Switching Between Grid And Solar For Development of Smart Power System In Home

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Abstract- *Considering the problem of generation of the ac electric energy we can design a system which can use the solar power in more efficient way. Due to the use of solar power in home appliances will reduces the usage of ac mains supply. This system results into the efficient use of renewable energy. This system will be useful to overcome the problems of load shedding and will reduce the electricity bill. The system consist of solar dc power that can be converted into ac power using the solar micro grid inverter. The output is given to the microcontroller and the source of supply will be selected automatically according to the load requirement and current status of the sources. Status of the system is shown by LED's, that means LED will show the load is running on solar power or grid supply.*

Keywords- solar, grid switching, At mega 328p, coil driver, relay etc.

I. INTRODUCTION

Renewable energy systems such as PV power generation, wind power generation and fuel cells are currently very popular. Renewable energy systems do not pollute atmosphere when they generate electricity. most power plants such as thermal power plants and nuclear power plants produces most of the power supply. But they establish a danger impacts in the atmosphere. On the other hand, renewable energy is very clean and cost effective from the perspective of return of investment. In this project, we propose a system to maximize the efficiency of a photovoltaic power system in application's aspect.

The combination of renewable energy with commercial electricity result in high efficiency and positive results. However, while research on the element technologies have been studied well, studies on commercial energy management with renewable energy are not relatively developed. In case of on-grid PV systems connected to commercial electricity grids directly, power consumption can be reduced in buildings or homes, but there could also be energy loss when power consumption is very low or electricity price are cheap, and vice versa.

We are interfacing solar energy with grid. There are several types of renewable energy such as solar, wind, tidal, geothermal etc. In our project we used solar energy since it is convenient for us. We implement this project to save the electricity which we produce manually by using different non-renewable resources, Considering the problem of generation of the ac supply we can design a system which can utilize the solar power. This system will be used to overcome the problem of load shedding and reducing the electricity bills. So we want to have a such system that running on renewable resources and save the electricity. In this project we used a concept called Grid Switching. In this concept, we will do switching between renewable resources and Grid. The switching of individual loads is a pre-calculated loads.

According to the weightage of the individual load we switch the particular load. The system consist of solar dc power can be converted into ac power using the solar micro grid inverter. The synchronized output is given to the microcontroller and the source of supply will be selected automatically according to the requirements of load and current status of the sources. For example- the total load consumption of our house is 100W (50w, 20w, 20w, 10w). When the solar is generating energy more than 100W our total house loads can be run on the solar source. But if the wind is producing energy less than 100w then what? Here we are measuring the power generated by the solar using CTPT, CT is used to measure the current flow and PT is used to measure the potential difference. Now if our source is generating power of 90w hence it is generating power less than our requirement. Now we will use 90w to drive the load of 50w,20w and will shift the rest load to grid.

II. METHODOLOGY

In this project the basic aim is to develop a system for switching between solar and commercial electricity supply. It is done by using switching relays with the help of microcontroller and various loads are connected to the load, the loads connected are predefined.

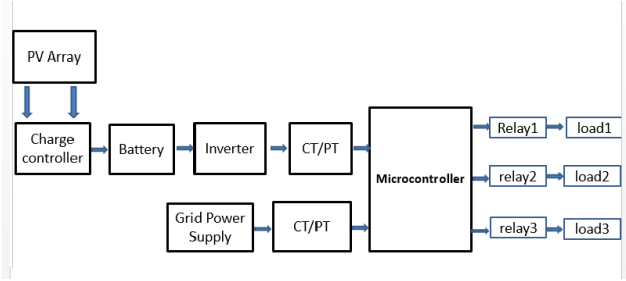


Fig. block diagram

The system will be designed according to the load at our home. So the solar output is capable of driving the load it will switch the load to solar. But if in the evening the solar becomes weak so it will check the output of the solar if it is capable of driving the load or not . If no then it will switch to GRID. Hence our project gives lowest priority to government grid and highest priority to renewable sources at home. Due to this use reduce our light bill and load on the government grid.

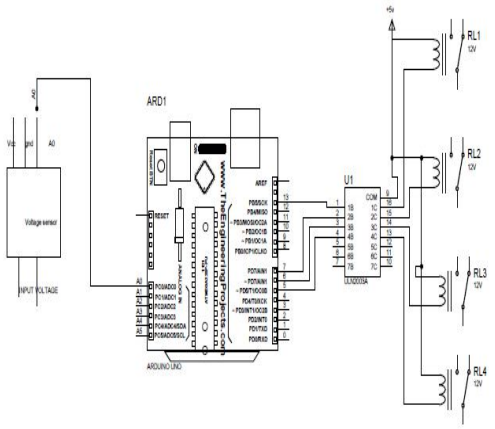
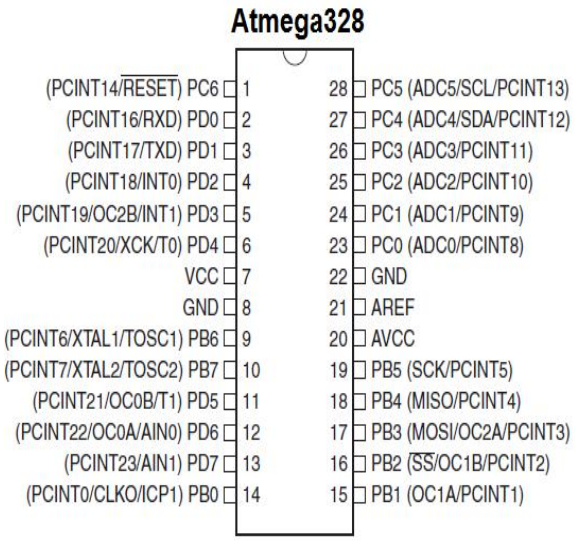


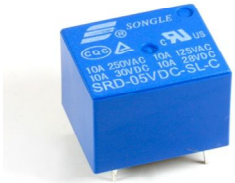
Fig. circuit diagram

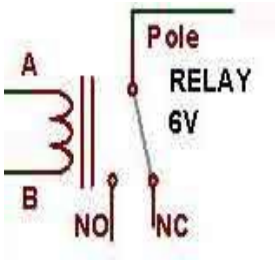
III. COMPONENTS

ATmega328/P- The Atmel Pico Power ATmega328/P is a low-power, 8-bit CMOS microcontroller which is based on enhanced RISC architecture. It executes powerful instructions in a single clock cycle, the ATmega328/P achieves the output close to 1 MIPS per MHz This is useful to system designer to optimize the device for power usage versus speed of processing.



SPDT Relay- This is Single Pole Double Throw SPDT relay. It is useful in various applications because of its internal configuration. It has one common terminal and two contacts but these contacts are in different configurations, if first one is normally Closed then the other one is opened or vise versa. So basically the SPDT relay as a way of switching between 2 circuits. When voltage is not applied ,the coil one circuit "receives" current, the other circuit do not receives the current and when the voltage is applied to the coil opposite is happening.



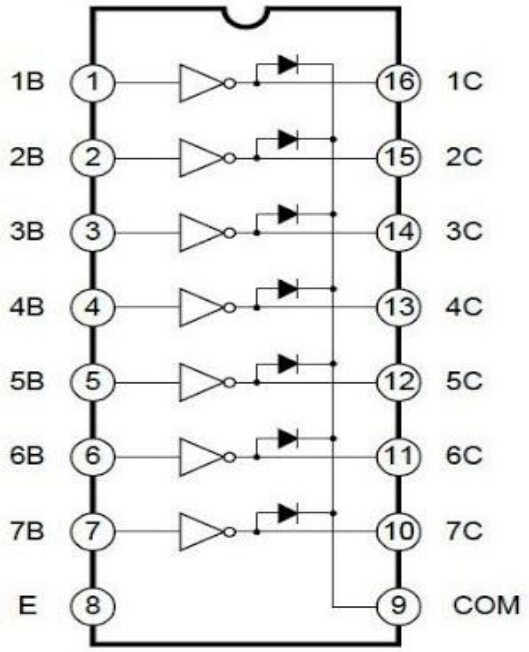


A relay is divided into two main parts that are input and output. The input section consist of a coil which generates magnetic field when a small voltage from an electronic circuit is applied across it. This is known as operating voltage of relay. The output section is consists of contactors which connect or disconnect mechanically. In a basic relay circuit there are three contactors named as normally open (NO), normally closed (NC) and common (COM). If the input is not available, the COM is connected to NC. When the voltage is applied the relay coil gets energized and the COM switches contact to NO. Different relays are available like SPST, SPDT, and DPDT etc. accordingly they have different number of changeover contacts. By selecting various combinations of contactors, the electrical circuit can be switched or and off.

ULN2003 COIL DRIVER- ULN2003 is a coil driver IC and it uses a Darlington array having high voltage and high currents as well. Open collector Darlington pairs are used to made it and have common emitter which shows that ULN2003 has ability of handling seven different relays at a time.

A single Darlington pair is made up of two bipolar transistors and it operates on the current range of 500mA to 600mA. ULN2003 is the part of ULN200X series. It operates on 5v and TTL (transistor transistor logic) CMOS (complementary metal oxide semiconductor) its pin configuration is designed such that the output pins are at the right side of the IC and the input pins of it are on left side in front of the corresponding input pin.

This IC can be used in various applications. ULN2003 is mainly used as relay drivers to drive different motors. the main applications of ULN2003 are logic buffers, line drivers, LED display, motor driver circuit etc.



VOLTAGE SENSOR 25 V DC- it is the module which uses a potential divider to reduce any input voltage by a factor of 5. This allows operator to use the analogue input of a microcontroller to monitor voltages much higher than it capable of sensing. For example- By using analogue input range of 0-5V operator can measure a voltage up to 25V.

BATTERY- In order to provide supply to the controller unit, we have used Lead acid battery in this project. The lead-acid battery is a rechargeable battery .this type of battery have a very low energy-to-weight ratio also low energy-to volume ratio, but they have ability to supply high surge currents means that the cells maintain a very large power-to-weight ratio. These features, along with their low cost, make them attractive for use in various applications to provide the high current required by starter motors.

IV. CONCLUSION

Switching between solar and commercial grid is done by using this model. In this model we have used relay tripping concept for shifting the load from one power supply to other. It shifts the pre-calculated loads according to program burn in microcontroller. So this system can be very useful in smart homes or building.

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