, ADC (analog to digital converters), DAC (digital to analog converter). PIC also supports the protocols like CAN, SPI, UART for interfacing with other peripherals. PIC mainly used modified Harvard architecture and also supports RISC (Reduced Instruction Set Computer) by the above specification RISC and Harvard we can easily that PIC is faster than the 8051 based controller which is made-up of Von-Newman architecture.



3.5.1 PIC Microcontroller Architecture

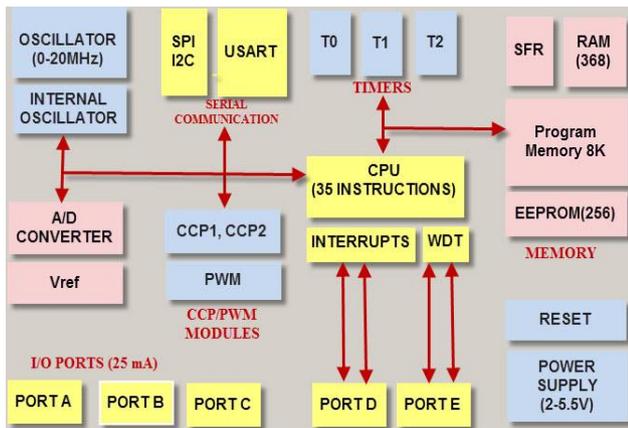


Fig. 6: PIC Microcontroller Architecture

Peripheral Interface Controller (PIC) is microcontroller created by Microchip; PIC microcontroller is quick and simple to execute a program when we analyze different microcontrollers like 8051. The simplicity of programming and simple to interfacing with different peripherals PIC ended up microcontroller. It Has A Total Number Of 40 Pins, And There Are 33 Pins For Input And Output. Pic16f877a Is Used In Many PIC Microcontroller Project. Pic16f877a controller Many Applications In Digital Electronics Circuits. Where Microcontrollers couldn't be Before As In Coprocessor Applications And Timer Functions.

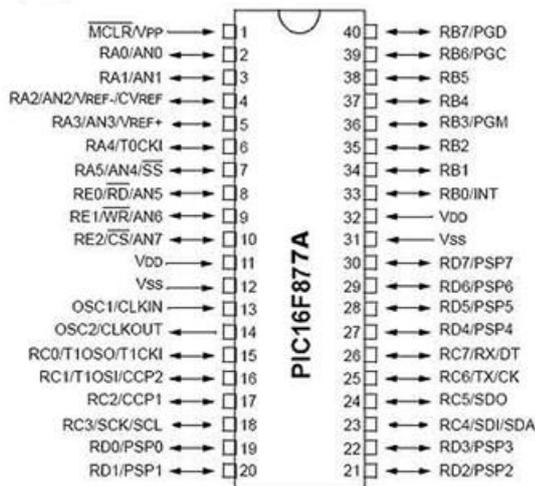


Fig. 7: PIC Microcontroller Pin Configuration

3.6 LCD

The Flat screen LCD and plasma screens work in a completely different way. In a plasma screen, each pixel is a tiny fluorescent lamp switched on or off electronically. In an LCD television.

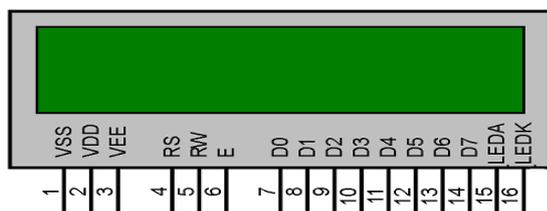


Fig. 8: LCD Display

The pixels are turned on or off electronically utilizing fluid gems to pivot captivated light. Short for fluid gem show, a kind of show utilized as a part of advanced watches and numerous convenient PCs. LCD shows use two sheets of polarizing material with a fluid precious stone arrangement between them. An electric current went through the fluid makes the gems adjust with the goal that light can't go through them. A liquid-crystal display (LCD) is a flat-panel display or another electronically modulated optical device that uses the light-modulating properties of liquid crystals.

3.7 Relay

The relay is an electromagnetic device which is utilized to segregate two circuits electrically and associate them attractively. They are exceptionally helpful gadgets and enable one circuit to switch another while they are isolated. They are frequently used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at high voltage. A relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.

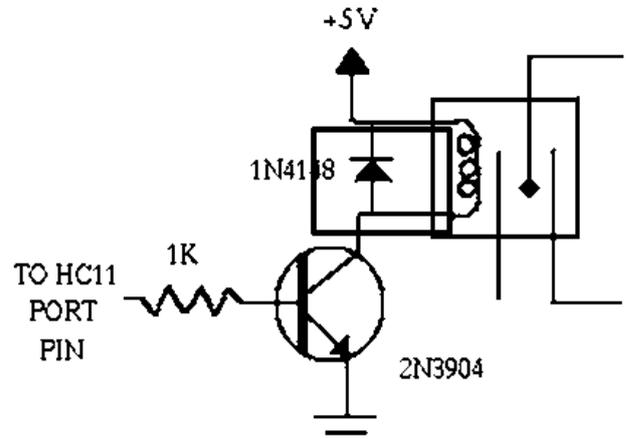


Fig. 9: Relay

3.8 GSM

GSM (Global System for Mobile correspondence) is a computerized portable communication system that is broadly utilized as a part of Europe and different parts of the world. GSM utilizes a variety of time division different access (TDMA) and is the most generally utilized of the three digital remote communication innovations (TDMA, GSM, and CDMA). GSM (Global System for Mobile correspondence) is an advanced, versatile communication framework that is broadly utilized as a part of Europe and different parts of the world. GSM utilizes a variety of time division different access (TDMA) and is the most generally utilized of the three computerized remote communication advances (TDMA, GSM, and CDMA). GSM digitizes and packs information, at that point sends it down a channel with two different surges of client information, each in its schedule vacancy. It works at either the recurrence band.



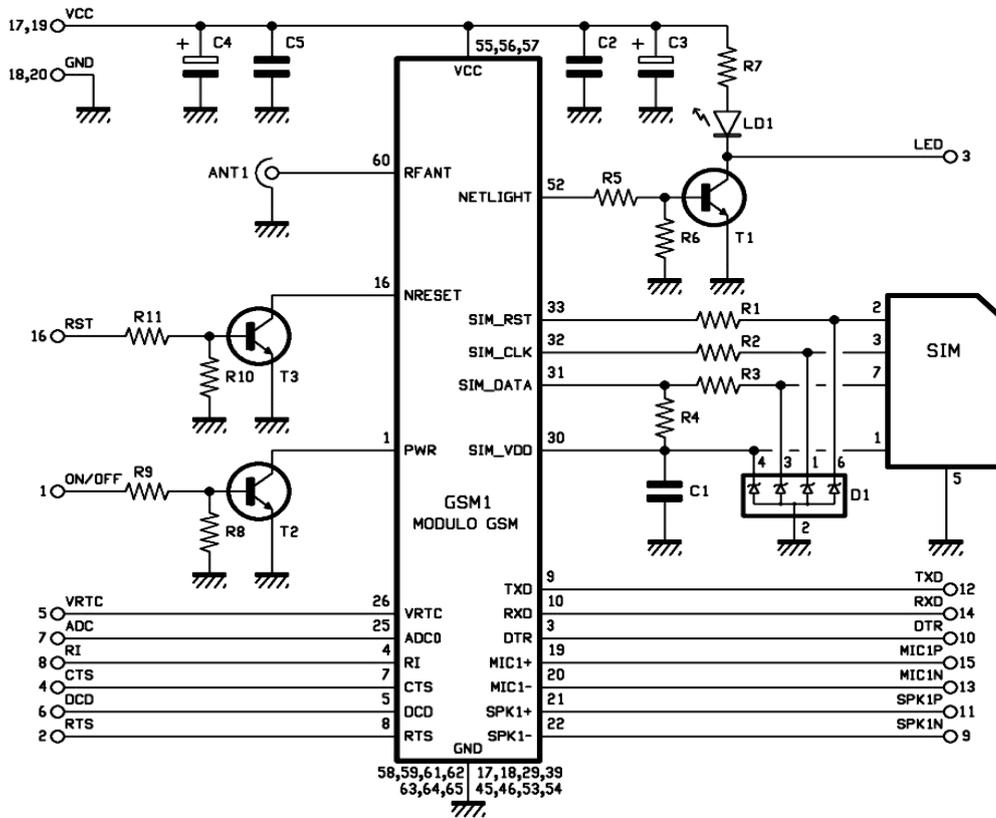


Fig. 10: GSM Modem

4. CIRCUIT DIAGRAM

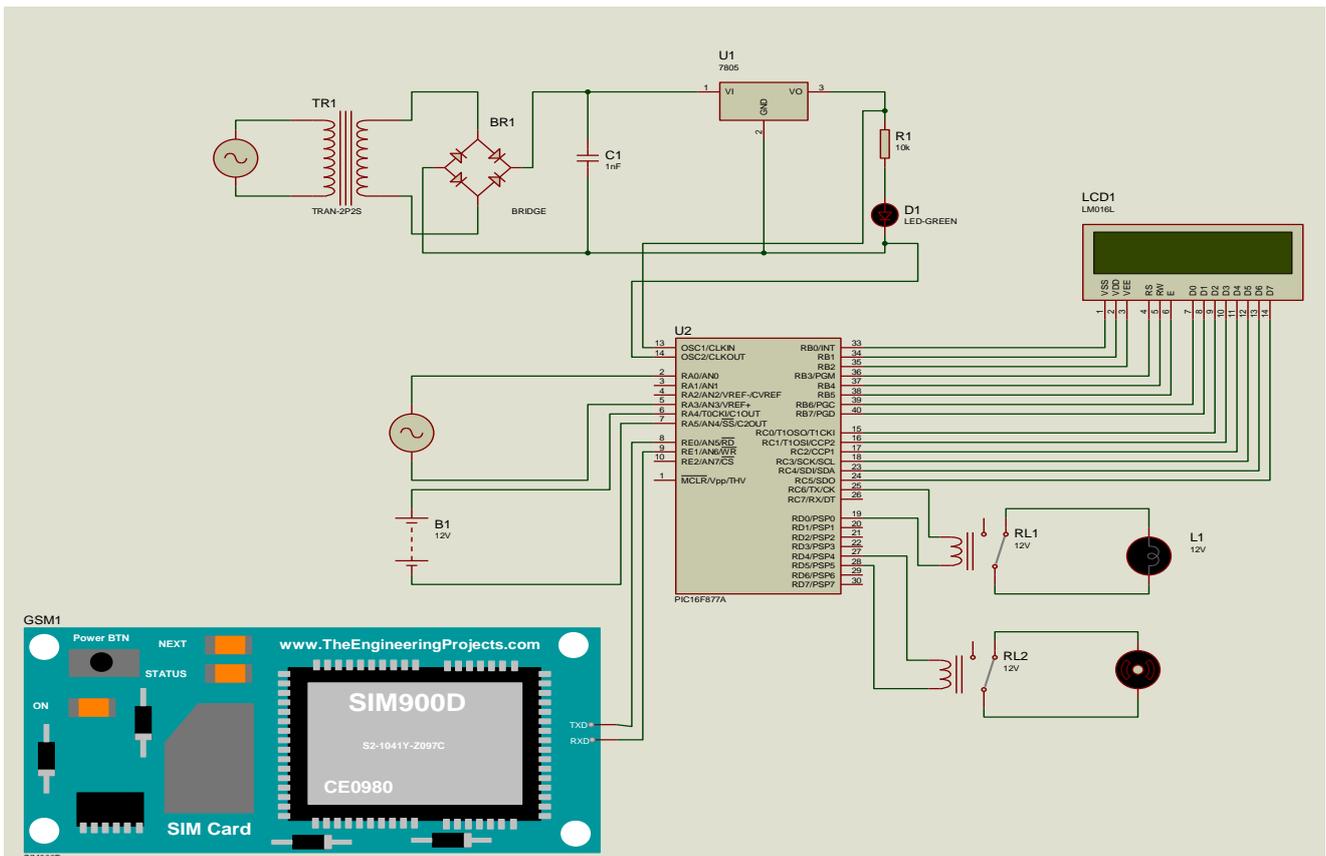


Fig. 11: Circuit Diagram Hybrid Power System

4.1 Circuit Diagram Explanation

In this model, shows the hybrid renewable energy generation for home appliances. The solar panel produces the 12V DC electric energy from sunlight. That electrical energy is stored in the battery (12V) and then it uses for home appliances. In case the cloudy weather or night time, the solar panel doesn't produce stable energy. The PIC microcontroller (16f877a) analyses the power from solar; if there is no adequate energy, then the controller disables the solar energy. Then the controller turns on the wind energy. As the solar energy, the wind is also doesn't produce adequate energy the controller disables the both renewable. And turn on the electric power supply. If there are any electrical malfunctions like short circuit controller analyses and trip the relay to protect the circuit. And also the GSM module interface with controller sends the alert message to the person.

5. RESULT DISCUSSION

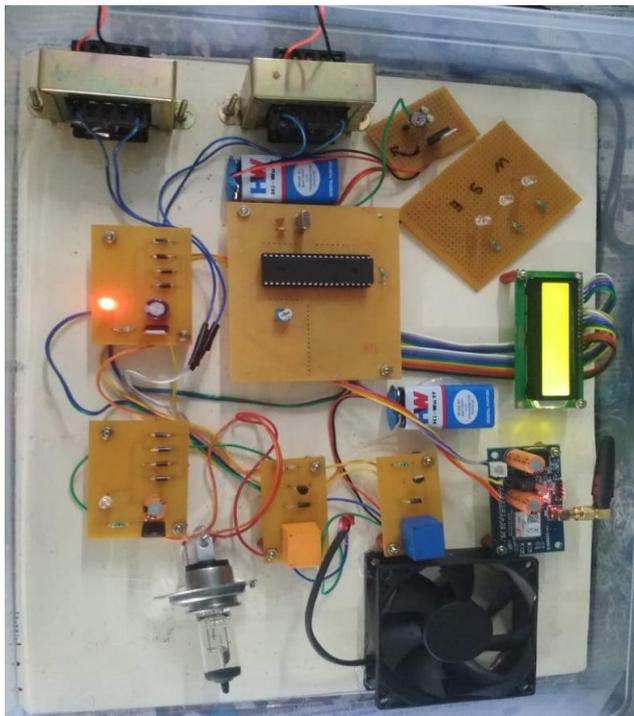


Fig. 12: Hardware output for Hybrid power system

5.1 Hardware Output

Hardware	Specification	Input Ranges	Output Ranges
Solar	Input power	1-10W	12V
Wind	Input power	Kinetic energy	12V
Battery	Input power	12V	7.5A
Microcontroller	PIC (16f877a)	5V DC	5V DC
Rectifier	Input power	12V AC	12V DC
Inverter	Output power	12V DC	12V AC
Boost converter	Regulating power	12V	0-50v
Transformer	step-up	24VAC	230VAC
GSM module	Sim600D	12V DC	Message alert
Load	Load	230V	4A

5.2 Advantages

- Both solar and wind power can be split by microcontroller depend upon peak load
- Load control system is applicable.

5.3 Application

- Electric generation
- Grid process
 - hybrid process
 - Industrial
 - Boiling, Heating

6. CONCLUSION

Renewable power sources likewise called characteristic procedures constantly renew a non-traditional sort of vitality. The hybrid system is the correct answer for clean vitality creation. Hybridizing sun powered and wind control sources give a reasonable type of intensity age. Half and half breeze and sunlight based vitality framework with a converter topology are proposed which makes utilization of CUK and SEPIC converters in the outline. This converter configuration conquers the downsides of the prior proposed converters. This topology enables the two sources to supply the heap independently or all the while relying upon the accessibility of the vitality sources. The yield voltage acquired from the half and half system is the total of the contributions of the CUK and SEPIC converters. The PV board, wind turbine, DC-DC converters and the proposed hybrid system.

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