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Rooftop Hybridized solar PV-Wind Energy Power System

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***Abstract*-This paper reports the performance of a 2-kw grid-connected PV-Wind Energy power system without battery storage. The detailed study of electrical power system is a key element of many curricula in industrial Technology. A new technology and those that are already in use provide much greater scope for the better use of energy. The opportunities lie in the use of renewable energy technology, greater effort at energy efficiency and the dissemination of these technology and options. Engineering college managements in India are spending a lot of money on energy bills. So to overcome the problem these papers can act as a reference guide. Unlike conventional generation, the wind and the sunrays are available at no cost and generate electricity pollution-free. Around noontime the PV-Wind energy power system satisfies its load and provides additional energy to the storage or to the grid. On-site energy production is undoubtedly accompanied with minimization of environmental pollution, reduction of losses in power system transmission and distribution equipment, and supports the utility in Demand Side Management (DSM).**

No battery storage, grid connected residential system, hybrid PV-Wind Energy Power system, loss of supply, System reliability.

I. INTRODUCTION

Recent development and trends in the electric power consumption indicate an increasing use of renewable energy. Virtually all regions of the world have renewable resources of one type or another. By this point of view studies on renewable energies focuses more and more attention. Solar energy and wind energy are the two renewable energy sources most common in use [1]. Wind energy has become the least expensive renewable energy technology in existence and has peaked the interest of scientist and educators over the world. Photovoltaic cells convert the energy from sunlight into DC electricity. PVs offer added advantages over other renewable energy sources and wind power sources provided a realistic form of power generation [1]. If environmental concerns keep growing, and restrictive guidelines constraint the use of the pollutant sources, wind and solar power can be considered as viable option for future electricity generation. Besides being emission-free, the energy coming from the wind and the sunrays is available freely at no cost.

This paper reports the results of the system performance, PV-Wind Energy power system which could generate 2KW grid connected whereas Wind turbine can generate 1KW on normal wind flow (5km/hr to 7km/hr) and solar panel can generate 1KW.the current control PV inverter applications [4]. In an institution, this 2KW energy could power the eight tube lights and four fans, in none other cases it could be distributed and transmitted through the grid connection to the neighbor buildings.

II. THE PV-WIND ENERGY POWER SYSTEM CONFIGURATION

An intelligent PV module for grid-connected PV system, presents [4].The PV-Wind Energy Power system as configured in Fig. 1 is composed of the following:

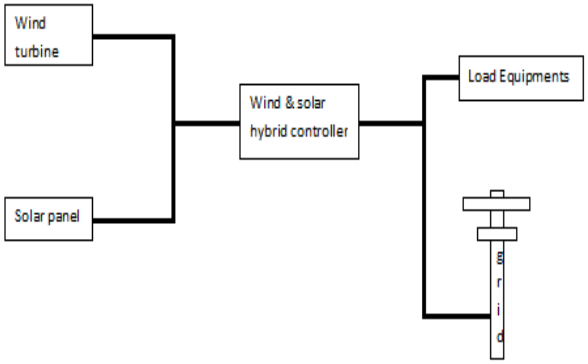

Figure.1.Configuration of the PV-Wind energy power system

A. *The PV Module*

When sunlight falls on the solar panel they convert the sun's energy into Direct current [7]. The benefits offered by rooftop for the economical and sustainable deployment of renewable solar energy also include: easy Access to sunlight [6]. The 1KW solar generator is made of 4solar panels, where 1solar panel requires 240wts generation per day as 4 units per day and it weights 20kgs with 18sq.ft and it can be installed on the rooftop of the college. These polycrystalline solar panel consists of 60cells in order of 6*10 matrix form to generate 0.475V/cell i.e. 3.5watts/cell to 4watts/cell [7]-

[8], where it is made up of German technologies. 72cells are connected series could generate 34.2Vmmp from a single panel. This solar panel has been located on rooftop of the building. The power is also dependent on the temperature, and the wind speed [4]. Linear modeling or Neural Networks are among methods that can be used to predict PV performance under various temperatures, and wind condition [1].currently the rooftop solar can be effectively combined into building integrated system, offering significant material, installation, maintenance savings[6].

B. *The wind turbine*

A 1KW wind turbine installed next to the PV arrays ensures wind energy conversion into electricity. Wind resources evaluation is the most crucial element in projecting turbine performance at a given site [3].The wind power that is extracted from the turbine depends upon the wind flow where it could generate 1KW when it has received the 5km/hr to 7km/hr. power output of a wind turbine generator at a specific site depends on the wind speed at hub height and speed characateristics of the turbine [3]. It is an upwind three-bladed, horizontal axis, with length of 8ft and height of 24ft, maintenance-free wind turbine. After the rotor system has captured the energy from the wind, and converted it into rotational forces, the alternator converts the mechanical energy into electrical energy. The alternator is a permanent-magnets brushless synchronous generator [1]. It has inverted configuration in that the outside housing rotates, while the stator windings are internal. To protect the wind turbine in high winds against mechanical stress, upon reaching the furling wind speed, the turbine will face away, out of the direction of the wind. It will repeatedly furl and unfurl [1]. As a result, in high winds, the output power of the turbine is significantly reduced .

The wind is a more dynamic source than the sun. It can produce energy during periods of little or no sunshine (Fig.2).

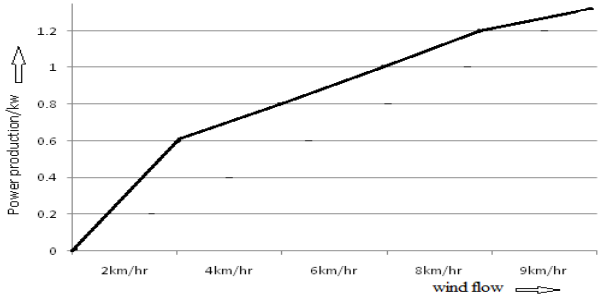

Figure.2. power curve of the wind turbine

C. The PV-Wind Energy Power System

A combination of different but complementary energy generation system based on renewable energies or mixed with backup provisions is known as hybrid power system [6]. Based on type of load demand Electricity can be generated by hybridizing solar and wind energy. In the PV-Wind Energy power system, the modules produce dc power and the wind generator produce ac power. This requires the need to condition the power at a fixed dc or ac voltage [1]. Besides the grid-connected applications of PV generators included in distributed generation systems, the increasingly important role play their stand-alone applications, in which the electric energy may also be provided by other renewable energy sources such as wind turbine [4]. Charge controller to maximizes the solar generator output; it separates the array terminals from the battery voltages and sets the solar generator at its optimum operating voltages at each isolation level. A converter rectifies the alternating current generated by the wind generator and protects the batteries from being over-charged by the wind turbine. A bi-directional inverter-charger links the system to the grid. A second inverter and a transformer condition the power for the emulated TNE load [1]. These components constitute the major sources of power quality problems in the system.

The hybridized PV-Wind energy power system can generate 2KW power, which satisfies the load demand of the respective building. In no case should be connected with grid to transmit the power generated and minimize the energy bill.

III. SYSTEM ANALYSIS

A. The Energy consumption

The intended hybrid energy system is incorporated of Renewable source PV and AC grid supply [6]. PV arrays are commercially available in modules [4]. Hybridized 2KW power can generate 180units/day which could power the eight tube lights and four ceiling fans around two rooms probably, during peak days and in other cases it can be transmitted through the grid connection to the required loads in usage at the time. (Fig.5).

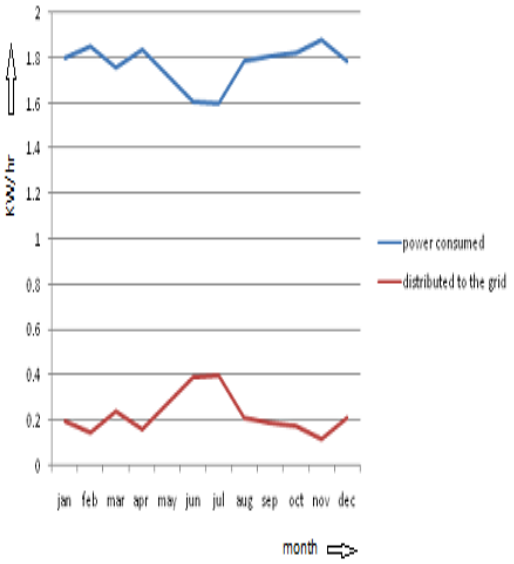

Figure. 5. Power utilization of an year.

B. PV-Wind energy power performances

India is located near to the equator; so far it can generate electricity by utilizing 6hrs to 7hrs sunlight in a day. Whenever, there is a high degree Celsius of heat it results in a low level of receiving windblown and whenever there is a high pressure of windblown in a atmosphere it results in a low degree Celsius of heat, thus it can be compensate the power demand.

C. Inverter Performances

The system gets connected with 2.5KW grid-tie inverter which converts the controlled DC power to AC power for the utilization of load. For a hybrid power system with a PV array-inverter assembly, and a village load, the inverter acts as a slave [4]. During peak days this loads can utilize the power generated from the system and in other cases it can be supplied to the grid.

4. Conclusion

The total voltage distortion, the frequency, and voltage level at the point of connection to the grid remains within acceptable levels. That is, the connection of the system to the grid is not a source of concern in terms of power quality. This paper has determined the technical and economical feasibility of solar and wind hybrid power turbine generator system to supply electricity for a selected loads.

The finding of this study suggests that the PV-Wind hybridized should be implemented since it is a more economical and cleanser sources of power as compared to the conventional energy power system.

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