

A Basic Review about Power Generation by Hybrid System

Er. Asif Mohammad

Student of M.Tech in Electrical Engineering (Power System)

Madhav university, Pindwara, Abu-road, Dist.-Sirohi, Rajasthan- 307026, India

ABSTRACT

Hybrid power system one of the best and future one system. In this system, there is wind system with solar system and diesel generator system, which is storage in one place that is storages (Batteries) and output, gives generation sources, small turbines system used in hybrid, means connection with battery, diesel-generator and photovoltaic system. The wind is a source of free-energy, which has been used since ancient time. It is used of air flow through wind turbine to provide the mechanical power to turn into electrical power this system for used by remote and off-grid system also, that phenomenon called hybrid power system. Sometimes this hybrid power system also known as Green Energy. Combination of two or more renewable energy sources is more effective than single. This is called as hybrid system. 'Hybrid' means combine renewable energy sources technologies. This technologies output gives electric supply gets at home, on-grid etc. Many hybrid system sources, which operated off-grid system, not connected to a distributed system from this system, we stored the energy power flow in batteries. A combination of two or more renewable energy sources is more effective than a single is called in terms of cost, efficiency and reliability. Energy is the most important factor for both industrial and agriculture development of any country.

Keywords: - Converter, Renewable, Hybrid power system, off-grid system, on-grid system.

1. Introduction

'Hybrid' means combine renewable energy sources technologies. This technologies output gives electric supply gets at home, on-grid etc. Many hybrid system sources, which operated off-grid system, not connected to a distributed system from this system, we stored the energy power flow in batteries. A combination of two or more renewable energy sources is more effective than a single is called in terms of cost, efficiency and reliability. Energy is the most important factor for both industrial and agriculture development of any country. The global energy increasing with the population growth but the available limited non-renewable fossil fuel cannot demands for longer duration. The renewable energy, which began some 100 years before but a serious thoughts was started since the "energy crises" in 1070s [2].

When neither wind nor solar system producing electric energy, so the batteries run slow (low). In this case, the diesel-generator can provide back-up power or provide power and recharge the batteries. Energy which freely in nature means infinite (never runs out) called renewable energy sources. These solar-wind sources are available energy can be converted into electricity, which is stored and distributed our consumers. The solar-wind sources are energy free system, which has been used since ancient times. Wind turbine for used in water pumping system, to get mechanical power and generated ever-green & clean energy. Energy today, is the need of 21st century. Accordingly, most hybrid systems also include one or more of the following to modernize the system: supervisory control system, short-term energy storage, and load management. According to the survey, by the end of 2001, worldwide wind operational total power capacity was 23,270MW. Out of this, in Europe 70.3%, in North America 19.1%, in Asia and the Pacific 9.3%, in the middle East and African 0.9% and in South and Central America 0.4% was installed[4]. Normally wind & solar energy are separately used to generate power but both are having some losses. Like our environment is changes every day the climate changes affect these systems, solar radiations are not consistent and wind speed varies every time so it affect the system & its performance. Whatever cost require for installing single system it will reduced up to some extent in this combine hybrid system. So instead of using single system, if we combine these two it will help each other to overcome losses. Like when sunshine hour's solar PV system will generate electricity and wind turbine system will extract energy from wind source. When wind conditions are not strong enough to produce power that time its have backup to fulfill load demand & that will generate from the solar system. For more convenience of hybrid wind-solar system many researcher have used different combinations to make system more reliable. They used combination of wind-solar and other sources like diesel/wind/PV, wind/diesel, and PV/diesel hybrid system [7].

2. How energy formed

Wind is caused by huge amount of currents in the earth's atmosphere, driven by heat energy from the sun. A wind is simply flow of always amount of air, usually from a high pressure area to a lower pressure area. The atmosphere is surrounded all over the

earth. These gasses extend about 400 miles into the sky above and it is made up of nitrogen, oxygen, argon, carbon dioxide, hydrogen and many more others. These all gasses that make up the atmosphere called 'air'. 'Air' is made by particles (liquid solid gas). These particles can be move from high pressure area to lower pressure area. The sun's radiation (hot effective rays) is absorbed on the earth's surface. The morning air (wind) has huge amount of mechanical energy and this can be transferred into electrical energy and used for wind-turbines. Wind (air) turns blades, which connected to generator (alternator) to produced AC electrical supply after that converted into DC, by rectifier conversion device and storages in batteries. Batteries give DC supply to inverter and converted into AC sources, which flow on transmission & distribution lines to a substation and used for business, schools and homes etc. wind turbines cannot work, if there is no wind or if the wind speed is so high, it would damage. It is essential to install a storage frame work that not only covers the power generation but can also reduce damaging in case of storage currents. Wind turbines are usually on high hills and mountain. Hybrid power system for the generation of power is the combination of wind, solar PV array, battery, inverter, and controller. To satisfy the load demand PV array and wind turbine work together and that time battery is in state of charging mode [3].

3. Requirements of wind-solar hybrid power system

To develop this system & to investigate performance, modeling and mathematical calculations have to develop. Different models of hybrid system have covered in literature. Following are the components from review of literatures:-

3.1 Meteorological data: - Meteorological analysis of the location has to be made for optimization process. It is important for total utilization of PV/Wind sources. Measuring solar and wind resources data is main input of the hybrid system.

3.2 Load Demand: - It is necessary part of system to design & analyze. To find out the exact load demand it is very complicated and difficult to decide. Load variation for different seasons is not predictable, so system have to design for nearer or more than load demand to full fill requirements.

3.3 System Configuration: - By studying all data like solar radiation, wind speed and load demand proper selection of equipments have to be made. But sizing of system will be according to the environmental conditions. Because producing power from solar-wind is depend upon the location which is to be selected.

4. How work a small wind-solar electric system

A solar-wind electric system mounted on a heavy & longer tower, which gives better strength. This system required some components are:-Tower, Turbines, Charge Controller and Wiring, Inverter/Rectifier, Base/Foundation and Earth/Grounding system. In turbines blades materials used such as 'Fibreglass' with the turbine, rotor, generator and gear box are attached with blades. When the base/foundation of tower stronger and increase in length, which gives better output energy and maintenance of small solar-wind electric system very easy and lower in cost, which produced 10kw. This system has no-pollution, the power flow in UPS (Uninterruptible Power Supply/Sources), which helps output utility. 'Hybrid' means combine renewable energy sources technologies. This technologies output gives electric supply gets at home, on-grid etc. Many hybrid system sources, which operated off-grid system, not connected to a distributed system from this system, we stored the energy power flow in batteries. A combination of two or more renewable energy sources is more effective than a single is called in terms of cost, efficiency and reliability. Water pumping on farms, where we installed this small-system and output results comes: -

Lower electricity up to 40% - 80%, Lower cost

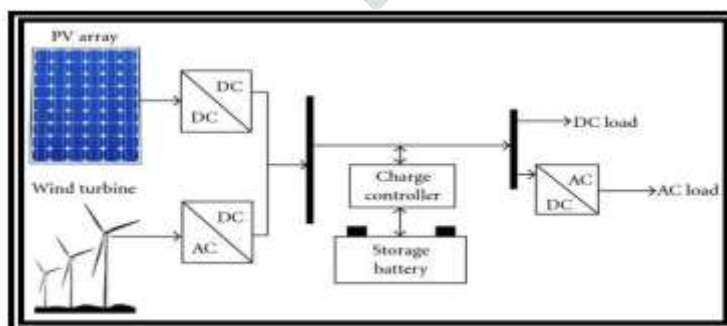


Fig.1: - Block Diagram [2]

There are 40% villages in our India, where not flow electricity supply, through in grid system. A hybrid electric system combination of one or more sources of renewable energy sources i.e. solar wind- solar, wind-diesel generator, solar-wind and diesel generator etc, which is connected with batteries, means storages batteries. This hybrid system gives 24 hours/day high quality & dynamic electric services.

There are this system consists are:-

4.1 Design working of solar panel system

The solar energy for power generation from the solar panels Numbers of cells are interconnection with parallel and series on module. Number of modules are connected on array plate, that plates called photovoltaic panels. These systems are connected with batteries for storages power (DC power) for gives DC power to DC loads, where output power measured in terms of Watts or KW. These solar panels are designed different output power like 5W/KW, 10W/KW, 20W/KW and 100W/KW etc. During normal sunlight a 12volt-15Watt solar panel produced approx 1 ampere current. The hybrid power system is a system in which two or more sources from different renewable energy (solar-thermal, wind, solar-photovoltaic, biomass, geothermal, hydropower, etc.) are integrated to provide electricity or heat, or both, to the consumers. The most popular form of the hybrid system consists of diesel generators and wind turbines [6]. The important of renewable energy sources was recognized in the early 18th century. There are many renewable energy sources but wind & solar energy is most because wind they are well known sources of energy and widely distributed everywhere. The global energy increasing with the population growth but the available limited non-renewable fossil fuel cannot demands for longer duration. The renewable energy, which began some 100 years before but a serious thoughts was started since the “energy crises” in 1070s [2].

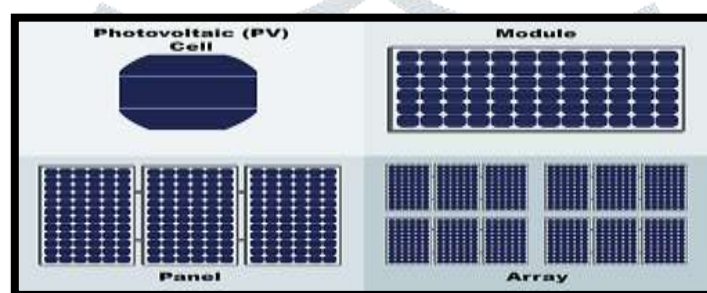


Fig. 2: - Photovoltaic System [2]

4.2 Wind power generation

The earth's surface heats and cools continuously and creating atmospheric pressure zone areas, where air flow from high to low pressure areas. Here two or more thin blades provide electrical energy by rotating at high speeds in RPM and generate electricity, which provide DC power for storages in battery and converting into AC power to giving the AC loads and connected to the grid system. Energy which freely in nature means infinite (never runs out) called renewable energy sources. These solar-wind sources are available energy can be converted into electricity, which is stored and distributed our consumers. The solar-wind sources are energy free system, which has been used since ancient times. Solar energy is a very large, inexhaustible source of energy, which is thousands of times more than the present rate of energy consumption on earth. Solar energy could supply all the present and future needs of the world on a continuous basis, which is one of the most promising nonconventional energy sources and it is an environmentally clean source of energy that is available over almost all parts of the world [1][5].

Wind turbine for used in water pumping system, to get mechanical power and generated ever-green & clean energy. 'Hybrid' energy sources system, which combines wind-solar (photovoltaic) and diesel-generator system technologies.

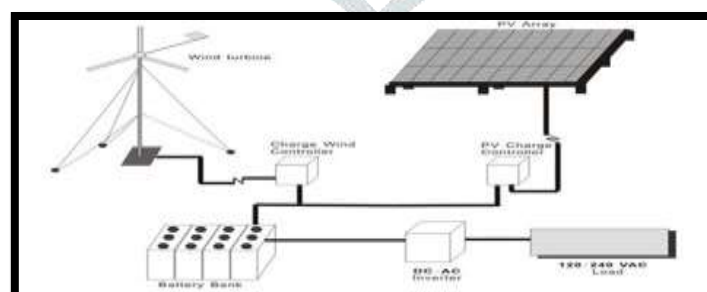


Fig.3: - Hybrid System [2]

4.3 Charge controller

It is used for safety from overcharging and overvoltage and in this battery performance reduced. It is used limits the rate of electric current (in ampere).

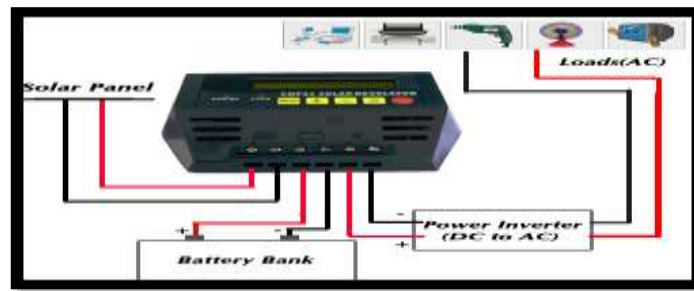


Fig.4: - Charge Controller [2]

4.4 Batteries

There can be a single battery or multiple batteries connected together to create one large essentially battery of the required voltage and amp-hour capacity, which is stored in battery bank with the help of wind-solar charge controller.



Fig.5: - Battery [2]

4.5 Inverter

They are used to obtain AC to DC supplies as per need.



Fig.6: - Inverter [2]

4.6 Output loads

They stand for the various AC and DC appliances that get electricity from the power system.

5. Power electronics topologies and control

There are two topologies for grid-connected solar PV and wind hybrid system as can be seen from fig. 1 and fig. 2 shows that the DC outputs voltages from individual solar PV, wind and battery bank stream, through individual DC/DC and AC/DC units, are integrated on the DC side and go through one common DC/AC inverter which acts as an interface between the power sources and the grid to provide the desired power even with only one sources available. Hence, the renewable energy sources acts as current sources and can exchanges power with the grid and the common DC/AC inverter controls the DC bus voltage. The individual units can be employed for maximum power from the solar PV and wind systems and the common DC/AC inverter will control the DC bus voltage. The battery bank is charged when there is an extra power and discharged (by supplying power) when there is shortage of power from that renewable energy sources. On the other hand, fig. 2 shows that renewable energy sources are injecting power directly to the grid through individual DC/AC and AC/DC-DC/AC units. Many researchers have proposed and presented experimental results of PV-wind-battery hybrid systems along with power management schemes and control.

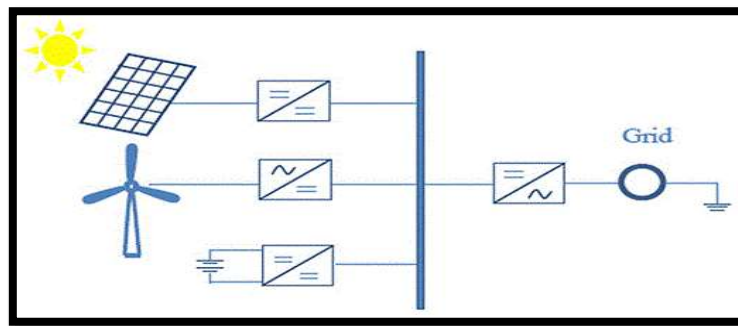


Fig. 1: - Grid-connected hybrid system at common DC bus

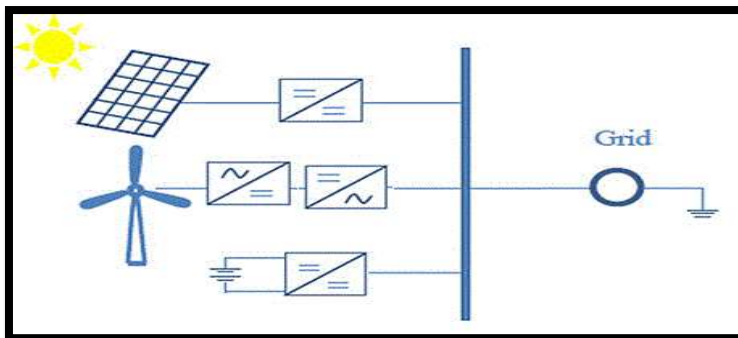


Fig. 2: - Grid-connected hybrid system at common AC bus

6. Procedure

Wind is caused by huge amount of currents in the earth's atmosphere, driven by heat energy from the sun. Wind turbines operate on a simple. They also can be connected to an electricity grid (on-grid) for distribution & transmission lines to a substation, then used for business, schools & home etc. if there is no wind (no air), wind turbines cannot work properly and batteries does not charge properly. Small wind-solar turbines are used in connection with batteries and photovoltaic (solar panel) system with based in remote and off system, these system are called **'hybrid system.'**

In some cases, when this system are not working properly and batteries not charging properly, so we can gives another way to recharge batteries, that way called **'diesel-generator set.'** We give generator's power to recharge batteries for proper working. Wind turbines are mounted on a tower at 100feet or more, above ground and used to produce electricity for a single home and building. They also can be connected to an electricity grid for distribution.

In the case of install a stronger frame, work to generate power but can also reduced damaging in case of stronger currents. Wind turbines are usually on high hills and mountain. Utility scale turbines range in size from 100KW to large MW. Large wind turbines are most costly and which provide power to the electrical grid.

7. Application

- Used for Farm House.
- Used for Hospital.
- Used for Hotels.
- Used for Laboratories and R&D centres.
- Used for Village, Street Lighting.
- Used for Battery Charging Application.

8. Advantages

- Design for easy to operate.
- Easy to maintenance.
- No pollution.
- Consistent power supply.
- Low height required.
- Very few moving parts negligible maintenance required.

9. Disadvantages

- At night, we can't use solar energy.

10. Conclusion

In this paper, provides review of the different hybrid power system techniques, which is very useful for the next generation students and researcher who are interested to make study in the hybrid power system which required continuous reliability power sources. The utilization of renewable resources is greatly demanding in the world. The world facing the problem of electricity and pollution can be easily overcome with renewable energy sources. This paper based on different researchers on the utilization of the natural resources like solar and wind. This paper provides review of the different hybrid power system techniques. These methods are very useful for the next generation students and researcher who are interested to make study in the hybrid power system. Hybrid power system is most advantageous power system which required for continuous reliability of power supply.

11. References

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BIOGRAPHY



Er. Asif Mohammad

Student of M.Tech in Electrical Engineering (Power System)
Madhav University, Pindwara, Dist. - Sirohi (Rajasthan) – 302076, India.

I am 25 years young energetic boy. My ambition is to educate every helpless student who is interested in education. I teach at my home free of cost. I believe each one teach one promote adult. In view of this I am also doing M.Tech in Electrical Engineering in Power System.