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# "HYBRID POWER SYSTEM"

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## ABSTRACT

***Renewable energy sources i.e., energy generated from solar, wind, hydro Resources are considered as a technological option for generating clean energy. But, the energy generated from solar and wind is much less than the production by the fossil fuels, however, electricity generation by utilizing PV cells and wind turbine increase rapidly in recent years. This project presents the solar-wind hybrid power system that harnesses the renewable energies in sun and wind to generate electricity this system control mainly on double-pole switch controller. It ensures the optimum utilization of resources and hence improves the efficiency as compared with their individual mode of generation. Also it increases the reliability and reduces the dependence on one single source. The hybrid solar-wind power generating system is suitable for industries, domestic, and the hilly areas where the power is not available.***

***Keyword:*** *Hybrid, Power, Energy*

## I. INTRODUCTION

According to statistics made in recent years, it is found that almost 33% of the world's populations do not have access to electricity. Most of the non-electrified regions are found in developing countries. These regions can be electrified either by extending the grids of the existing power systems or by constructing isolated new power systems, which are alternative energy sources. In general, it is preferred to go for the extension of the existing grids but they are not always affordable the fact that most of the non-electrified regions in developing countries are located in remote and difficult areas, like hilly regions, forests, deserts and islands, which demand huge investment for grid extension.

Hybrid PV/ Wind power generation systems are becoming prevalent options for the power supply of small electrical loads at remote locations or for isolated grids. With the complementary characteristics between solar and wind energy resources for certain locations, hybrid PV/Wind power generation systems offer a highly reliable source of power.

Most previous studies for hybrid PV/Wind systems were focused mainly on local feasibility analysis. Yet, system stability, control and reliability analysis play an important role in practical application of hybrid systems. Therefore, this project develops a methodology for investigating the characteristics of hybrid PV/Wind power generation systems by applying simulation modeling.

## II. OBJECTIVE

The main objective of this work is to construct a PV/Wind hybrid system for an isolated network and study the impact of rejecting or inserting anyone of the power sources and to design a smart switching circuit for the overall system control.

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## III. PROBLEM DEFINITION

In the present scenario standalone solar photovoltaic or wind systems have been promoted around the globe on a comparatively larger scale. The independent systems of wind only or solar only cannot provide continuous source of energy, as they are seasonal. The solar and wind energies are complement in nature. By integrating and optimizing the Solar photovoltaic and wind systems, the reliability of the systems can be improved.

## IV. LITERATURE SURVEY

### 4.1 Energy Overview

The term ―Energy is defined as the ability of producing work. Energy is a compound word and comes from the Greek words: en + ergo, which mean work inside a body. The normal technical definition is that energy is the capacity or ability to do work. A more scientific definition of energy was given by the famous physicist Max Planck: "The ability of a system to produce outside activity" Energy is something that we cannot touch, see, smell or hear. People and civilizations couldn't survive without it. The energy is an essential part of our daily life. Nothing could happen without energy. We depend on the hundreds of different ways which it appears in nature. Our organisms need energy to move and our machines need energy to function as well.

#### 4.1.1 Non-renewable resources

Sufficient, reliable sources of energy are a necessity for industrialized nations. Energy is used for heating, cooking, transportation and manufacturing. Energy can be generally classified as non-renewable and renewable. Over 85% of the energy used in the world is from non-renewable supplies. Most developed nations are dependent on non- renewable energy. The three main types of fossil fuels are coal, oil, and natural gas.

#### 4.1.2 Renewable resources

An alternative to the nuclear and fossil fuel power is renewable energy technologies (hydro, wind, solar, biomass, geothermal, and ocean). Large-scale hydroelectric projects have become increasingly difficult to carry through in recent years because of competing use of land and water. Relicensing requirements of existing hydro plants may even lead to removal of some dams to protect or restore wildlife habitats. Among the other renewable power sources, wind and solar have recently experienced a rapid growth around the world. Having wide geographical spread, they can be generated near the load centers, thus simultaneously eliminating the need of high voltage transmission lines running through rural and urban landscapes.

### 4.2 Solar system

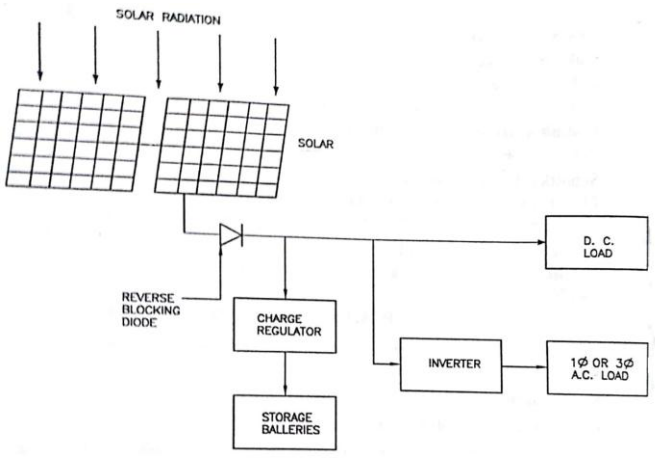


Figure 1 Solar system block diagram

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### 4.3 Wind Systems

Wind energy is derived fundamentally from solar energy via a thermodynamic process. Sunlight warms the ground causing air above it to rise. The ensuing pressure differential causes air from elsewhere to move in, resulting in air motion (wind). Different regions on earth are heated differently than others—primarily a function of latitude. Air motion is also affected by the earth‘s rotation.

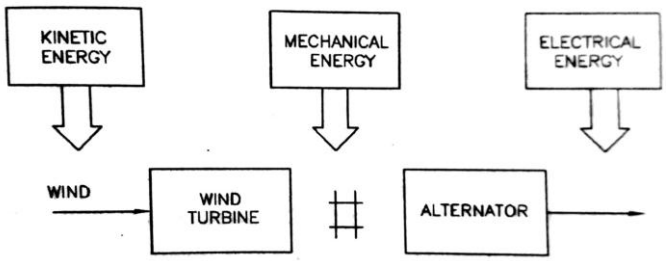


Figure 2 Wind system block diagram

### 4.4 Hydro power station

Hydro power stations are less popular than thermal power station as the hydro power stations are constructed where large quantity of water is available at some considerable height. Although medium and low head hydro power plants are also constructed by constructing a dam across the river. Mainly it is multipurpose scheme. It intrudes flood control and irrigation schemes in addition to power generation. In this unit, we shall study classification of hydro power station, selection of sit, plant layout, types of turbine, auxiliaries

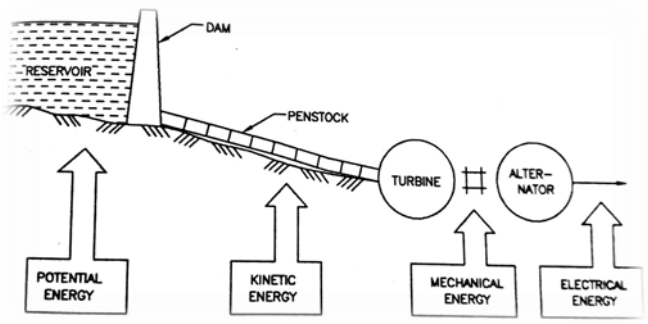


Figure 3 Hydro power station block diagram

### 4.5 Hybrid Systems

Hybrid power systems combine two or more energy conversion devices, or two or more fuels for the same device, that when integrated, overcome limitations inherent in either. Hybrid Power Systems incorporate several electricity generating components with usually one major control system which enables the system to supply electricity in the required quality. Figure shows the hybrid connection. Components for electricity generation can utilize renewable energy sources like wind turbines, photovoltaic, solar thermal, hydro power, wave power or hydro power stations.

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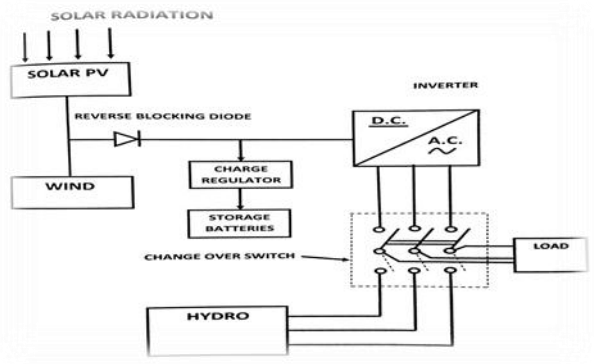


Figure 4 Hybrid power station block diagram

## V. METHODOLOGY

Results and objectives of this project presented in two main areas, the control section and the power analysis section. Control section started with considering all the different situations that could be considered for such a hybrid system, deciding the suitable control component to use for coordinating the supply of the electric power, knowing the Suitable type of input that it could understand and how to make use of the output for the better understanding of the process.

Simulation for the process is made, readings and data taken from the wind system and the diesel generator are an AC power, and data from the PV and battery are DC power, so the power of the PV and battery are first inverted to an AC power. Having all sources with the same type of power, the microcontroller Atmega16 will be used to coordinate the work, microcontroller could only handle 5 volt so the huge power from the different sources will be stepped down very much to match with the microcontroller, process start with checking the availability of the wind energy which have the highest priority to supply the load if it has enough power, supplying the load will be followed by calculating the excess power remaining to decide if the battery should be charged or not. If the wind energy wouldn‘t be enough then the solar energy will be the next option to use if it is available and enough for the load, same checking for the excess power will be made. Another option that is available is to use both sources together if the combination is enough, and the battery might be supplied too. Either of the two sources not available or not enough, the battery unit or the diesel generator - if the battery is empty - maybe used. The Flow-Chart of the system is shown in Figure.

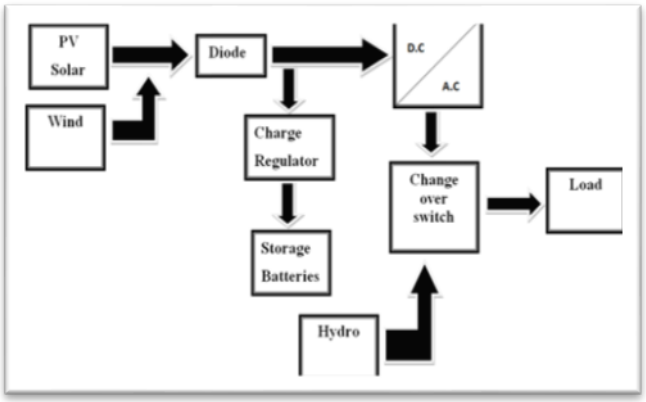


Figure 5 Flow Chart of the process

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## VI. MODELS

### 6.1 Grid-Tied (Battery Free)

The simplest and most cost effective PV design for most sites is the "Grid-Tie" (sometimes referred to as intertie or utility-interactive) system. This system does not provide backup power during a power outage (even if the sun is shining) but for sites with reliable grid power, this is usually the logical system choice. A typical PV Grid-Tie system with no battery is shown in Figure.

There are no batteries to store excess power generated--the electric utility essentially stores it for you through a system called "net-metering." DC (direct current) generated by the PV panels is converted into AC (alternating current) power by the inverter (exactly the same high quality AC current delivered to your site by the utility-provided Power grid). Output from the inverter is connected to your existing distribution panel (breaker panel) which feeds the rest of your site. While the system is generating electricity, power needs are provided by the PV system (up to its capacity), reducing or eliminating the power you would have drawn from the utility grid at that time. During periods when your grid-tie system is generating even more energy than your site requires, any excess is fed back into the grid for others to use and the electric utility company "buys" it from you at the retail rate. They provide credits to your account for all the power that is pushed back into the grid through the meter. And your meter will literally run backwards! When your site needs to draw more energy than it is producing (say, during cloudy conditions or at night), electricity is provided by the power grid in the normal manner and is first paid for by your accumulated credits.

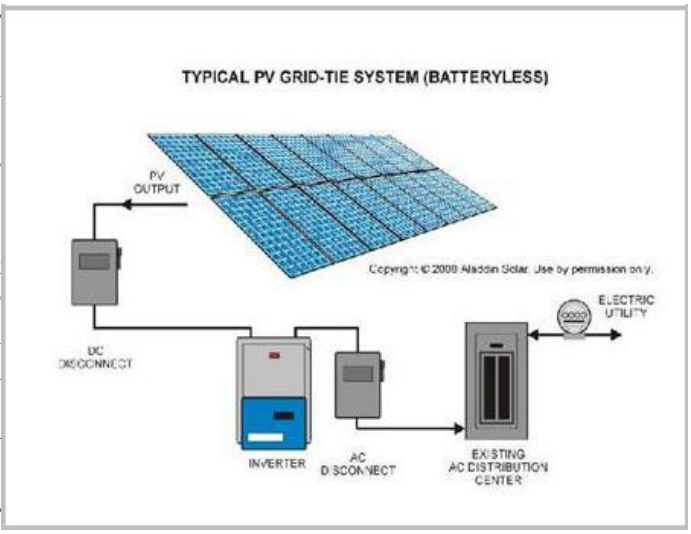


Figure 6 Typical PV Grid-Tie Systems (Battery less)

### 6.2 Grid-Tie With Battery Backup

The Grid-Tie with Battery Backup system can also push excess electricity produced to the electric utility grid but has the added feature of batteries in order to power some selected backup loads when the grid is down. A typical PV Grid-Tie system with battery backup is shown in Figure

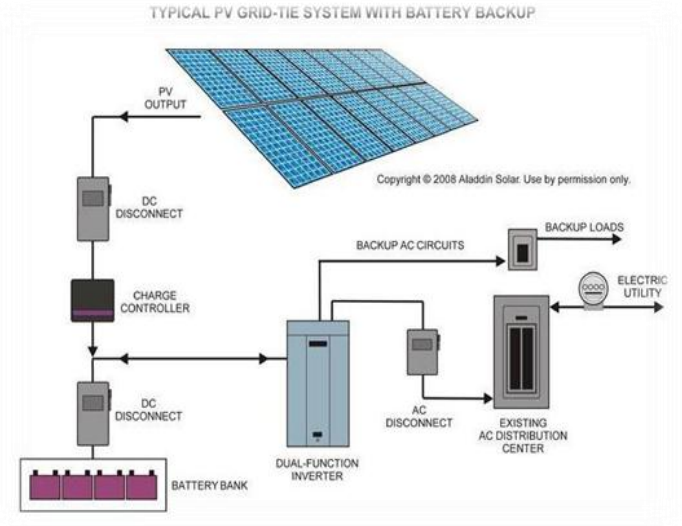


Figure 7 Typical PV Grid-Tie System (With Battery)

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The "Grid-Tie With Battery Backup" PV system incorporates one or more special AC circuits which are not directly connected to the electric grid like the rest of the building, but are always powered through the inverter and/or charge controller. These circuits may power a refrigerator, selected lights, computers or servers... any devices the owner deems essential. The "dual function" inverter can supply the utility grid with any excess Power produced by the system like the "grid-tie" inverter, plus the inverter works with the PV modules and battery bank (through the charge controller) to provide AC power to the backup circuits when the grid is down. The charge controller manages the battery voltage, keeping them fully charged when the grid is live, and preventing them from being depleted when the system is drawing power from them.

## VII. CONCLUSION

Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. It can also be provided at domestic areas due to less water usage. So that the power can be utilize where it generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. People should motivate to use the non-conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is cost effective solution for generation. It only need initial investment. It has also long life span. Overall it good, reliable and affordable solution for electricity generation.

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