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A HYBRID MODEL OF SOLAR WIND POWER GENERATION SYSTEM

[1]Suganya.S, [2]Sudhakaran.M,
[1]Student, Dept of EEE, Gtec Engineering college, Vellore,
[2]Associate professor, Dept of EEE, Gtec Engineering college, Vellore.

Abstract:
This paper deals with the detailed of a hybrid model of a solar / wind in Simulink, which is using battery as its storage system. The simulation includes all realistic components of the system, in this system power delivered by the combine system component is compared with each other and various conclusions are drawn. A comparative study of hybrid model solar /wind system has been made. This paper describe of solar-wind hybrid system for supplying electricity to power grid. Work principle and specific working condition are presented in this paper.

KEYWORDS : Solar power, wind power, hybrid generation energy, grid.

1. INTRODUCTION

Energy is essential to our society to ensure our quality of life and to underpin all other elements of our economy. The escalation in cost and environmental concerns involving conventional electrical energy. Sources have increased interest in renewable energy sources. Many societies across the world in which we live have developed a large appetite for electrical energy. This appetite has been stimulated by the relative ease with which electricity can be generated, distributed, and utilized, and by the great variety of its applications. It is arguable whether the consumption of electricity should be allowed to grow unchecked, but the fact is that there is an ever-increasing demand for this energy form. Clearly, if this demand is to be met, then the world's electricity generating capacity will have to continue to grow. Presently almost all the electricity generation takes place at central power station which utilizes coal, oil, gas, water or fissile nuclear material as the primary fuel source. There are problem facing the further development of generating methods based on any of these ―conventional fuels‖. Hydro-power generation is restricted to geographically suitable areas, and reserves of coal, although presently plentiful, are not renewable .The possible hazards of nuclear power have been much publicized, particularly those concerning the storage and military use of nuclear waste material. Nevertheless, to assist in maintaining electrical supply in many of our societies its seems likely that an increasing nuclear power presence, involving breeder and possibly fusion reactors, will be tolerated. To achieve this and also to aid in management of the existing fossil-fuel resources, it is essential that some part and an increasing part, of future electrical energy research and development be concerned with so called ―nonconventional ―methods of generation Wind- solar power generations are visible options for future power generation. Besides being free, they are free of recurring costs. They also offer power supply solutions for remote areas, not accessible by grid power supply today around 30,000 wind turbines and more than 1,00,000 off-grid solar PV systems are installed all over the world. Wind and solar hybrid model with proper storage system have been keen interest for the last few years. In this paper a hybrid model of solar / wind is developed using the battery. The simulation circuit will include all realistic components of the system.

2. LITERATURE REVIEW

Hybrid models have been an effective means of producing generating electricity throughout the world. Lots of research work has been done and continuing the accommodate new advances in this system. This paper reports the probabilistic performance assessment of a wind, Solar Photo Voltaic (SPV) Hybrid Energy System. In addition to this solar/wind system with backup storage batteries were designed, integrated and optimized to predict the behavior of generating system. This paper proposes a hybrid energy system combining solar photovoltaic and wind turbine as a small scale alternative source of electrical energy where conventional generation is not practical. Simulation of the hybrid system under investigation was carried out by using PSIM software. A simple and cost effective maximum power point tracking technique is proposed for the photovoltaic and wind turbines. This paper provides a core of a CAD/CAA tool that can help designers determine the optimal design of a hybrid solar power system for either autonomous or grid link applications. This technique uses linear programming principles to reduce the cost of electricity while meeting the load requirement. A controller that monitors the operation of autonomous/grid linked system is designed. This paper presents a decision support technique to help the decision makers to study the influencing factors in design of a hybrid-solar power system (HSWPS) for grind linked applications. The analytic Hierarchy Process was used to quantify the various divergences of opinions, practices and events that lead to confusion and uncertainties in planning. This paper provides a core of a CAD/CAA tool that can help designers determine the optimal design of a hybrid solar power system for either autonomous or grid link applications. This technique uses linear programming principles to reduce the cost of electricity while meeting the load requirement. A controller that monitors the operation of autonomous/grid linked system is designed.

3. HYBRID ELECTRIC SYSTEM

The European PV industry Association reported that the total global PV cell production worldwide in 2002 was over 560 MW and has been growing about 30% annually in recent years. The physical of PV cell is very similar to that of the classical diode with a PN junction formed by semiconductor material.

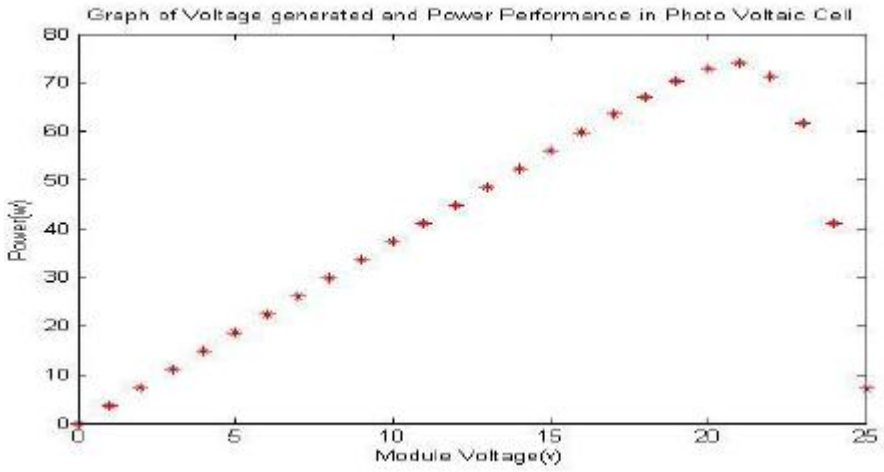

Fig.1.Waveform generated in PV cell

When the junction absorbs light, the energy of absorbed photon is transferred to the electron-proton system of the material, creating charge carriers that are separated at the junction. The charge carriers in the junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit. The solar cell is the basic building of the PV power system it produces about 1 W of power. To obtain high power, numerous such cell are connected in series and parallel circuits on a panel (module), the solar array or panel is a group of a several modules electrically connected in series parallel combination to generate the required current and voltage. Wind power systems convert the kinetic energy of the wind into other forms of energy such as electricity.

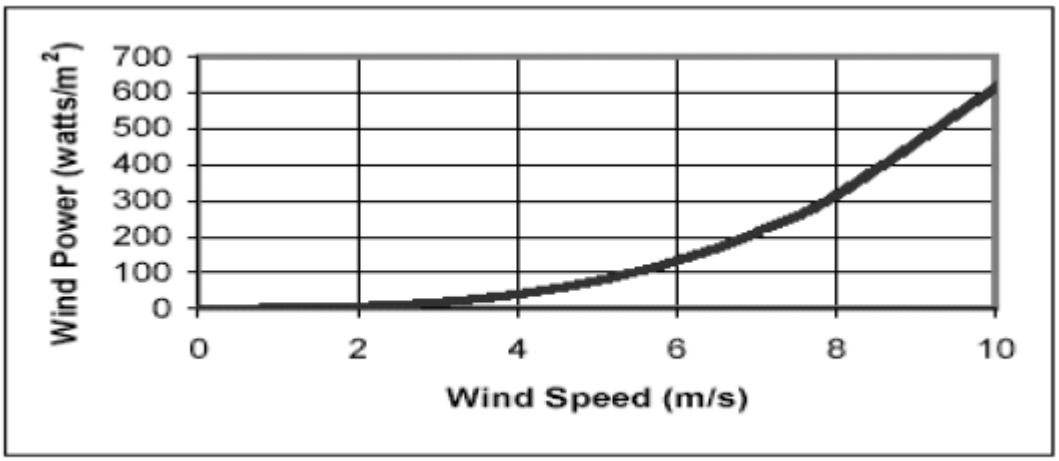

Figure Relationship between wind speed and wind power.

Although wind energy conversion is relatively simple in concept, turbine design can be quite complex. Most commercially available wind turbine uses a horizontal – axis configuration with two or three blades, a drive train including a gearbox and a generator and a tower to support the rotor. Typical sizes for a wind turbine range from 200-750 KW, with electricity produce within a specific range of wind speed. Capital costs have declined from about $ 2.2/w in early 1980 to less than $ 1/w today. Cooperative research between DOE and manufacturing companies is aimed at increasing the aerodynamics efficiency and structural strength of wind turbine blades, developing variable speed generation and electronic power controls and using taller tower that allow access to the stronger wind found at greater height. An important factor in how much power your wind turbine will produce is the height of its tower. The power available in the wind is proportional to the cube of its speed. This means that if wind speed doubles, the power available to the wind generator increases by a factor of 8 (2 x 2 x 2 = 8) Since wind speed increases with height increases to the tower height can mean enormous increases in the amount of electricity generated by a wind turbine.

4. RESULT ANALYSIS

The escalation in electrical energy costs associated with fossil and nuclear fuels, and enhanced public awareness of potential environmental impacts of conventional energy systems has created an increased interest in the development and utilization of alternate sources. Photo voltaic and wind energy are being increasable recognized as cost effective generation sources in small isolated power systems. A realistic cost benefit analysis requires evaluation models that recognize the highly erratic nature of these energy

sources while maintaining the chronology and inter dependence of the random variables inherent in them. Currently we can observe very fast development of new electrical power sources called renewable sources. These sources are environmentally friendly and use primary energy carriers like solar, wind and water flow, biogas, biomass etc.

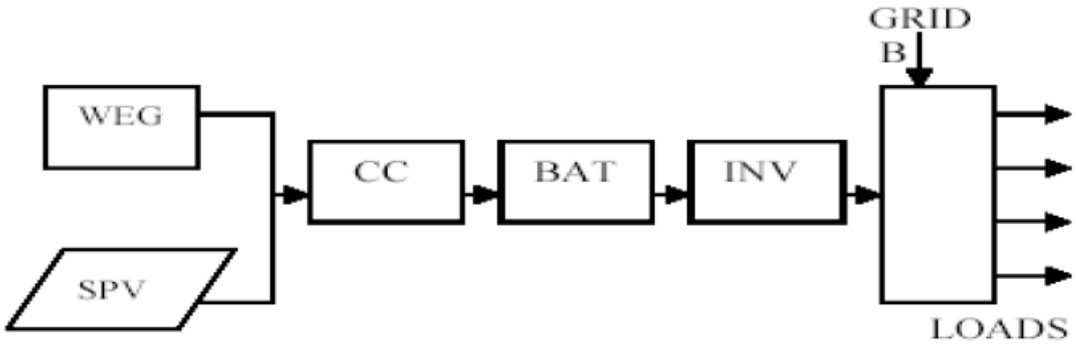

Fig.3. Wind / SPV Hybrid energy model configuration

The escalation in costs and environmental concerns involving conventional electric energy sources has increased interest in renewable energy sources. Wind, Solar PV and Biomass power generations are viable options for future power generation. The architecture more suitable for most of India would be a highly distributed set of individual rooftop power generation systems, all connected via a local grid. However, erecting such an infrastructure, which does not enjoy the economies of scale possible in mass, utility-scale, solar panel deployment, needs the market price of solar technology deployment to substantially decline, so that it attracts the individual and average family size household consumer.

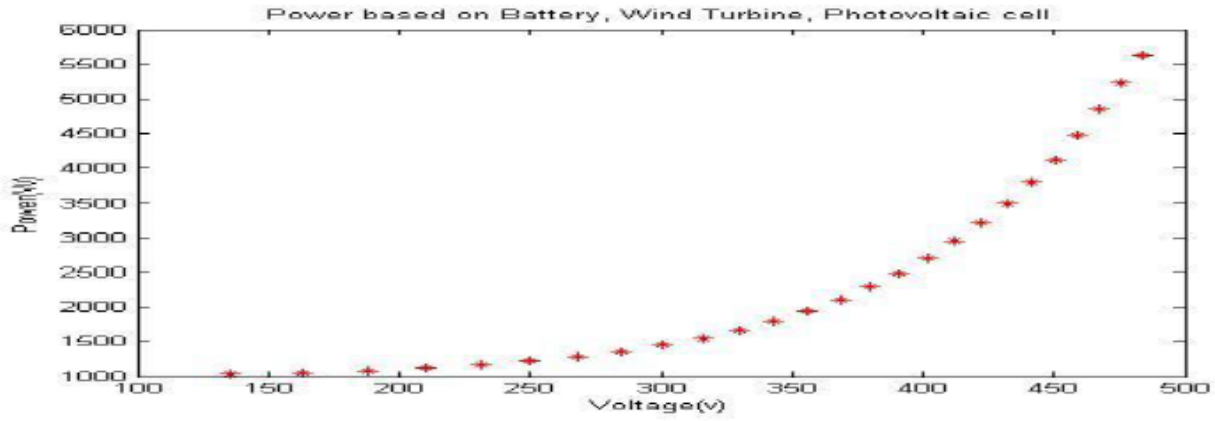

Fig.4.Output analysis

That might be possible in the future, because PV is projected to continue its current cost reductions for the next decades and be able to compete with fossil fuel. Some noted think-tanks recommend that India should adopt a policy of developing solar power as a dominant component of the renewable energy mix, since being a densely populated in the sunny tropical belt, the subcontinent has the ideal combination of both high solar insolation and therefore a big potential consumer base density. In one of the analyzed scenarios,

India can make renewable resources such as solar the backbone of its economy by 2050, reining in its long-term carbon emissions without compromising its economic growth potential.

CONCLUSION

Obviously, a complete hybrid power system of this nature may be too expensive and too labor intensive for many Industrial Technology Departments. The enhancements to instruction, especially in making electrical power measurements more physical, intuitive and real-world are substantial and the costs and labor involved in some adaptation of the ideas in this paper to a smaller scale setup are reasonable. In other places, other power sources could be used. For example hybrid combinations of wind power, solar power, geothermal power, hydroelectric power, tidal power, biomass generated power, power from incineration of solid wastes, and many other technologies.

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