

## **MULTI-WEATHER POWER GENERATOR SYSTEM**

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**ABSTRACT:** In the year 2018, the world has consumed roughly 1,60,000 TWh (TeraWatt Hour) of energy. 35% of that was produced from Natural Oil, another 25% from coal. Only about 5% was harnessed from Solar Radiations and another 8% from Wind. We need to preserve the non-renewable fuels and switch to the renewable sources and more eco-friendly sources. We propose a system that harnesses energy from multiple renewable sources at once thus making it efficient in multiple weather conditions and also extremely eco-friendly.

**KEYWORDS –** Energy; Eco-friendly Technology; Environmental Engineering; Solar Power; Wind Mill.

### **Introduction:**

In the year 2018, the world has consumed roughly 1,60,000 TWh (TeraWatt Hour) of energy. 35% of that was produced from Natural Oil, another 25% from coal. Only about 5% was harnessed from Solar Radiations and another 8% from Wind. We need to preserve the non-renewable fuels and switch to the renewable sources and more eco-friendly sources. We propose a system that harnesses energy from multiple renewable sources at once thus making it efficient in multiple weather conditions and also extremely eco-friendly.

This project consists of Solar cells, Piezo plates and Wind turbines .Solar tracking system is attached to the model, using which the panel's will be tilted according to the sun movement to utilize efficient energy. The wind mill generates voltage during day and night time when wind is available. Consequently, in this project an attempt is made to make the electric and mechanical systems share their powers in an efficient way. And a panel cleaning mechanism will be installed, which automatically cleans the panels when needed. A DC motor with duster arrangement will swipe the solar panels once the light detecting resistor generates the signal in the afternoon.

### **Principle of Solar Panel:**

Electrical energy can be harvested from solar power by means of either photovoltaic cells or concentrated solar powersystems.

Photovoltaic Cells directly convert solar energy into electricity. They work on the principle of the photovoltaic effect. When certain materials are exposed to light, they absorb photons and release free electrons. This phenomenon is called as the photoelectric effect. Photovoltaic effect is a method of producing direct current electricity based on the principle of the photoelectric effect.

Based on the principle of photovoltaic effect, solar cells or photovoltaic cells are made. They convert sunlight into direct current (DC) electricity. But, a single photovoltaic cell does not produce enough amount of electricity. Therefore, a number of photovoltaic cells are mounted on a supporting frame and are electrically connected to each other to form a photovoltaic module or solar panel. Commonly available solar panels range from several hundred watts (say 100 watts) up to few kilowatts (ever heard of a 5kW solar panel?). They are available in different sizes and different price ranges. Solar panels or modules are designed to supply electric power at a certain voltage (say 12v), but the current they produce is directly dependent on the incident light. As of now it is clear that photovoltaic modules produce DC electricity. But, for most of the times we require AC power and, hence, solar power system consists of an inverter too.

### **Principle of Wind Turbine:**

A windmill turbine converts wind energy into rotational energy by means of its blades. The basic principle of every windmill is to convert kinetic energy of wind into mechanical energy which is used to rotate the turbine of electrical generator to produce electricity. They are sometimes used to pump water or to extract groundwater.

The most commonly seen windmills are Horizontal axis windmills which have their main rotor shaft and electrical generator at the top of a tower arranged in a row, horizontally. Basic parts include blades, rotor, a gear box (which amplifies the energy output of the rotor), and a generator which generates electricity. Sometimes, a tail-vane is also attached to direct the turbine to gather maximum wind energy.

When the main rotor shaft is set traverse, not necessarily vertical, to the wind, it is a Vertical axis windmill. The main components of these windmills are located at the base of the turbine. The main advantage of this arrangement is that the generator and gearbox are located close to the ground, facilitating service and repair. These windmills do not necessarily be pointed into the wind, which removes the need for orientation mechanisms.

### **Principle of Piezo Plate:**

The main principle of a piezoelectric is that a force, when applied on the quartz crystal, produces electric charges on the crystal surface. The charge thus produced can be called as piezoelectricity. Piezo electricity can be defined as the electrical polarization produced by mechanical strain on certain class of crystals. The rate of charge produced will be proportional to the rate of change of force applied as input. As the charge produced is very small, a charge amplifier is needed so as to produce an output voltage big enough to be measured. The device is also known to be mechanically stiff. For example, if a force of 15 kiloN is given to the transducer, it may only deflect to a maximum of 0.002mm. But the output response may be as high as 100KiloHz. This proves that the device is best applicable for dynamic measurement.

The figure shows a conventional piezoelectric transducer with a piezoelectric crystal inserted between a solid base and the force summing member. If a force is applied on the pressure port, the same force will fall on the force summing member. Thus a potential difference will be generated on the crystal due to its property. The voltage produced will be proportional to the magnitude of the applied force.

### **Principle of Inverter Circuit:**

The basic idea behind every inverter circuit is to produce oscillations using the given DC and apply these oscillations across the primary of the transformer by amplifying the current. This primary voltage is then stepped up to a higher voltage depending upon the number of turns in primary and secondary coils.

The circuit can be divided into three parts: oscillator, amplifier and transformer. A 50Hz oscillator is required as the frequency of AC supply is 50Hz. This can be achieved by constructing an Astable multivibrator which produces a square wave at 50Hz. In the circuit, R1, R2, R3, R4, C1, C2, T2 and T3 form the oscillator. Each transistor produces inverting square waves. The values of R1, R2 and C1 (R4, R3 and C2 are identical) will decide the frequency. The formula for the frequency of square wave generated by the astable multivibrator is  $F = 1/(1.38 * R2 * C1)$

The inverting signals from the oscillator are amplified by the Power MOSFETS T1 and T4. These amplified signals are given to the step-up transformer with its center tap connected to 12V DC.

## **Components Details:**

### **MOSFET:**

The MOSFET (Metal Oxide Semiconductor Field Effect Transistor) transistor is a semiconductor device which is widely used for switching and amplifying electronic signals in the electronic devices.

The MOSFET is a core of integrated circuit and it can be designed and fabricated in a single chip because of these very small sizes. The MOSFET is a four terminal device with source(S), gate (G), drain (D) and body (B) terminals. The body of the MOSFET is frequently connected to the source terminal so making it a three terminal device like field effect transistor. The MOSFET is very far the most common transistor and can be used in both analog and digital circuits.

### **TRANSISTOR:**

A transistor is semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor; terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

### **1N4007:**

The 1N4007 (or 1N4001 or 1N4000) series is a family of popular of general- purpose silicon rectifier diodes commonly used in AC adapters for common household appliances.

It's blocking voltage varies from 50 volts (1N4001) to 1000 volts (1N4007). This JEDEC device number series is available in the DO-41 axial package, and similar diodes are available in SMA and MELF surfacemount packages (in other part number series).

### **Full Wave Bridge Rectifier:-**

A Full wave rectifier is a circuit arrangement which makes use of both half cycles of input alternating current (AC) and converts them to direct current (DC). This arrangement is known as Center Tapped Full Wave Rectifier. The second method uses a normal transformer with 4 diodes arranged as a bridge.

## BLOCK DIAGRAMS

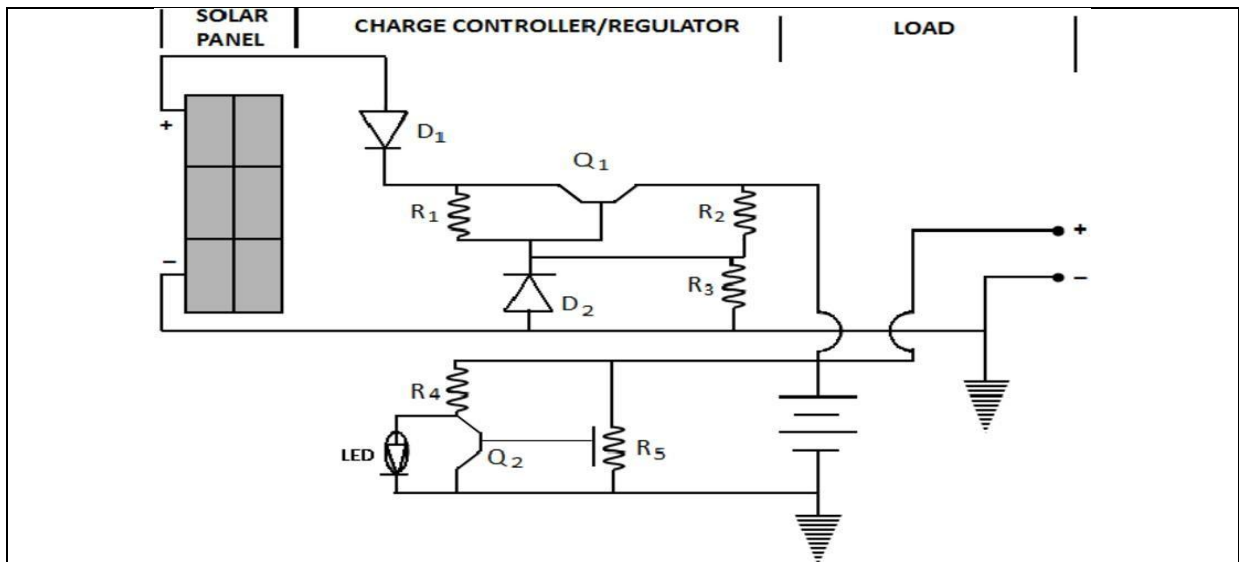


Fig: Solar Panel Circuit Diagram

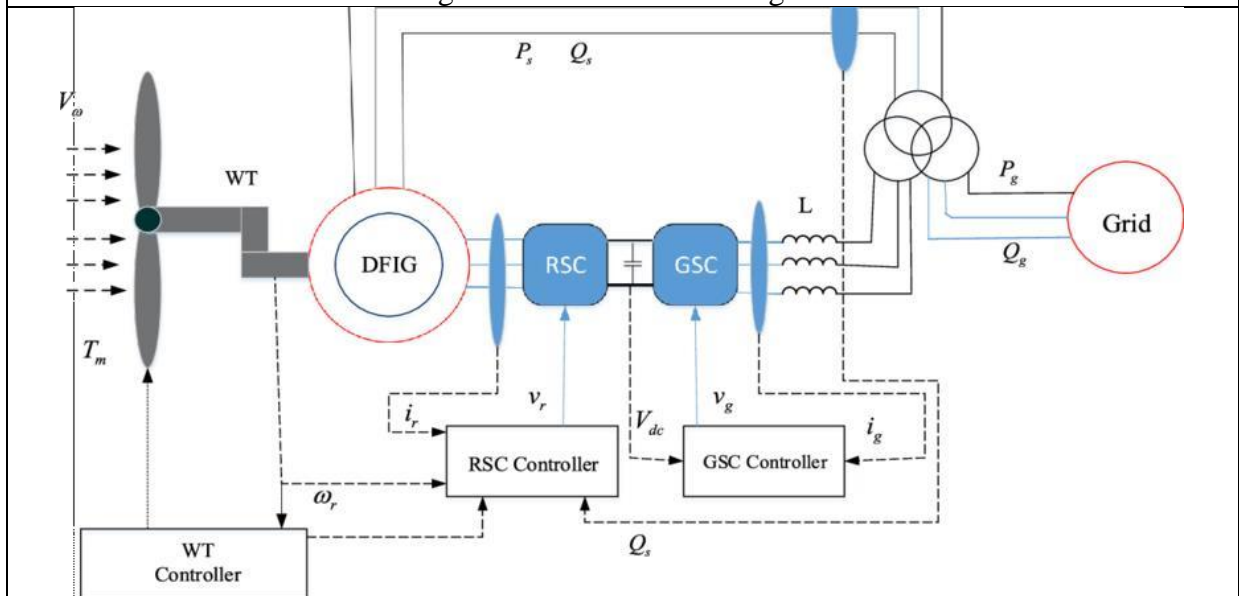


Fig: Wind Turbine Circuit Diagram

## SCOPE FOR FUTURE WORK:

To improve the sun tracking, a standalone sun tracker can be designed using ATmega328 Microcontroller. In this microcontroller, program can be stored in flash memory. We need not to do it manually (no need of rotation). Alignment with sun can be change automatically with intensity of light rays on LDR's. This project method can be used to increase the efficiency of power produced by solar panel. *Also we plan on introducing Hybrid Solar Cells to Harvest Energy from Rain.*

## **CONCLUSION:**

In this article, the all whether power generator system was implemented which is based on circuit design. After examining the information obtained in the data analysis section, it can be said that the proposed system is a feasible method of maximizing the energy received from solar radiation, wind turbine and piezo plate.

The controller circuit used to implement this system has been designed with a minimal number of components and has been integrated onto a single PCB for simple assembly.

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