Scientific Journal of Impact Factor (SJIF): 4.14

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 3, Issue 5, May -2016

Self-Sustaining Controlled Power Generation Using Renewable Energy Sources for Satellite Earth Stations in Remote Area

Mr, B.V.Kumbhar[1], Dr. A.M.Mulla[2]

[1]*Department Electrical Engineering,ADCETAshta*
[2] *Principal ADCET Ashta*

Abstract-*This paper deals with self-sustaining controlled power generation using renewable energy sources for satellite earth stations in remote area. As per the current scenario of electricity generation in remote area, renewable energy source plays a vital role in generating electricity for meeting remote energy demand. Optimization of grid network to remote satellite earth stations is not enough convenient since several problems raised by present situation. Also remote earth stations looking forward for green energies evidently along with rest of the world due to obvious reasons like increase in carbon deposits, global warming & pollution etc. an effort has been made to investigate whether the power generated by renewable energies especially by solar & wind energies can replace the situation of power generation by fossil fuels.*

Keywords*- Wind mill,solarpanel,microcontroller,chargecontroller,Battery.*

I. INTRODUCTION

As a result of increasing acceptance of renewable energy conversion technology, hybrid Power systems now represent the preferred choice for electrical power at many remote areas. Solar & wind energies are abundant & the power generation by these sustainable energy sources do not abuse nature, carbon emissions can be decreased this will in turn reduce global warming. With the technological advancement they are accepted to play major role in short term & long term climate change mitigation.Remotely located satellite earth stations sets up a communication channel for video & audio teleconferences. The earth station may also provide telephone service to nearby remotely situated villages. Now a day's these earth stations faces a problems of power supply since they are located in remote area. Unavailability of greed connected power supply, these earth stations mostly depends upon renewable energy sources for dominant and promising power supply. Now current existing system consists a PV system in addition with engine – generator set, in the absence of sun engine generator set has to meet a required energy demand. But present existing system offers some drawbacks like deep discharging of battery, carbon emission from engine generator set, a problem of global warming which also affects the operation of satellite earth station, increasing rates of fossil fuels etc.

Proposed system consists the solar – wind hybrid power system that harnesses the renewable energies in sun & wind to generate & supply electricity for remotely located earth stations. Solar-wind hybrid power systems are the combined power generating system by wind mill & solar panel [9&10]. It also includes a battery which is used to store the energy generated from both the sources. Using this system power generation by wind mill, when wind source is available & generation from P V Module when light radiation is available when solar cells are connected to the load it becomes very difficult to maintain the output to a particular value because the solar insolation keeps varying through the day. So backup system is usually provided to compensate the demand of power under high dip condition. Optimally designed batteries are used to reduce the cost of the product and hence efficiency increases. Charge controller is used to check when to charge the battery and when to disconnect the battery from the source. This avoids the deep discharging of the battery or prevent over charging of the battery. Charge controller is basically connected between the solar panel and load or battery with an automatic bidirectional switch.

II.SYSTEM DISCRIPTION

Proposed system consist solar wind hybrid power plant. The energy is being produced from both sources with a combination. Using this system power generation by wind mill when wind source is available & generation from solar panel. When light radiation is available can be achieved. The microcontroller compares the input of both sources & gives the signal to the particular relay, to connect a appropriate source for power generation this will leads to continuity of generation. The main disadvantages of using independent renewable energy resources are that unavailability of power of all time. Solar energy could not produce electrical energy in rainy & cloudy season so we need to overcome, and also the wind flow is much more unpredictable during all time, to overcome this drawback. We can use two resources together so that any one of source fails other source will keep generating the electricity. Also when both the resources are not enough sufficient to maintain rated outputvoltage the constant output voltage will be maintained some time there is sudden

increase in generated voltage due to unpredictable source of energy, the excessive voltage will harmful to the battery so this voltage will reduced up to a rated value by using a buck-boost converter in conjunction with PWM technology

III.SYSTEM DESIGN

The design of system includes solar panel, wind mill, microcontroller, charge controller & battery shown in fig. 1. It is found that the complementary of one resource over another can together result in a highly reliable power supply. Also, efficient & generalized intelligent controllers are in need which in turn improve the transitional state & reduce the fluctuations in the steady state.

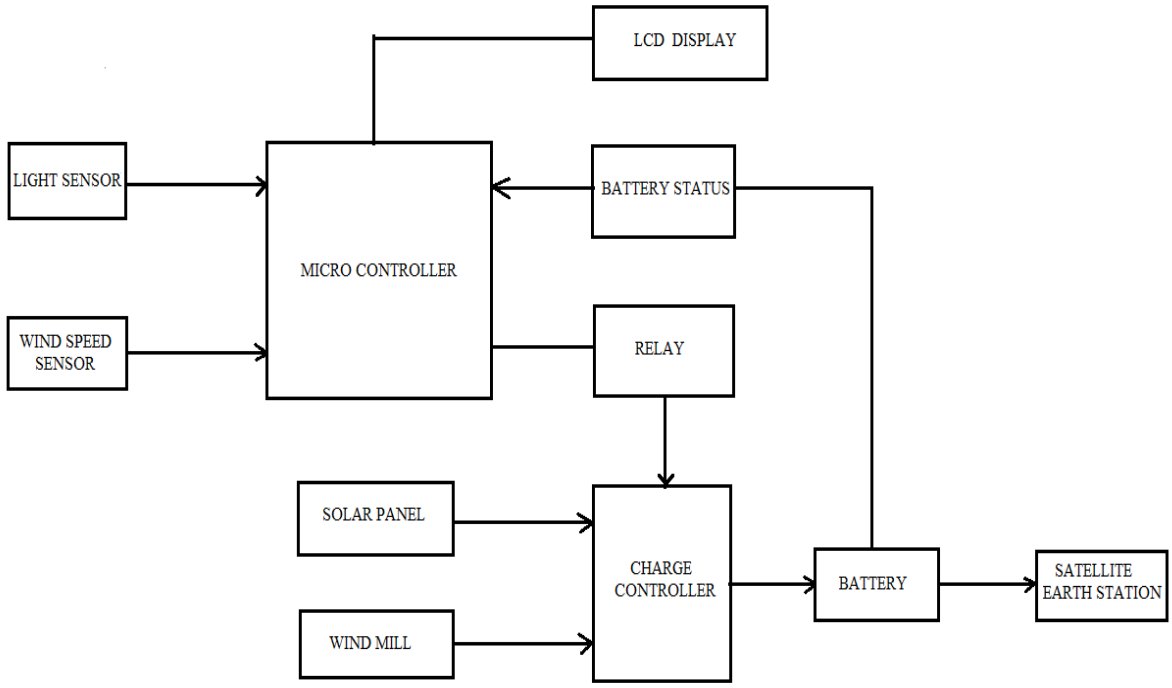

Fig.1.Block Diagram

In this system solar & wind power is used for generating power. Solar & wind has good advantages than any other non-conventional energy sources. System design includes,

3.1. Wind Mill

Wind mill consists wind turbine & generator for electricity generation. The wind is a clean& sustainable fuel source, it does not create emissions & it will never run out as it is constantly replenished by energy from the sun most wind turbines start generating electricity at wind speeds of around 3-4 metres per second generate maximum rates power at around 15m/s 25 m/s or above.

3.2 Solar Panel

A solar panel is made up of the natural element, silicon, which generate electricity when subjected to solar radiation. Typically the angle of solar array is set within a range of between site latitude. Plus 15 degree & site latitude minus is degree, depending on whether a slight winter or summer bias is desirable in the system.

3.3 Charge Controller

A charge controller monitors the battery's state-of-charge to insure that when the battery needs charge-current it gets it, and also insures the battery isn't overcharged. The most advanced charge controllers utilize a charging principle referred to as Pulse-Width-Modulation (PWM) - which insures the most efficient battery charging and extends the life of the battery.

3.4 Microcontroller

The microcontroller compares the input of both Power system and generates a signal to select appropriate resource for charges the Battery. Also Microcontroller continuously monitor the output voltage from either source of energy.

If output is not enough sufficient to charge the battery, then microcontroller gives the signal to MOSFET drive circuit to boost the voltage at rated value, also in some cases when input from live source exceeds suddenly then output voltage at charging stage increases which affects the charging of battery in that situation microcontroller gives signal to MOSFET drive circuit to buck the output voltage at rated value

3.5 Battery

The batteries in the system provide to store the electricity that is generated from the wind or the solar power. Any required capacity can be obtained by serial or parallel connections of the batteries. The battery that provides the most advantageous operation in the solar and wind power systems are maintenance free dry type and utilizes the special electrolytes. These batteries provide a perfect performance for long discharges

IV.CALCULATIONS

4.1 Wind Power

Wind power is a measure of the energy available in the wind.The amount of power available in the wind is determined by the equation

$$W=1/2\ r\ A\ v3$$

Where, W is wind power, r is air density, A is rotor area, v is wind speed.

4.2 Solar Power

The Electrical Energy generated by solar panel is given by the equation

$$E = A^* r^* H^* PR$$

Where, E is Energy (kwh), A is total solar panel area(m^2), r is yield of the solar panel given by the ratio electrical power (in kwp) of solar panel divided by the area of one panel, H is annual average solar radiation on tilted panels, PR is performance ratio, coefficient for losses (range between 0.5 & 0.9 default value 0.75)

V EXPERIMENTAL SETUP

Fig. - 2 Experimental Setup

VI. CONCLUSION

Solar and wind integrated technology have a great potential to achieve constant & continuous power generation for remotely located satellite earth stations.power generation by this technology overcomes the power supply problems of remotely located satellite earth stations at great extent.

VII.REFERENCES

[1] Radha Rani Gogula Engineering Department, Shinas College of Technology "A Sustainable hybrid/ off grid power generation systems suitable for a remote coastal area in Oman"Proceedings of the 8th IEEE GCC Conference and Exhibition, Muscat, Oman, 1-4 February, 2015

[2] Ritesh Dash, Pratik RanjanBehera, Dr. S.M Ali "Hybrid System For Meeting Global Energy Demand With Solar Pv And Wind System"2014 International Conference on Control, Instrumentation, Communication and .Computational Technologies (ICCICCT) 978-1-4799-4190-2/14/$31.00 ©2014 IEEE

[3] Mudda Mercy, S. HimaBindu"BESS-Based Smoothing Control of Photovoltaic and Wind Power Generation Fluctuations"International Journal of Scientific Engineering and Technology Research ISSSN 2319-8885 VoL 03,Issue.38,November-2014.

[4] Zehra Ural Bayrak, MuhsinTunayGencoglu"Simulation and Experimental Study of A Hybrid System for Different Loads"3rd International Conference on Renewable Energy Research and Applications Milwakuee, USA 19-22 Oct 2014.

[5] R. Nagaraj, "Renewable Energy based Small Hybrid Power system for Desalination Applications in Remote locations",5th India International Conference on Power Electronics (IICPE),pp-1-5,2012 .

[6] J.Godson,M.Karthick,T.Muthukrishnan,M.S.Sivagamasundari "Solar PV-Wind Hybrid Power Generation System"International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering Vol.2,Issue11,November 2013.

[7] Richard DeLombard National Aeronautics and Space Administration "Photovoltaic Power System For Satellite Earth Stations In Remote Areas" CN273 - S/6OO.W $01.W@15 IEEE.

[8] Proietti, G. ; TelespazioSpA, Rome, Italy ; Repetto, A. "Design and evaluation of a stand-alone PV system with fuel generator back up" Telecommunications Energy Conference, 1988. INTELEC '88., 10th International.

