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Solar PV-Wind Hybrid Energy Generation System

Ankita Raut¹, Gauri Bhajbhuj², Komal Nimje³, Nikita Patil⁴, Shruti Kamble⁵

^{1, 2, 3, 4, 5} B. E Students, Department of Electrical Engineering, Rashtrasant Tukdoji Maharaj University, Nagpur, Maharashtra, India

Abstract: Renewable energy systems area unit seemingly to become wide spread within the future thanks to adverse environmental impacts and step-up in energy prices connected with the exercise of established energy sources. Solar and wind energy resources area unit various to every different which can have the particular potential to satisfy the load quandary to a point. However, such solutions any time researched severally aren't entirely trustworthy thanks to their impact of unstable nature. During this perspective, autonomous electrical phenomenon and wind hybrid energy systems are found to be a lot of economically viable various to meet the energy demands of diverse isolated shoppers worldwide. Conservation of energy is extremely traditional these days however management of energy is extremely essential issue to figure on the idea of change to energy generation devices for continuous provide of dc storage conjointly demand of electricity is increasing day by day however accessible wattage plants aren't ready to provide electricity as per the strain wants. The main objective of the project is to supply a framework for promotion of enormous grid connected wind - solar PV hybrid system for optimum and economical utilization of transmission infrastructure and land. Project conjointly aims to encourage new technologies, ways and way-outs involving military operation of wind and solar PV plants. Battery storage could also be other to the hybrid project to cut back the variability of output power from wind solar hybrid plant, for providing higher energy output for a given capability at delivery purpose, by putting in further capability of wind and solar energy in an exceedingly wind solar hybrid plant and making certain handiness of firm power for a specific amount.

Keywords: Wind - solar PV hybrid system, Battery storage

I. INTRODUCTION

Many remote communities round the world cannot be physically or economically connected to an electrical grid. The electricity demand in these areas is conventionally equipped by tiny isolated diesel generators. The operational prices related to these diesel generators could also be intolerably high because of discounted fuel prices beside difficulties in fuel delivery and maintenance of generators. In such things, renewable energy sources, like solar electrical phenomenon (PV) and turbine generator give a sensible various to supplement engine-driven generators for electricity generation in off-grid areas. It's been incontestable that hybrid energy systems will considerably cut back the overall life cycle price of standalone power provides in several off-grid things, whereas at an equivalent time providing a reliable offer of electricity employing a combination of energy sources. Various hybrid systems are put in across the planet, and therefore the increasing renewable energy business has currently developed reliable and value competitive systems employing a style of technologies. In a very report, India's gross renewable energy potential (up to 2032) is calculable at 220 GW. It's likewise noted within the report that, with a renewable energy capability of fourteen. 8 GW (i.e. 9.7% of the overall put in generation capacities of one hundred fifty GW as on thirty June 2009), India has barely damaged the surface of an enormous chance.

However, within the last few years itself, the share of renewable energy in put in capability has matured from five to nine. This means a colossal potential in energy generation, which may attain many hundred GW with current renewable energy technologies. Because the price of building solar PV-wind capability continues to collapse future 5 to 10 years; a big scale-up of renewable generation may be a terribly realistic chance within the developing world. Thousands of villages across the world area unit still being exiled from electricity and energizing these villages by extended grids or by diesel generators alone are going to be uneconomical. Moreover, with the present resource crunch with government, these villages receive low priority for grid extension thanks to lower economic come back potential. Standalone solar PV-wind hybrid energy systems will give economically viable and reliable electricity to such native desires. Solar and wind energy area unit non-delectable, web site dependent, non-polluting, and attainable sources of other energy decisions. Nowadays, the mixing of PV and wind system with battery storage and diesel backup system is turning into a viable, cost-efficient approach for remote space electrification. Wind and solar systems area unit expandable, further capability could also be side because they would like arises. Moreover, the mix of wind and solar PV system shrinks the battery bank demand and any reduces diesel consumption.

The PV–wind hybrid energy system uses battery bank associated a diesel generator as a back-up may be provided to impress the remotely set communities wherever it's uneconomical to increase the standard utility grid. In these systems, sizing, management setting, and operational methods area unit dependent. Additionally, a number of the system parts have non-trivial behavior characteristics. Thus, the task of assessing completely different style potentialities to set up a hybrid system for a particular location becomes quite easy. The System is based on Atmega328 microcontroller which smartly senses and charges the battery while displaying the voltage on the LCD. The Solar Panel which is mounted on a rotating panel which sets itself to maximum exposure of the daylight to generate energy enough to charge the battery also the wind power is another most competitive renewable technology. The wind turbine rotor consists of two or three blades mechanically coupled to an electrical generator. The power is captured by the wind turbine. Since both of them simultaneously can work in favorable natural conditions, both can charge the battery at a faster pace than they would had individually. Thus this project is an example how natural resources like solar and wind can be efficiently harnessed to produce electricity at a faster pace and cheaper rate.

II. REVIEW OF LITRETURE

- 1) Yang, Hongxing, et al. "Optimal sizing method for stand-alone hybrid solar–wind system with LPSP technology by using genetic algorithm." *Solar energy* 82.4 (2008): 354-367. This paper the decision variables enclosed within the improvement method square measure the PV module range, turbine range, battery range, PV module slope angle and turbine installation height. The planned methodology has been applied to the analysis of a hybrid system that provides power for a telecommunication relay station, and sensible improvement performance has been found. What is more, the relationships between system power responsibility and system configurations were conjointly given.
- 2) Uzunoglu, M., O. C. Onar, and M. S. Alam. "Modeling, control and simulation of a PV/FC/UC based hybrid power generation system for stand-alone applications." *Renewable energy* 34.3 (2009): 509-520. In this paper the study centered on the modeling and analysis of the system-level cell dynamics, that have a detailed relationship with the operational temperature and therefore the cooling conditions of fuel-cell modules. Mathematical models were established by modeling the energy-conversion phenomena within the fuel-cell stack and therefore the heat-dissipation method by the thermal-management system. The output equations for the calculation of the wattage and voltage were in addition deduced from chemical science theory. Four typical disturbances, as well as step changes in electrical phenomenon, fluid rate of flow, the cooler's external thermal resistance and therefore the temperature of the close air were numerically investigated to judge the transient performances of a PEM cell within which the cooling load and cooling ability of its thermal-management system were varied. The results incontestable that the impacts of the exhaust heat and therefore the cooling conditions on the transient performance of a PEM cell square measure important and merit additional attention.
- 3) Nandi, Sanjoy Kumar, and Himangshu Ranjan Ghosh. "Prospect of wind–PV-battery hybrid power system as an alternative to grid extension in Bangladesh." *Energy* 35.7 (2010): 3040-3047. The main aim of this article to introduce rudiments, characteristics, integration of hybrid power system for the production of reliable power according to literature reviews. Renewable energy systems in rural and non-electrified location in Jordan in specific and throughout the world normally has a major weakness that they square measure extremely dependent on the renewable resources that cannot be controlled and square measure intermittent in nature and in some cases square measure tough to be foreseen like star irradiance and wind energy.
- 4) Ashok, S. "Optimised model for community-based hybrid energy system." *Renewable energy* 32.7 (2007): 1155-1164. This paper discusses totally different system elements of hybrid energy system and develops a general model to search out an optimum combination of energy elements for a typical rural community minimizing the life cycle price. The developed model can facilitate in filler hybrid energy system hardware and in choosing the operational choices. Micro-hydro-wind systems are found to be the optimum combination for the electrification of the agricultural villages in Western Ghats (Kerala) Bharat supported the case study. The optimum operation shows a cost of Rs. 6.5/kW h with the chosen hybrid energy system with 100% renewable energy contribution eliminating the requirement for standard diesel generator.
- 5) Eroglu, Mehmed, et al. "A mobile renewable house using PV/wind/fuel cell hybrid power system." *International journal of hydrogen energy* 36.13 (2011): 7985-7992. In this paper the bestowed mobile house will turn out enough power to hide the height load. Electrical phenomenon and wind energy area unit used as primary sources and a cell as backup power for the system. The ability budgeting of the system is meant supported the native knowledge of radiation and wind handiness. More analysis can target the event of the information acquisition system and also the implementation of automatic controls for power management.

- 6) Shiyas, P. R., S. Kumaravel, and S. Ashok. "Fuzzy controlled dual input DC/DC converter for solar-PV/wind hybrid energy system." Electrical, Electronics and Computer. This paper proposes a multiple input power conditioner topology with Fuzzy controller to integrate intermittent nature of renewable sources like star, wind, etc. star PV and aero generator square measure used because the primary energy supply to fulfill the load demand and well-regulated output voltage is obtained from the multiple input power conditioner. The regulated energy is transferred to the load through PWM electrical converter. Mathematical model of the multiple input power conditioner topologies has been developed. Supported the developed model dynamic simulation has been allotted and also the results obtained from the simulation square measure given during this paper. Performance analysis of the projected device shows that the projected fuzzy controller tunes the parameters of dc/dc device to get well regulated output voltage to the load from the intermittent nature of supply.

III. BLOCK DIAGRAM

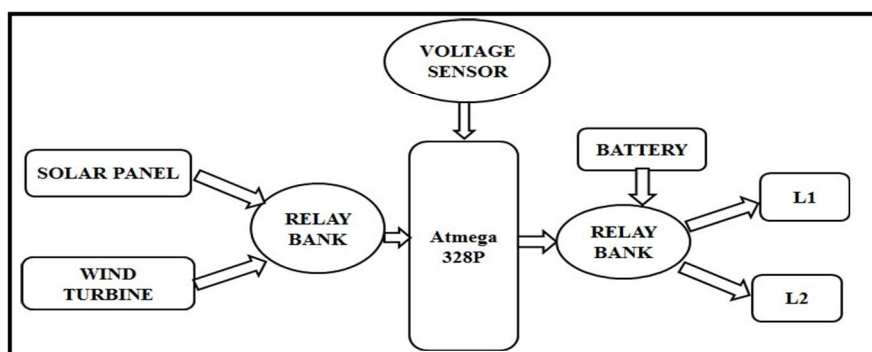


Figure 1. Block diagram of proposed work

When we start project all the sensors and controllers goes power on indication of LED. When sunlight is more than threshold limit which is detected by voltage sensor by detection of voltage generation using solar panel. The System is based on Atmega328 microcontroller which smartly senses and charges the battery while displaying the voltage on the LCD. Microcontroller trace trigger and sit on relay so that all the power supply will directly goes to battery. If generation using wind turbine is more than solar module then wind turbine reliable on and solar module release in goes to off because of that no battery will charge using wind rather than Solar module. The Windmill, when is enough wind to drive it, generates power enough to charge a battery. Similarly, the Solar Panel which is mounted on a rotating panel which sets itself to maximum exposure of the daylight to generate energy enough to charge the battery. Since both of them simultaneously can work in favorable natural conditions, both can charge the battery at a faster pace than they would had individually. Thus, this project is an example how natural resources can be efficiently harnessed to produce electricity at a faster pace and cheaper rate.

IV. METHODOLOGY

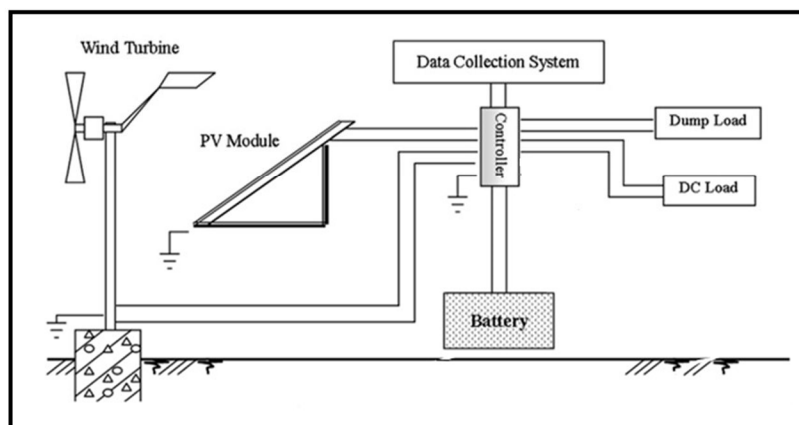


Figure 2. Internal Structure of Proposed Work

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. In case one of the components, wind turbine or PV array not in the condition to fulfill the load demand, in that case battery bank release energy to synchronize the load requirement. It is necessary to select excellent PV array model because it is highly influenced by weather conditions especially solar radiation.

V. APPLICATION

- A. Hybrid energy-based power system for rural electrification
- B. Wind-solar hybrid system for irrigation
- C. Solar electric system
- D. Encourage new technologies, methods and way-outs involving combined operation of wind and solar pv plants battery storage

VI. RESULT

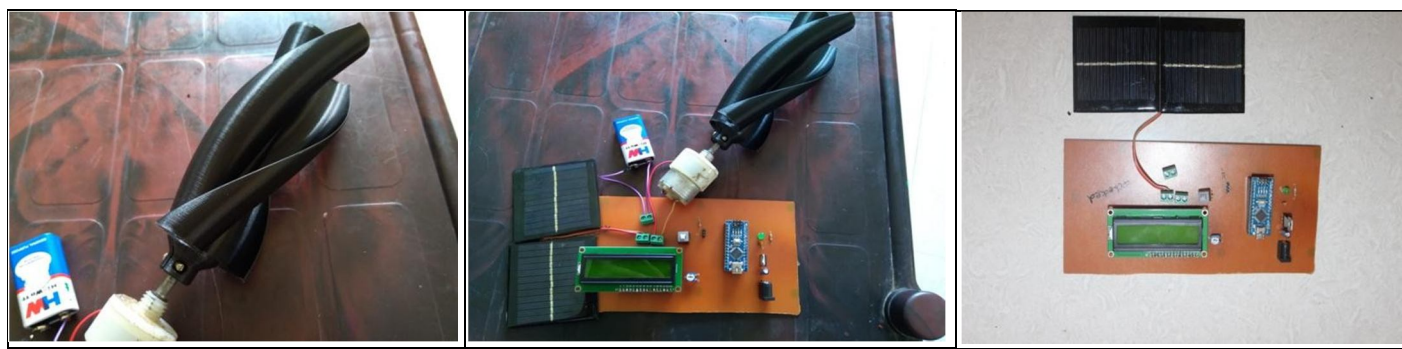


Figure 2. Result view of proposed work

The above pictures show the result view of our project. The system is meant and optimized as hybrid energy base grid in prescript to fulfill the present user's power need at a minimum value of energy. The simulation-based improvement generates the best-optimized filler of various combos of wind and PV array with diesel generators for a rural hybrid base grid. The designed solar wind hybrid energy generation system is used to supply a framework for promotion of enormous grid connected wind - solar PV hybrid system for optimum and economical utilization of transmission infrastructure and land. Project conjointly aims to encourage new technologies, ways and way-outs involving military operation of wind and solar PV plants.

VII. FUTURE SCOPE

In this paper we have a tendency to study the varied knowledge regarding the wind, solar for generating the hybrid at tiny level that facilitate to the decision manufacturers to check the varied factors in construct a Hybrid generation plant with a numerous minimum value with highest generating capability. The result shows by the experimental and theoretical knowledge that has been able to predict the energy generation through hybrid system. For future scope completely different fundamental quantity has been use for calculating the facility and potency. This technique motivates the engineers to put in tiny scale solar radiation hybrid system in Jodhpur region. the govt. of India takes a serious decision towards the hybrid energy sources. The Jawaharlal Nehru star mission (JNNSM) target to provide twenty gig-a watts up to 2022 and may 100 percent Renewable up to 2050.

VIII. CONCLUSION

This paper provides review of the completely different hybrid power system techniques. This ways area unit terribly helpful for the next generation students and research worker United Nations agency area unit interested to build study in the hybrid power system analysis exploitation completely different simulation software's. Hybrid facility that solely pivots on the intermittent renewable energy sources can generate a swing output voltage that leads to injury the machines that operate on stable provide. Hybrid power system area unit most advantageous facility that needed for continuous responsibility of power provides.



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