# A Review Paper on Generation of Electric Power by Using Renewable Energy Systems

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**Abstract: -** *Global consumption of electricity is continually increasing, necessitating the expansion of power producing capacity. Energy deregulation has previously reduced investments in power stations, implying that the demand for new electrical power sources could be very high in the near future. Two significant technology will be critical in resolving future difficulties. One option is to switch from traditional, fossil-based (and short-term) energy sources to renewable energy resources for electrical power generation. Another option is to use high-efficiency power electronics in transmitting, distributing, and end-user applications. The PE is critical to the Grid's integration. The study focuses on the electrical machines utilized in renewable energy sources, particularly in wind generators, photovoltaic (PV) devices, and system components.*

**Keywords:** ***PV system, grid system wind system, MPPT.***

## I. Introduction

Because of the world's population increase, energy consumption is rapidly increasing. The production of energy has become a major global concern. Renewable energy sources are becoming increasingly popular as a means of generating energy. Renewable energy is energy derived from resources that are not exhausted due to human use [1]. Liquid, winds, solar, & bio-fuel or biomass are the most popular renewable energy sources. Power production, heating, and transportation fuels are all examples of conventional uses of these sources of energy. Renewable energy sources are appealing because of their long-term viability. As a result, there is an alternatives to the reduction of traditional energy such as coal, gasoline, and nuclear power. Renewable energy sources are environmentally friendly energy sources which have a lesser impact on the environment than traditional energy sources [2]. Energy access is critical for a country's economic development. In a typically developing nation, every 1% increase in GDP equates to a 1.4 percent increase in energy demands [3].

Energy demand is predicted to increase by about 40% by 2035, with an average annual growth of 1.4 percent, while oil demand will increase by around 0.8 percent per year until 2035 [3, 4]. However, the world's oil reserves are only enough to last 40 years. As a result, renewable energy sources will be in short supply for the next 2 decades or longer. These renewable sources account for 16% of worldwide energy consumption, with 10% coming from traditional biomass, which would be primarily utilized for heating, 3.4 percent from hydroelectric power, and the remaining 2.6 percent comes from other resources [4].

Electrical generation, hot water/space heaters, motor fuels, and rural (off-grid) energy services are all areas where renewable energy is replacing traditional fuels [5]. The key considerations for creating renewable energy sources might lead to a variety of favorable outcomes. Renewable energy sources are capable of reducing greenhouse gas emissions and preventing global warming [6, 7]. The biogenetic fuel plays an important role in space heating and transporting, as it verifies sustainable energy [7].

## II. Literature review

Majid TahmasbiFard et al. [8] This study describes a hybrid power system using a current source inverter (CSI) with a wind turbine and solar cells (PVs). A diode rectifier and a buck - boost converter are used to link a permanent magnet synchronous generator (PMSG) to the CSI, which controls the rotor speed. PVs' maximum power point is controlled by some other buck converter. Under normal operating conditions, the current proposal tracks the maximum power output of wind turbines and PVs and injects the appropriate reactive current into the grid during voltage drops. Fault current is within the permissible limit for power semiconductor converters when CSI is combined with the intrinsic behavior of wind turbines and PVs. To validate the proposed technology, simulations are performed using PSCAD/EMTDC software.

B.Venkatasamy et al. [9] Even after the average life lifetime, electricity is provided in windy generators, according to this article. The focus of this research is on the performance of the solar array and energy inverters. Solar irradiation is only available during day (i.e., 6 to 8 hours per day). The Photovoltaic system and grid-connected inverters will be idle if there are no sun rays. When PV power is unavailable, the grid-tie inverters can be run in reactive power injection mode to increase the inverter's usage for the day. This article simulates an inverters that can function both in active and reactive injecting modes. To improve the overall performance of the grid connected inverter utilized in the hybrids power plant, results and effective analysis are carried out.

J. Hossain et al. [10] The focus of this study is on solar energy resources, solar projects, and storage systems to provide the necessary power supports. This letter is specifically related to the mathematics of solar power plants and simulations for various elements and instances of the systems. Aside from that, the Zinc Bromide Batteries and Li-ion Battery are described, together with performances descriptions and simulations. The effectiveness of the microgrid systems, as well as the storage unit, is then assessed for various parameters, both in islanded mode and grid-tied mode of operation. Matlab simulation are used to rigorously verify all of the results.

Aida BaghbanyOskouei et al. [11] This research proposes a quinary asymmetrical inverters with connected inductances & transformers for usage in photovoltaic (PV) and wind hybrid systems. This inverters has only one DC source and provides twenty-five levels of voltage in addition to the advantages of a multilayer inverter. Then it is suitable for electric drivetrains, as it inhibits the increase of the DC-link and simplifies control system.

R. Koad et al. [12] This work introduces the particle swarm optimization methodology and describes a new maximum-power-point detection technique for a pv system that relies on the Lagrange Interpolation Formulation. By employing simply a basic numerical computation to start the particles around the globally maximum power output, the suggested control system removes the issues associated with traditional methods. As a result, the proposed technique will require fewer rounds to achieve the maximum powerpoint slides.

## III. MICROGRID

With the advancement of the world, the production of electric power is increased day by day. To meet the need for energy, a large amount of nonrenewable resources such as fossil fuels, coal, natural gas, and oil are used to generate power. It took a million years for it to form. However, the country's natural resources are limited. They'll be done one day, and once we've depleted these nonrenewable resources, they'll be gone forever, posing a serious threat to power generation. To address this issue, experts are looking to offer new procedures that will allow them to meet the growing need for electricity as the world develops. Micro - grid is a more reliable and practical method of generating electricity while reducing the use of nonrenewable energy sources. Microgrid (MG) is a miniature connection of the power network that may generate power when the main grid is turned off .

Local electricity, energy storage, and loads, among other things, can operate independently of the macro grid using a microgrid. Microgrids have the potential to operate local whenever the main system's output current is disrupted or unavailable. It must have enough capacity to meet the load needs. Higher usage of renewable, increased reliability, flexibility, voltage quality, and sustainability, as well as inexpensive public investment and ease of operation, have made it popular around the world.

The microgrid schematic is shown in Figure 1. Distributed generation (DG), particularly renewable energy sources (RES), points of common couplings (PCC), energy storage, and voltage source inverter (VSI) are all components of a microgrid. Wind turbines, solar panels, photovoltaic panels, biomass, hydroelectric energy sources, fuel cells, and other DGs units are modest energy sources placed locally or at the point of use. The energy that the DG units provide is DC. A VSI unit is required to convert DC electricity to AC power utilizing a rectification and inverters or just an inverters. It may also use a filter to keep the voltage and current stable. VSI units may convert both frequency and voltage. When power generation systems and loads are not in that place, stored energy is used. It has the capacity to store as well as provide power according on the demands of the loads. It stabilizes the output of the DG units, providing a ride-through capacity in the event of variations in the sun's energy, winds, and other sources, and providing power backup. The power storage elements include a battery, a flywheel, and a super-capacitor. PCC refers to the link between the micro and the power system. It is not attributable to the presence of a micro grid..

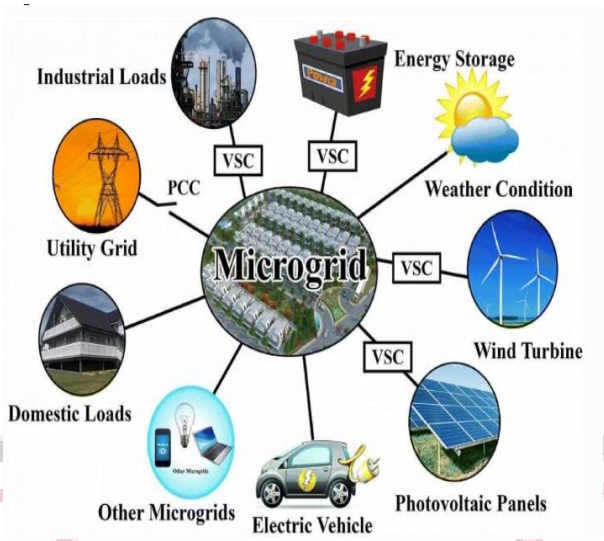


Fig.1 An Illustration of Islanded Microgrid Scheme

## IV. WIND TURBINE SYSTEMS

The converting of wind energy into an useful electrical energy, like using wind turbines to generate electricity, windmills to provide mechanical energy, wind pumping to pump or draining liquid, or sails to move ships, is known as wind energy. Families in remote locations without access to the power network may be forced to drive vast distances and wait extended periods of time to get their batteries recharged at commercial centers. Practical Action has designed dependable and cost-effective renewable power charging devices to assist these folks in meeting their electrical energy requirements.

In the renewable energy sector, wind turbines has the largest proportion. Grid-connected wind capacity has more than double in the last 20 years, and the cost of electricity generated by windy power devices has dropped to one-sixth of what it was in the early 1980s. The wind energy conversion device is depicted in Figure 2. Wind speeds, pressurization, atmospheric temperature, earth ’s surface temp, and other variables are all closely connected. The quantity of electricity a wind turbine can produces is primarily determined by the wind speed. As indicated in Table 1, increasing wind velocity is increased the amount of air moving through the rotor, which increasing the wind program's output. The following are the most commonly used power devices and machineries in wind turbines:

• Grid interconnects consist of a synchronous machine, a rectification, and a power inverters. Both the rectification and the inverters must have the same power rating as the generators.

• Rotor frequencies and voltage regulation are controlled by a dual-fed induction machine with an ac-to-ac power converter. Only 30 percent of the generator's power is needed by the converters [7].

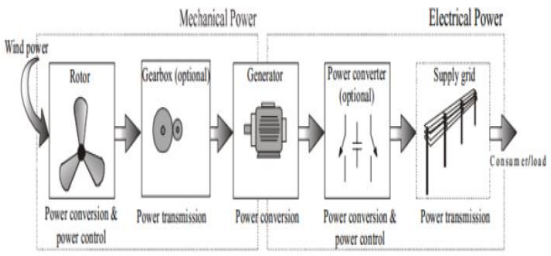


Fig. 2 Basic Power Conversion Principle in Wind Energy System

## V. PHOTOVOLTAIC SYSTEMS

Solar photovoltaic (SPV) technology is one of the most well-established renewable energy (RE) technology, with increasing demands for SPV installations in both grid-connected and off-grid stand-alone modes. Despite the fact that solar PV installations penetration has improved significantly in recent years as a result of many programs, it is still not regarded one of the mainstream renewable energy technologies. The main disadvantages of solar PV systems are their high

installation costs for producing acceptable power levels of electric, which are caused by the high production costs of solar modules combined with their low conversion efficiency. To making solar Systems commercially feasible, the cost of unit energy production from solar PV systems must be decreased, necessitating the transition to low, high-efficiency power converters or schemes for supplying required electrical energy. As a result, it is vital to build and test the most appropriate energy converters to ensure max power acquisition from photovoltaic panel, as well as perfect power quality, dependability, and efficacy.

PV (photovoltaic) power generation is a method of turning solar energy into direct current electricity utilizing semiconductors that exhibit the photovoltaic effect. Solar panels made up of a number of cells that contain pv material are used in photovoltaic power generating. Mono - crystalline silicon, poly crystalline silicon, mono crystalline silicon, cadmium sulfide, and indium gallium sulfide are currently utilized in photovoltaics. After hydro and wind power, photovoltaic solar has become the third most important renewable source in terms of installation worldwide. PV panels are composed of a number of solar cells connected in series. The current flowing is determined by the weakest solar cell because the cells are placed in parallel to slowly build the terminal voltage. The PV array, DC/DC converters, and DC/AC inverter are the three primary components of a Photovoltaic.

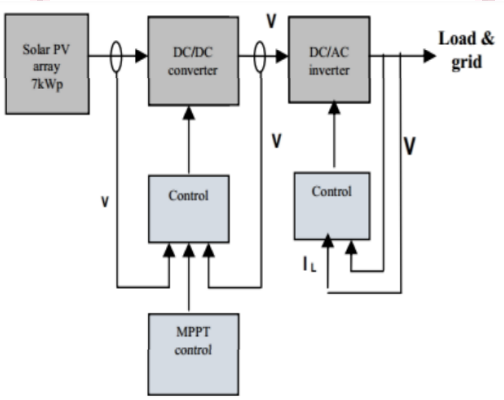


Fig. 3. Setup of the solar PV system

The conversion strategy is complicated by the conversion of the output voltage from of the solar module to a useful DC power (using a DC-DC converter) and then to the requisite AC power (using a DC-AC inverter) for able to operate most conventional devices. The conversion of the nonlinear parameter extraction of solar PV sources, which fluctuates with solar insolation and temperatures, into an adequate level of voltage is a major problem that DC-DC converters must address. Similarly, the DC-AC inverter's fundamental task is to shape voltage and current into a sinusoidal signal while maintaining optimal power factor and providing isolation transformers between both the input and output sides. A maximum power point tracker (MPPT) controller is utilized in the SPV system to maximize the panel's output, as can be seen in figure 3.

Given a solar irradiation level as illustrated in figure 4, the MPPT uses optimization algorithm to measure array voltages, leading to maximum energy.

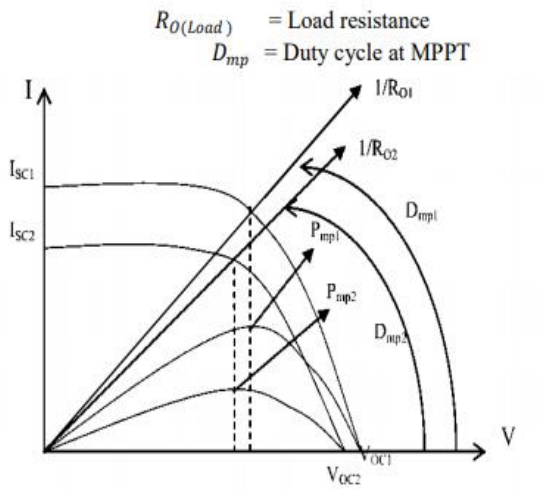


Fig. 4.Maximum Power Point Tracking

## VI. Conclusion

It has been highlighted the importance of renewable power, renewable energy-based power conversion technologies, and distributed electricity production. The usage of renewable energy sources such as wind and photovoltaic systems is discussed in this study. To meet the daily demand for electricity, the future globe will rely heavily on renewable energy sources. This study addresses the significance of micro - grids in both the present and future worlds. Only wind and solar-PV were discussed in these studies and they're the most promising renewable energy sources for generating power..

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