ISSN: 2278-0181
ICONEEEA - 2k19 Conference Proceedings

Hybrid Energy Power System using Solar and Wind Power and Monitoring in Wireless Technology

Oviya R, Narmadha M, Elangovan S
Department of Electronics and Communication Engineering,
Sri Ramakrishna College of Engineering,
Perambalur, Tamilnadu.

***Abstract* – There is increasing demand for the use of alternative renewable energy sources to achieve clean and low-cost electric energy for loads. Wind and solar energies are some of the renewable energy sources which are mostly available in the world. In this study, a hybrid power station has been designed using solar and wind energies.The objective of this concept is to generate electric power from windmill and solar panel and synchronizing with EB power supply**

I. INTRODUCTION

The amount of energy sources such as gas, water, coal and petrol are being reduced day by day since they are used in industry intensively.

On the other hand, the need of electrical energy is increasing in parallel with developing technology. Electrical energy can be produced using energies of water, coal, petrol and gas.

But, the price of the electrical energy is increasing due to lack of energy sources mentioned above. In addition, coal, gas and petrol can cause air pollutions when they are burned to produce energy. There are other energy sources that can be used for production of electrical energy.

Wind and solar (W&S) energies are some of them. These are renewable energy sources as well as environment friendly, cheap and mostly available in the world.

II. DESCRIPTION FOR PROPOSED MODEL

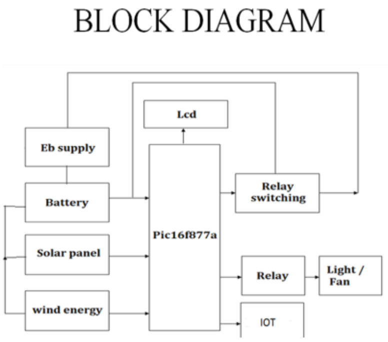


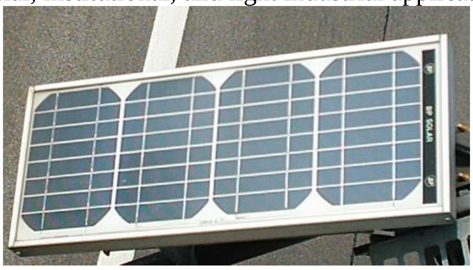
Fig. 1 Block diagram

The block diagram of our model shows the overview of how it works to generate electricity effectively. Here electrical power generated by the respective systems is given to switching circuit. By comparing the battery voltage with both the inputs the controller gives signal to switching circuit to select appropriate input which is used to charge the battery through the synchronization of EB supply

A.Solar panel

The term solar panel is best applied to a flat solar thermal collector, such as a solar hot water or air panel used to heat water, air, or otherwise collect solar thermal energy. But 'solar panel' may also refer to a photovoltaic module which is an assembly of solar cells used to generate electricity. In all cases, the panels are typically flat, and are available in various heights and widths.

An array is an assembly of solar-thermal panels or photovoltaic (PV) modules; the panels can be connected either in parallel or series depending upon the design objective. Solar panels typically find use in residential, commercial, institutional, and light industrial applications.



Solar-thermal panels saw widespread use in Florida and California until the 1920's when tank-type water heaters replaced them. A thriving manufacturing business died seemingly overnight. However, solar-thermal panels are still in production, and are common in portions of the world where energy costs, and solar energy availability, are high.

Recently there has been a surge toward large scale production of PV modules. In parts of the world with significantly high insolation levels, PV output and their economics are enhanced. PV modules are the primary component of most small-scale solar-electric power generating facilities. Larger facilities, such as solar power plants typically contain an array of reflectors (concentrators), a receiver, and a thermodynamic power cycle, and thus use solar-thermal rather than PV.

The largest solar panel in the world is under construction in the south of Portugal. A 52,000 photovoltaic module, 11-megawatt facility covering a 60-hectare south-facing hillside in the southern Alentejo region and it will produce electricity for 21,000 households.

B. Wind Turbine

A windmill is an engine powered by the wind to produce energy, often contained in a large building as in traditional post mills, smock mills and tower mills. The energy windmills produce can be used in many ways, traditionally for grinding grain or spices, pumping water, sawing wood or hammering seeds. Modern wind power machines are used for generating electricity and are more commonly called wind turbines

C. Controller

The controller is electrical circuitary which monitors the wind and solar input voltage as well as battery voltage; The main function of the controller is to select suitable source either wind or solar or EB supply to store the charge in the battery.

D. Calculation

DYNAMO
speed = 1500 rpm
Volts = 12 v
Watts = 18 w
If the dynamo rotates at 1500 rpm it will produce 6- 8 v
BATTERY CALCULATION:
B_{AH} / C_I = 8 ah/420ma
= 19 hrs
To find the Current
Watt = 18 w
Volt = 12v
Current =?
P= V x I
18 =12 x I
I = 18/12
= 1.5 AMPS

BATTERY USAGE WITH 1.5 AMPS
B_{AH} / I
8/1.5 = 5.3 hrs

III. SYSTEM MODELING OF TURBINE

As a general rule, wind generators are practical where the average wind speed is 10 mph (16 km/h or 4.5 m/s) or greater. Usually sites are pre-selected on basis of a wind atlas, and validated with wind measurements. Meteorology plays an important part in determining possible locations for wind parks but meteorological wind data alone is usually not sufficient for accurate siting of a large wind power project. Site Specific Meteorological Data is crucial to determining site potential. An 'ideal' location would have a near constant flow of non-turbulent wind throughout the year with a minimum likelihood of sudden powerful bursts of wind. A vitally important factor of turbine siting is also access to local demand or transmission capacity.

The most crucial step in the development of a potential wind site is the collection of accurate and verifiable wind speed and direction data as well as other site parameters. To collect wind data a Meteorological Tower is installed at the potential site with instrumentation installed at various heights along the tower. All towers include anemometers to determine the wind speed and wind vanes to determine the direction. The towers generally vary in height from 30 to 60 meters. The towers primarily used in determining site feasibility for potential wind farms are guyed steel-pipe structures which are left to collect data for one to two years and then usually disassembled. Data is collected by a data logging device which stores and transmits data to a server where it is analyzed.

The wind blows faster at higher altitudes because of the reduced influence of drag of the surface (sea or land) and lower air viscosity. The increase in velocity with altitude is most dramatic near the surface and is affected by topography, surface roughness, and upwind obstacles such as trees or buildings. Typically, the increase of wind speeds with increasing height follows a logarithmic profile that can be reasonably approximated by the wind profile power law, using an exponent of 1/7th, which predicts that wind speed rises proportionally to the seventh root of altitude. Doubling the altitude of a turbine, then, increases the expected wind speeds by 10% and the expected power by 34% (calculation: increase in power = (2.0) ^(3/7) – 1 = 34%).

Wind farms or wind parks often have many turbines installed. Since each turbine extracts some of the energy of the wind, it is important to provide adequate spacing between turbines to avoid excess energy loss. Where land area is sufficient, turbines are spaced three to five rotor diameters apart perpendicular to the prevailing wind, and five to ten rotor diameters apart in the direction of the prevailing wind, to minimize efficiency loss. The "wind park effect" loss can be as low as 2% of the combined nameplate rating of the turbines.

Utility-scale wind turbine generators have minimum temperature operating limits which restrict the application in areas that routinely experience temperatures less than −20 °C. Wind turbines must be protected from ice accumulation, which can make anemometer readings inaccurate and which can cause high structure loads and damage. Some turbine manufacturers offer low-temperature packages at a few percent extra cost, which include internal heaters, different lubricants, and different alloys for structural elements, to make it possible to operate the turbines at lower temperatures. If the low-temperature interval is combined with a low-wind condition, the wind turbine will require station service power, equivalent to a few percent of its output rating, to maintain internal temperatures during the cold snap. For example, the St. Leon, Manitoba project has a total rating of 99 MW and is estimated to need up to 3 MW (around 3% of capacity) of station service power a few days a year for temperatures down to −30 °C. This factor affects the economics of wind turbine operation in cold climate.

WIND POWER GENERATION TECHNOLOGY

Various Technologies in Wind Turbines

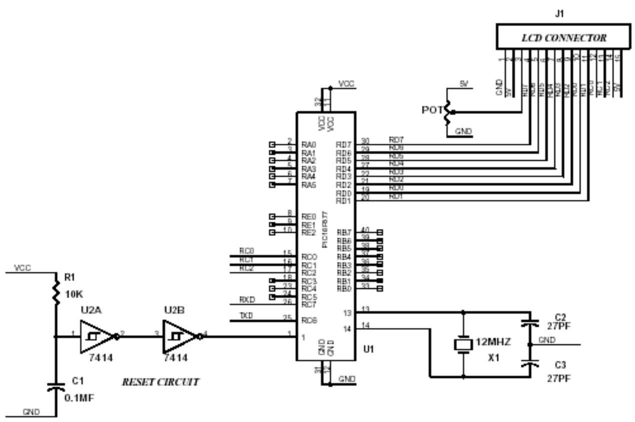
AXIS	Vertical	Horizontal
DIRECTION	Upwind	Downwind
BLADES	Three	Two
SPEED	Constant	Variable

REGULATION	Stall	Pitch
GENERATOR WINDING	Single	Double
GEAR	With Gear	Gearless
ELECTRONICS	Direct AC	AC-DC-AC
DIRECTION	Vertical	Horizontal

Blades Two		Direction three
Cheaper, lighter, operates at high speeds leading to transmission costs, easier to install. Higher speed sop greater loading, thus more noise.		Less cyclical load, dynamic or gyroscopic imbalance of 2 bladed WTGs with change in wind direction.

IV. CONTROLLER STRATEGY

PIC MICRO CONTROLLER



The microcontroller circuit is connected with reset circuit, crystal oscillator circuit, lcd circuit the reset circuit is the one which is an external interrupt which is designed to reset the program. And the crystal oscillator circuit is the one used to generate the pulses to microcontroller and it also called as the heart of the microcontroller here we have used 4mhz crystal which generates pulses upto 12000000 frequency which is converted it machine cycle frequency when divided by 12 which is equal to 1000000hz to find the time we have to invert the frequency so that we get one micro second for each execution of the instruction.

The lcd that is liquid crystal display which is used to display the what we need the lcd has fourteen pins in which three pins for the command and eight pins for the data. If the data is given to lcd it is write command which is configured by the programmer otherwise it is read command in which data read to microcontroller the data pins are given to the to Ported and command pins are given to the Port.

Other than these pin a one pin configured for the contrast of the lcd. Thus the microcontroller circuit works .

V. CONCLUSION

A hybrid power station on the basis of wind turbine, solar panel, synchronisation with EB and electrochemical energy stored and generation systems for decentralized electricity supply for urban and rural areas, mountains area and domestical as well as industrial application.

The application of developed power stations will allow to create environmentally safe and energy effective network of the decentralized power supply facilities without use of traditional hydrocarbon fuels and radionuclieds

VI. ACKNOWLEGMENT

We would like to place on record our deep sense of gratitude to Asst. prof .Mr . V. Rajesh project guide dept. of Electronics and communication Engineering, Sri Ramakrishna College Engineering, Perambalur, Tamilnadu. We express our sincere gratitude to Asst .prof. Mrs. E. Sharmila Head of the department and all staff of department of Electronics and communication Engineering, , Sri Ramakrishna College Engineering, Perambalur, Tamilnadu. we acknowledge our sincere thanks to Dr.Padmalal,principal, ,Sri Ramakrishna College Engineering, Perambalur, Tamilnadu. for providing us infrastructural facilities to work.

VII. REFERENCES

[1] Freddy Simon, B. Anand, A. J. Antony Venus, “Hybrid model of standalone renewable hybrid power generation system.IEEE 2012 Global Humanitarian Technology conference,2015 pp. 172-177.

[2] R. Sathyanarayanan, S. Muthamizh, C. Giriramprasath, and K. T. Gopinath, “Highway windmill,” 2011 IEEE 3rd Int. Conf. Commun. Softw. Networks, ICCSN 2011, pp. 343–347, 2011.

[3] Anurag Pandey, J.P.Sharma, “ Power generation & Automation System Designing For Highway”, 2015 IEEE International Conference on Electrical, Computer and Communication Technologies (ICECCT),2015 pp.1-8.

[4] Fontes, N.; Roque, A.; Maia, J. “Micro generation of Hybrid solar and wind energy system,” Market of Electricity, 2008. EEM 2008. 5th International Conference on European, vol.,no.,pp.1,5, 28-30 May 2008

[5] S. Bharathi and G. Balaji, “A Method for Generating Electricity by Fast Moving Vehicles,” Appl. Mech. …, vol. 110–116, pp. 177–2182, 2012.

[6] S. Selvam,Edison Prabhu .K , Bharath Kumar M.R , Andrew Mathew Dominic, “Solar and Wind Hybrid power generation system for Street lights at Highways” International Journal of Science, Engineering and Technology Research (IJSETR), Volume 3, Issue 3, March 2014].

[7] Siraj Ahmed, Wind Energy Theory and Practice, 3rdEdition, PHI Learning Pvt. Ltd. Published year 2016. Chapter 5- Wind Turbine Design.

[8] Joshua Earnest, Wind Power Technology, 2nd Edition, PHI Learning Pvt. Ltd. Published year 2015. Chapter4- Energy Conversion, chapter5 – Wind Turbine Aerodynamics.

[9] Chetan Singh Solnki, Solar Photovoltaic Technology and System, PHI Learning Pvt. Ltd. Published year 201. Chapter 4- Solar PV Models, chapter 6- Basic of Batteries.