HYBRID WIND SOLAR CONTROLLER SYSTEM

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ABSTRACT

Renewable energy resources are the most important & expected field to find new energy sources to meet up the large demand in power all over the world especially in a developing countries. Within the renewable resources, wind & solar being they are most popular ones because abundant, ease of accessibility and the possibility of conversion to the electricity.This document presents the design and analysis of a hybrid solar-wind system domestic purpose in the remote areas of country where continuous power supply from central grid is problem and sometimes for some remote places it's economically not applicable absolutely.We suggest in this hybrid system which is expected to work effectively under the controller to take advantage the maximum possible solar & wind resources to limited from the demands on national grid for on-grid region so to supply power to those areas where there is no grid line.

KEYWORDS : *Hybrid system; solar power; wind power;renewable energy; on-grid region; off-grid region.*

I. INTRODUCTION

General, we act as having energy with no thinking that the energy available without borders. Often we use the energy and do not thinking about where or how is it production or have originated. Energy is important to provide a nation and it must be saved in a most efficiency. Not solely the technologies should be prepared to produce energy in a most a friend of the environment manner from all type of fuels but also must enough importance should be given to maintain the energy resources in the most effective way. Energy is the main element responsible for the both industrial and agricultural development. [1]

Anyway, it is important to prevent perceptions and avoiding energy absence. There is energy problem all over the world. But developing countries suffer most for very limited resources and technology in energy. There are more of

area there are no supplies of electrical power and some areas which are grid connected but most of the time without continuous supply. [1-2]

The costs of installation and services for a distribution lines are largely high for remote areas. Also there will be a significant increase in transmission line losses in as well as poor in power supply reliability. There is a growing interest and demand in exploitation renewable energy sources since they are naturally available, pollution free and inexhaustible.

In this time, independent photovoltaic and wind power systems have been promoted all around the world on a comparatively larger scale .But, These independent systems cannot provide continuous source of energy, The photovoltaic energy system cannot provide power during non-sunny days and The wind system does not meet the constant load demands due to great disparity in the wind speeds from hour to hour throughout the year. Therefore, the energy storage systems will be need for each of these systems in order to meet the power demands. Usually storage system is expensive and the size must be reduced to a minimum possible for the renewable energy system to be cost effective. In Hybrid power systems can be used for reducing energy storage requirements. In this paper apply the hybrid system for both on-grid and off-grid areas. [3]

II. THEORY

Although a hybrid wind-solar electric system demands a higher technology but the hybrid systems are the best option for a significant improvement in termsof production and efficiency when the sun and the wind resources have opposite cycles and intensities during the day or in some chapters. [3-4]

A. Solar Power

Solar panels are the types to convert solar power into the electrical power. Solar panels can convert the energy by two ways directly or heat the water from the induced energy. PV (Photo-voltaic) cells are semiconductor structures as in the computer technologies. Sun light is absorbed with this material and electrons are emitting from this materials the Photovoltaic is known as the process between light packages and the electricity induced. Solar power is converted into the electric power. [5]

The solar power generation for any solar radiation can be predicted by using the equation below:

$$P = Ax^2 + Bx + C \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

x = solar radiation.

P = power generation A, B, C are constants.

By this equation can be derived from measured data. The practical values and simulated values for solar power generation are nearly coinciding. By using the above formula, we can predict solar power generation at any solar radiation. [6]

B. Wind Power

Wind energy is the use of the wind as an energy source. A wind energy system transforms the kinetic (moving) energy of the wind into mechanical or electrical energy that can be harnessed for practical use. Wind has been utilized as a source of power for thousands of years for such tasks as propelling sailing ships, grinding grain, pumping water, and powering factory machinery. [6-7]

Mechanical energy: Wind energy can be harnessed by sails for transportation (sailboats) and other purposes such as grinding grain and pumping water.

Electrical energy: Harnessing the wind for electricity generation is the most widespread use of wind energy today.

Wind power plants or wind farms as they are sometimes called, are clusters of wind machines used to produce electricity. A wind farm usually has dozens of wind machines scattered over a large area. Unlike power plants, many wind plants are not owned by public utility companies. Instead they are owned and operated by business people who sell the electricity produced on the wind farm to electric utilities. These private companies are known as Independent Power Producers (IPPs).Operating a wind power plant is not as simple as just building a windmill in a windy place. Wind plant owners must carefully plan where to locate their machines. One important thing to consider is how fast and how much the wind blows. As a rule, wind speed increases with altitude and over open areas with no windbreaks [8] .Good sites for wind plants are the tops of smooth, rounded hills, open plains or shorelines, and mountain gaps that produce wind funneling. Wind speed varies throughout the country. It also varies from season to season. [9]

As well as, we cannot convert all the wind energy into electrical power; we can convert 59% only form wind power into electricity, When using an optimized system, the power available as shown by this equation:

$$P = (1/2)\, p.\, A.v^3 \text{ (in watt)} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

Where:

A= is the area perpendicular to the direction of flow, meter.

***P*=** density of air, kgm^{-3} is approximately 1.2 kg/m^3

***V*=** wind velocity, meters per second.

We can find the output power in wind turbine bythis equation:

$$P = (1/2)\rho\ Cp.\ v^3\ .A \ \text{……..(3)}$$

Where:

P = power (W)

Cp = denotes the power coefficient.

ρ = air density (kg/m^3).

V = wind velocity (m/s).

A = denotes the swept area of rotor blades (m2).

III. PROPOSED HYBRID SYSTEM

There are two systems from hybrid have evolved on grid as well as for off grid regions:

A. Off-Grid Hybrid Systems.

The figure (1) is the block diagram of an off-grid hybrid system which is very useful in remote places and Residential complexes Far from power plants and which need to long transmission lines and costly. In the off grid system solar panels and wind generators have been used.

The designed system also includes a load controller in order to control the load, batteries and inverter so that we may get both DC and AC loads.

Figure (1): Off-grid solar-wind hybrid system

B. On-Grid Hybrid Systems

The figure (2) is the block diagram of an on-grid hybrid system. In this on grid system solar power plan and wind power plan was used like the off grid system. As well, load controller batteries and inverter have been used. A controller has been used in the block diagrams which are connected with grid line and the inverter. The output of the controller system is seconds connected with the loads point [10] . Such as console has two inputs one from the inverter and another from the grid, it choose only one input this depends on the availability of the output of the inverter. The controller will choose the grid line and transport it to the load only when there will not be any input from the inverter system.

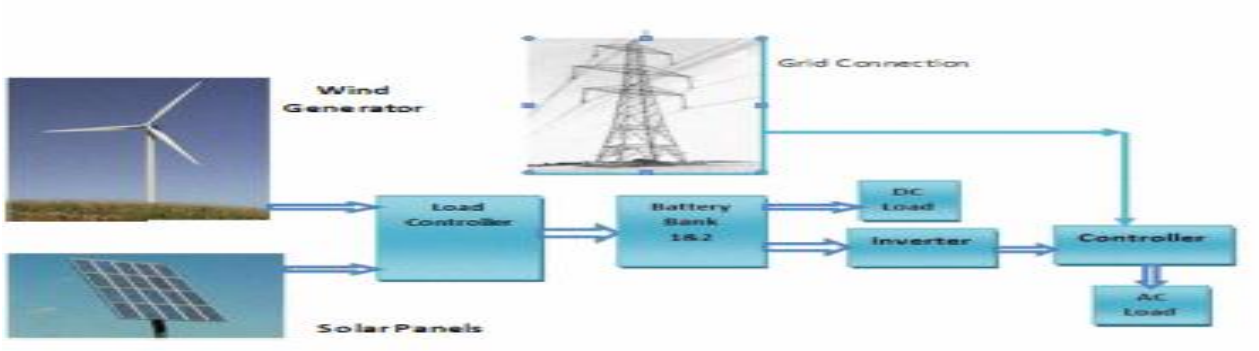

Figure (2). On-grid solar-wind hybrid system

IV. SYSTEM FLOW CHART

In the wind-solar hybrid system a controller was developing which is shown in figure (2). The system deafness in a way that makes the most of wind and solar energy is ensured. This system designed for on grid and off grid area especially for rural areas where grid line has been reached but availability of electricity is very less or in supply of electricity is not continuous and there is much interruption in energy. So this system has been designed where we mainly focused on using renewable energy instead of national grid line. The main goal is to use the wind energy and solar energy without national grid and if the period neither wind or solar energy is available then will be used the national network.In the controlled system we give first priority to the wind turbine. If the wind energy is greater than 4m/1s then we will charge the storage battery which will enable us to supply DC or AC. But if the wind energy is less than 4 m/1s then we would like to use the solar power panel. In this case, we will check again from the radiation is satisfactory enough to produce energy or not. If it good we will used the solar energy in produce the electricity and If not then we would use power grid system and check whether the power grid is available or not.If the grid is available then we will take power from the national network and if not then we would again check what if the battery is charged enough to produce electricity or not. If it is charged enough then we will take power from batteries and if not then we will take power from second storage battery which will charge by solar panel. In this case it should be kept in mind that the second battery bank is for emergency case. If the first battery is case of failure to supply current then we would use the second battery bank.So through this controlled system we will work to ensure maximum use of wind and solar energy without connection from grid line. As shown in figure (3).

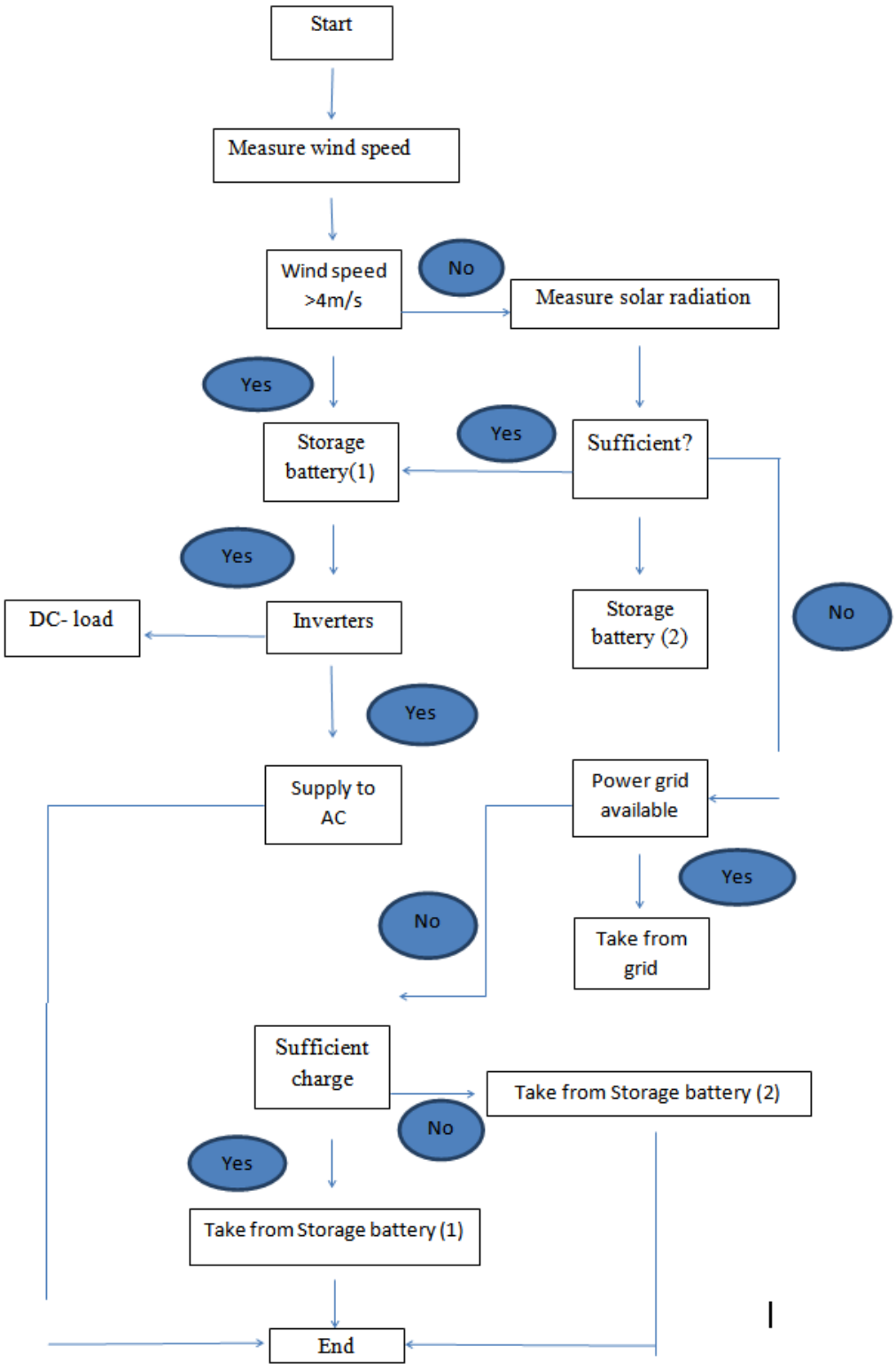

Figure (3): System Flow Chart for Hybrid Wind - Solar Controller System

V. CONCLUSION

In this paper, the design of an effective solar-wind hybrid system has been proposed to achieved in the rural and remote areas of any country Far from city centers and production plants where it's hard to get continuous power source from national network and in some places where we can't to Deliver electrical lines have bring the grid line because of impracticability and uneconomically.[11-12]

There is a great opportunity to improvement & extend the system in this way for to be able to supports national network by optimal type and size for the all system. Also by entering multi- control with the maximizing the use of lower cost in the hybrid system.

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