iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** II **Month of publication:** February 2018

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue II, Feburary2018- Available at www.ijraset.com

Analysis on Hybrid Modeling of Solar-Wind Power Generation System

Bukke. Prasannalakshmi
Research Scholar, Department of EEE, JNTUA, Anantapur, Andhra Pradesh, India.

Abstract: This paper deals with the specific of a hybrid version of a sun / wind in Simulink that is the usage of battery as its storage machine. The simulation includes all realistic additives of the machine, on this gadget electricity delivered through the integrate device factor is compared with each different and numerous conclusions are drawn. A comparative study of hybrid version sun /wind device has been made. This paper describe of solar-wind hybrid device for presenting energy to energy grid. Work principle and particular working situation are offered in this paper.
Keywords: Solar power, wind power, hybrid generation energy, grid

I. INTRODUCTION

Power is important to our society to ensure our pleasant of existence and to underpin all different elements of our financial system. The escalation in price and environmental issues concerning conventional electric energy. Resources have expanded interest in renewable electricity sources. Many societies the world over wherein we stay has advanced a huge appetite for electric strength. This urge for food has been inspired by means of the relative ease with which power may be generated, dispensed, and utilized, and by the incredible type of its programs. It is debatable whether the consumption of electricity ought to be allowed to grow unchecked, but the fact is that there is an ever-growing call for this electricity form. Absolutely, if this call for is to be met, then the arena's power producing potential will should continue to grow. Currently nearly all the energy era takes place at significant electricity station which utilizes coal, oil, gasoline, water or fissile nuclear material as the primary gas supply. There are trouble facing the in addition improvement of generating techniques based on any of those ―traditional fuels‖. Hydro-electricity generation is restrained to geographically appropriate areas, and reserves of coal, although presently plentiful, aren't renewable .The viable risks of nuclear energy have been a great deal publicized, particularly the ones concerning the storage and navy use of nuclear waste material. Nonetheless, to assist in maintaining electric supply in many of our societies its appears in all likelihood that an growing nuclear power presence, regarding breeder and in all likelihood fusion reactors, can be tolerated. To achieve this and also to resource in management of the existing fossil-fuel sources, it's miles critical that a few component and an increasing component, of future electric electricity studies and improvement be worried with so known as
―nonconventional ―techniques of generation Wind- sun energy generations are visible alternatives for destiny energy era. Besides being unfastened, they may be free of ordinary fees. They also provide energy supply answers for faraway areas, not handy by means of grid strength supply these days round 30,000 wind turbines and greater than
1, 00,000 off-grid solar PV systems are installed all over the world. Wind and sun hybrid version with right storage machine have been eager hobby for the previous couple of years. On this paper a hybrid version of sun / wind is evolved the use of the battery. The simulation circuit will consist of all sensible additives of the gadget.

II. LITERATUREREVIEW

Hybrid fashions have been an effective approach of manufacturing generating power throughout the arena. Masses of studies work has been done and persevering with the accommodate new advances on this gadget. This paper reports the probabilistic overall performance evaluation of a wind, solar photograph Voltaic (SPV) Hybrid power machine. in addition to this sun/wind device with backup storage batteries had been designed, included and optimized to expect the conduct of generating machine.
This paper proposes a hybrid energy machine combining sun photovoltaic and wind turbine as a small scale alternative supply of electrical electricity where conventional generation isn't realistic. Simulation of the hybrid machine underneath investigation turned into completed by using PSIM software. An easy and value effective most electricity point monitoring technique is proposed for the photovoltaic and wind turbines. This paper gives a middle of a CAD/CAA tool that can help designers decide the top-quality layout of a hybrid solar strength device for either independent or grid link applications. This approach makes use of linear programming principles to lessen the cost of strength while meeting the weight requirement. A controller that monitors the operation of self

©IJRASET (UGC Approved Journal): All Rights are Reserved

reliant/grid linked gadget is designed.

This paper affords a decision help approach to assist the selection makers to observe the influencing elements in design of a hybrid-solar electricity system (HSWPS) for grind related programs. The analytic Hierarchy procedure becomes used to quantify the diverse divergences of critiques, practices and occasions that lead to confusion and uncertainties in making plans.

This paper affords a middle of a CAD/CAA device that could assist designers determine the most excellent design of a hybrid sun electricity machine for either self reliant or grid hyperlink applications. This approach uses linear programming ideas to lessen the price of energy even as assembly the load requirement. A controller that monitors the operation of independent/grid linked system is designed. on this paper the diverse advances in photovoltaic module era inverts, machine set up practices in enhancing the performance of PV systems and have caused PV becoming hooked up as a strongly competitive power source for off-grid energy applications. PV is also at the CUSP of becoming aggressive in grid connect configuration. Furthermore it also introduces the modern inverters which can be extra green, have better reliability and progressed software. Device interface features. It also introduces the various developments in designs and economics inside the PV system. This paper describes the simulation of a combined wind – solar – hydro machine for electric powered energy generation with power garage facilities. A simple multivariable weather model such as the wind speed, the sun radiation and the rain fall become evolved. This version is used to evaluate the reliability of the blended generating machine. Exclusive percentages of wind and sun technology capacities were tried as well as the solar arrays. This paper investigates the results of kinetic wave – particle interactions at the sun wind the use of a worldwide hybrid model. The version follows the evolution of the particle distribution alongside an inhomogeneous field line below the influence of wave – particle interactions, an am bipolar electric powered area that is steady with the particle distributions themselves and coulomb collusions. This represents the ―first effects‖: of worldwide evolutionary study of the solar wind that bear in mind these kinetic results. The version can account for the bulk acceleration of the sun wind. In this paper laptop models of wind generators for strength device balance studies have been advanced and supply to power gadget operators international. The development of such models is of unique importance for stability research on structures experiencing very huge penetrations of wind energy consisting of the power gadget within the Republic of Ireland. There may be a massive variation inside the complexity of models advanced and no sizable agreement on the extent of modeling detail required. Using more than one wind turbine fashions for large-scale balance studies is also proving difficult. Similarly, the majority of fashions have no longer been verified. This paper has tested version

Development and use from the perspective of the Irish grid operator. The validation of developed models will be discussed, and a generic modeling approach will be proposed for large-scale power system stability.

This paper reports the development of a computer approach for evaluating the general performance of stand-alone wind photo voltaic generating systems. Simple models for different system components are developed, integrated, and used to predict the behavior of generating systems based on available wind solar and load data. The model is useful for evaluating the performance of stand-alone generating systems and gaining a better in sight in the component sizes needed before they are built. Simulation results are presented for performance evaluation of a stand-alone generating system that has been previously designed to supply the average power demand of atypical residential house. In this paper panel contribution, the modeling of wind generators in energy structures dynamics simulations is discussed. First the 3 maximum critical actual wind turbine ideas are defined. Then, numerous instructions of wind turbine fashions are introduced and it will likely be mentioned which model type may be included in power machine dynamics simulation software. To conclude, it will likely be argued that its miles feasible to model numerous forms of variable velocity wind mills with most effective one version in power gadget dynamics simulations. in this research, wind turbine turbines, photovoltaic panels, and storage batteries are used to construct a grid- connected era device that's premiere in phrases of more than one standards which includes value, reliability, and emissions. Multidisciplinary layout enables the decision maker to make greater rational evaluations. A fixed of tradeoff answers may be acquired the use of the multidisciplinary approach, which gives many layout options to the choice maker. A customized particle swarm optimization set of rules is developed to derive those non-ruled answers. A grid- connected hybrid strength gadget is designed based totally at the proposed method.

III. SOLARPHOTOVOLTAICSYSTEM

The European PV industry affiliation pronounced that the whole global PV cell production international in 2002 become over 560 MW and has been growing approximately 30% annually in current years. The physical of PV cell could be very similar to that of the classical diode with a PN junction shaped by way of semiconductor material. while the junction absorbs mild, the energy of absorbed photon is transferred to the electron-proton system of the fabric, developing rate carriers which are separated on the junction. The charge carriers in the junction location create a ability gradient, get multiplied under the electrical field, and flow into as modern through an outside circuit. The solar cell is the basic building of the PV electricity system it produces about 1 W of power. To acquire

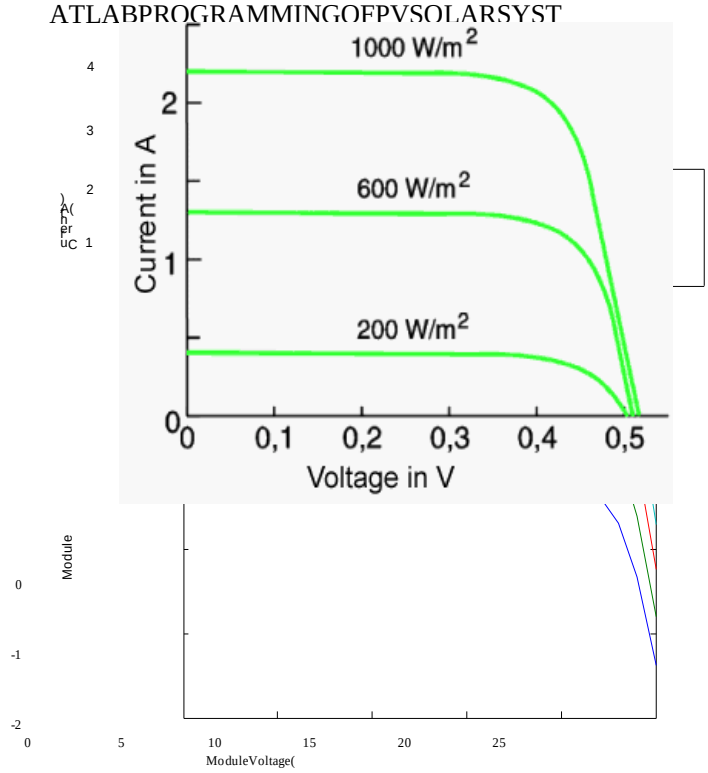
©IJRASET (UGC Approved Journal): All Rights are Reserved

high strength, numerous such mobile are related in collection and parallel circuits on a panel (module), the sun array or panel is a collection of a several modules electrically linked in series parallel mixture to generate the required modern-day and voltage. the electrical traits of the PV module are typically represented by the modern-day vs. voltage (I-V) and the modern vs. power (P-V) curves. Figs. and show the (IV) and (P-V) traits of the used photovoltaic module at one-of-a-kind solar illumination intensities.

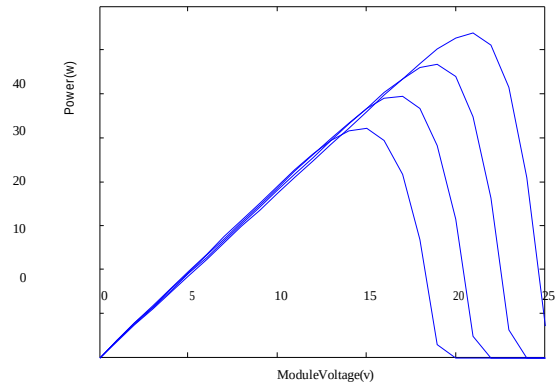
The I–V characteristic of the PV module are: I=IL-
I0(e^q(V+IRS)/nkT _1)
WhereIL=photo current
I0=diode saturation current RS=series resistance
q=charge of electron k=constant
T=temperature
N=number of PV module
PoweroutputfromthePVarraycanbeobtainedbyusingtheequation:Ppv(t)=Ins(t)
*A*Eff(pv)
Where Ins(t) =inso lation data at timet(kw/m^2)A=area of single PVpanel(m^2)
Effpv=overall efficiency of the PV panels and dc/dc converters. The Solar Cell Characteristics:

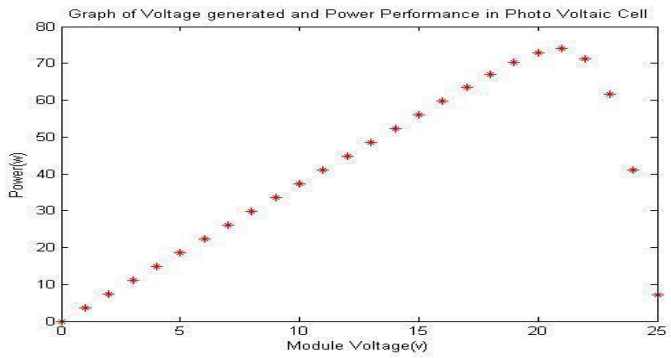
A. Isc- short circuit current.
B. Voc-open circuit voltage.
C. Peak power
D. The open circuit voltage of a single sola rcellis approx0.5V.
E. Much higher voltage is required for practical application.
F. Solar cells are connected in series to increase its open circuit voltage.

- M ATLABPROGRAMMINGOFPVSOLARSYST



GraphofVoltagegeneratedandPowerPerformance in Photo VoltaicCe





IV. WIND ENERGY SYSTEM

Wind strength structures convert the kinetic electricity of the wind into different styles of power inclusive of power. Although wind power conversion is relatively easy in concept, turbine design can be quite complicated. Most commercially to be had wind turbine makes use of a horizontal – axis configuration with two or three blades, a drive teach together with a gearbox and a generator and a tower to guide the rotor. Usual sizes for a wind turbine range from 2 hundred-750 KW, with energy produce within a selected variety of wind speed. Capital prices have declined from approximately $ 2.2/w in early 1980 to less than $ 1/w these days. Cooperative research among DOE and production businesses is aimed toward increasing the aerodynamics efficiency and structural energy of wind turbine blades, growing variable velocity technology and digital electricity controls and using taller tower that permit access to the stronger wind determined at extra top. An essential issue in how a great deal electricity your wind turbine will produce is the height of its tower. The energy available inside the wind is proportional to the cube of its speed. Because of this if wind velocity doubles, the power available to the wind generator will increase by a thing of 8 (2 x 2 x 2 = 8) on the grounds that wind pace will increase with height will increase to the tower peak can imply vast increases in the quantity of electricity generated by using a wind turbine.

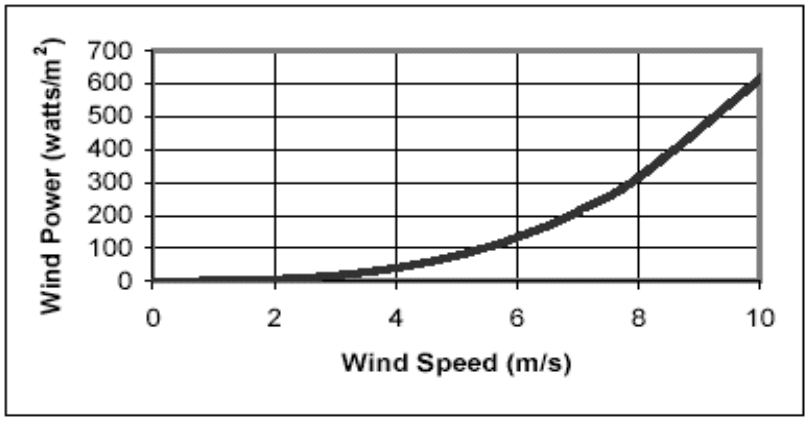


Figure. Relationship between wind speed and wind power.

©IJRASET (UGC Approved Journal): All Rights are Reserved

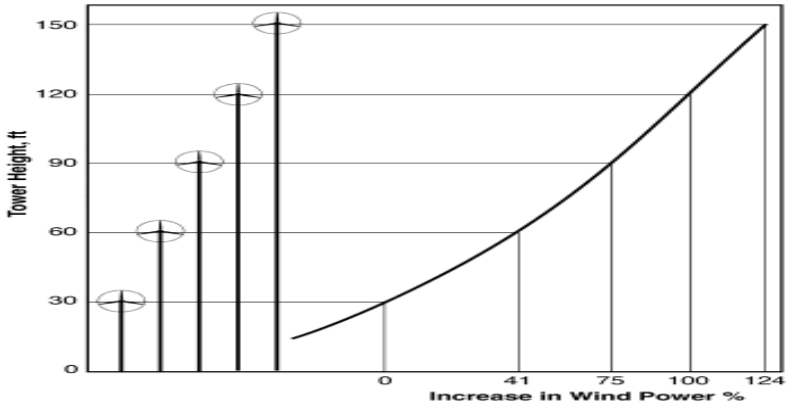


Figure Wind speeds increase with height.

The fundamental equation governing the mechanical power capture of the wind turbine rotor blades, which drives the electrical generator, is given by

$$Pwin(t)=1/2*\ell*A*V(t)^3*Cp*Effad$$

Where ℓ= air density(kg/m^3)

A =are as weptofrotor(m^2)

V =wind speed (m/s) and Effad=efficiency of the AC/DC Converter

The theoretical maximum value of the power coefficient Cpis0.59 and it is often expressed as function of the rotor tip-speed to wind-speed ratio (*TSR*). *TSR* is defined as the linear speed of the rotor to the wind speed.

TSR=□□*R/V*

Where *R* and □□ are the turbine radius and the angular speed, respectively. Whatever maximum value is attainable with a given wind turbine, it must be maintained constant at that value for the efficient capture of maximum wind power. Power is directly proportional to wind speed, as the wind speed increases the power delivered by a wind turbine also increases. If wind speed is between the rated wind speed and the furling speed of the wind turbine, the power output will be equal to the rated power of the turbine. Finally, if the wind speed is less than the cut-in speed or greater than the furling speed there will be no output power from the turbine.

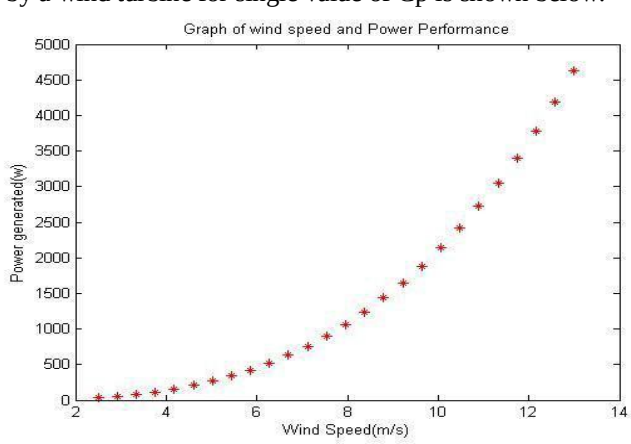
Power output from practical turbine:

The fraction of power extracted from the power in the wind by a practical wind turbine is usually given the symbol *Cp*, standing for the coefficient of performance. Using this notation and dropping the subscripts of q. the actual mechanical power output can be written as

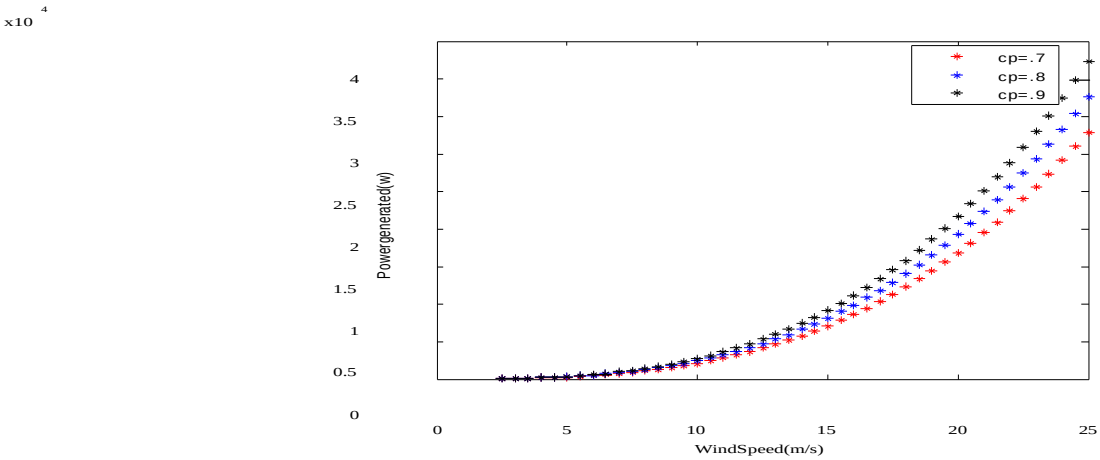
$$Pm=Cp(½\rho Au3)=CpPw$$

A. Mat Lab Programming of Wind Turbine

1) The graph for power generated by a wind turbine for single value of Cp is shown below.



2) The graph for power generated by a wind turbine for different value of Cp is shown below.



V. HYBRIDMODELOFPVSOLARANDWINDENERGY

The escalation in electric strength prices related to fossil and nuclear fuels, and improved public focus of ability environmental influences of traditional energy structures has created an expanded interest within the development and usage of trade sources. Picture voltaic and wind electricity are being increasable diagnosed as value powerful generation sources in small isolated strength systems. A sensible value advantage analysis calls for assessment fashions that recognize the exceptionally erratic nature of those energy resources at the same time as keeping the chronology and inter dependence of the random variables inherent in them. Presently we are able to take a look at very rapid improvement of recent electrical energy sources called renewable resources. These assets are environmentally pleasant and use primary electricity vendors like sun, wind and water flow, biogas, biomass etc.

The escalation in prices and environmental issues regarding conventional electric electricity assets has extended interest in renewable strength sources. Wind, solar PV and Biomass energy generations are feasible options for destiny power era. Besides being pollution unfastened, they're free routine prices. Additionally they provide energy supply answers for faraway areas, now not handy by using the grid deliver. Today, around 30,000 wind mills and more than 1, 00,000 off-grid solar PV structures are hooked up everywhere in the world. Hybrid systems can address boundaries in phrases of –

A. Fuel Flexibility

B. Efficiency

C. Reliability

D. Emissions

E. Economics

1) The hybrid system of solar/wind is environmental friendly.

2) Uses conventional energy resources.

3) Need of the hour to use conventional energy resources.

4) Efficient way of supplying electricity.

5) Wind speed and sunshine is different in different parts of the world.

Because the wind does now not blow all the time nor does the sun shine all of the time, sun and wind electricity on my own are negative strength resources. Hybridizing sun and wind energy resources together with garage gas cellular to cowl the intervals of time without sun or wind provides a practical shape of energy era. Land is a scarce resource in India and in step with capital land availability is low. Maybe dedication of land place for one of a kind installation of solar arrays ought to compete with other requirements that require land. The quantity of land required for utility-scale sun energy vegetation— presently approximately 1 km2 for each 20–60 megawatts (MW) generated may want to pose a stress on India's available land aid. The structure greater appropriate for maximum of India would be a pretty distributed set of person rooftop energy generation structures, all linked through a neighborhood grid. However, erecting such an infrastructure, which does not experience the economies of scale feasible in mass, application-scale, sun panel deployment, wishes the marketplace price of sun generation deployment to notably decline, so that it attracts the man or woman and common circle of relatives length family purchaser.

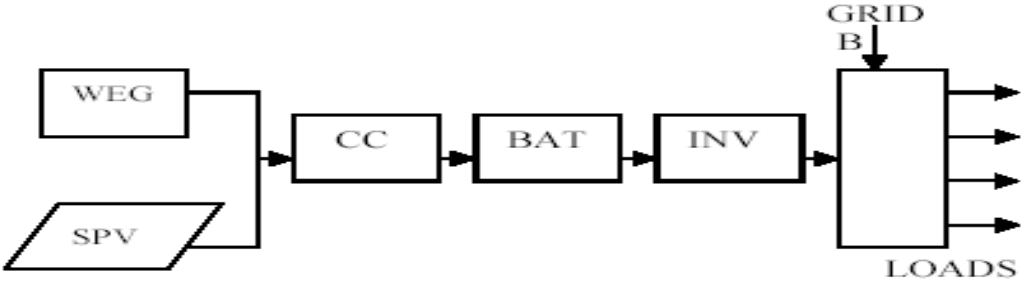
That might be feasible inside the destiny, because PV is projected to continue its contemporary cost reductions for the following

©IJRASET (UGC Approved Journal): All Rights are Reserved

many years and be able to compete with fossil gas. a few referred to assume-tanks advise that India have to undertake a coverage of growing solar strength as a dominant factor of the renewable electricity blend, in view that being a densely populated within the sunny tropical belt, the subcontinent has an appropriate combination of each high solar insulation and consequently a huge capacity consumer base density. In one of the analyzed situations, India can make renewable assets together with solar the backbone of its economic system through 2050, reining in its long-term carbon emissions without compromising its monetary boom capacity.

The standalone sun photovoltaic electricity machine cannot provide reliable energy during non-sunny days. The standalone wind machine cannot meet the consistent load demands because of full-size fluctuations within the value of wind speeds all through the year. Therefore, electricity storage structures could be required for each of those structures which will satisfy the electricity needs. Generally garage Machine is high-priced and the dimensions need to be reduced to a minimum viable for the renewable power device to be price powerful. Hybrid strength structures also can be used to lessen energy garage necessities. by way of integrating and optimizing the solar photovoltaic and wind systems, the reliability of the structures may be improved and the unit price of power may be minimized. In India the sun-Wind Hybrid electricity flora are technically permitted with the aid of the Ministry of recent and Renewable energy (MNRE). Those sun / Wind Hybrid strength plant life generate strength and can be an exchange source for the costly diesel generators that are run throughout the energy cuts and also in places where continuous EB deliver isn't available. The Returns on investment (ROI) of those initiatives are very much less and additionally with the principal monetary assistance furnished by way of the governments it is a lot quicker. With those systems we can generate, shop and use the energy as and while required and additionally for rural electrification.

The Solar Wind hybrid model block diagram is shown in the figure below:



Where,

Fig. Wind SPV Hybrid Energy Model Configuration.

WEG=wind energy generator SPV= solar photovoltaic panels CC=power conditioning units BAT=battery banks INV=inverter

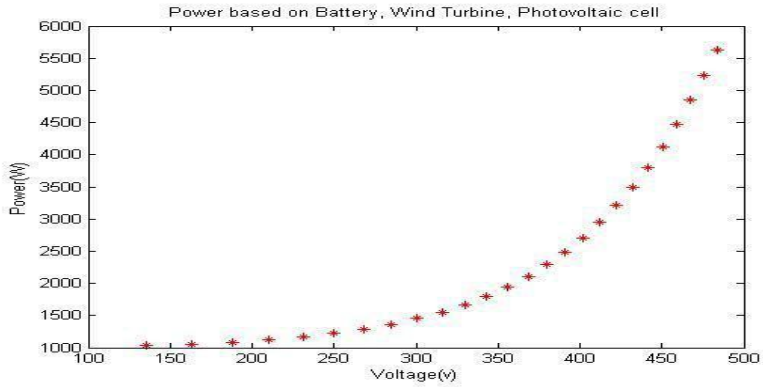
Combine power output power from a Wind and a PV module:

The total wind-and PV-generated power during each hour is first computed as follows:

$$P_{Gen}(t) = P_{Wind}(t) + N_{PV} \times P_{PV}(t)$$

Where NPV is the number of PV panels, and *P Wind (t)*is the power from the wind at time.

F. Mat lab Programming Of Hybrid Model With Using Battery



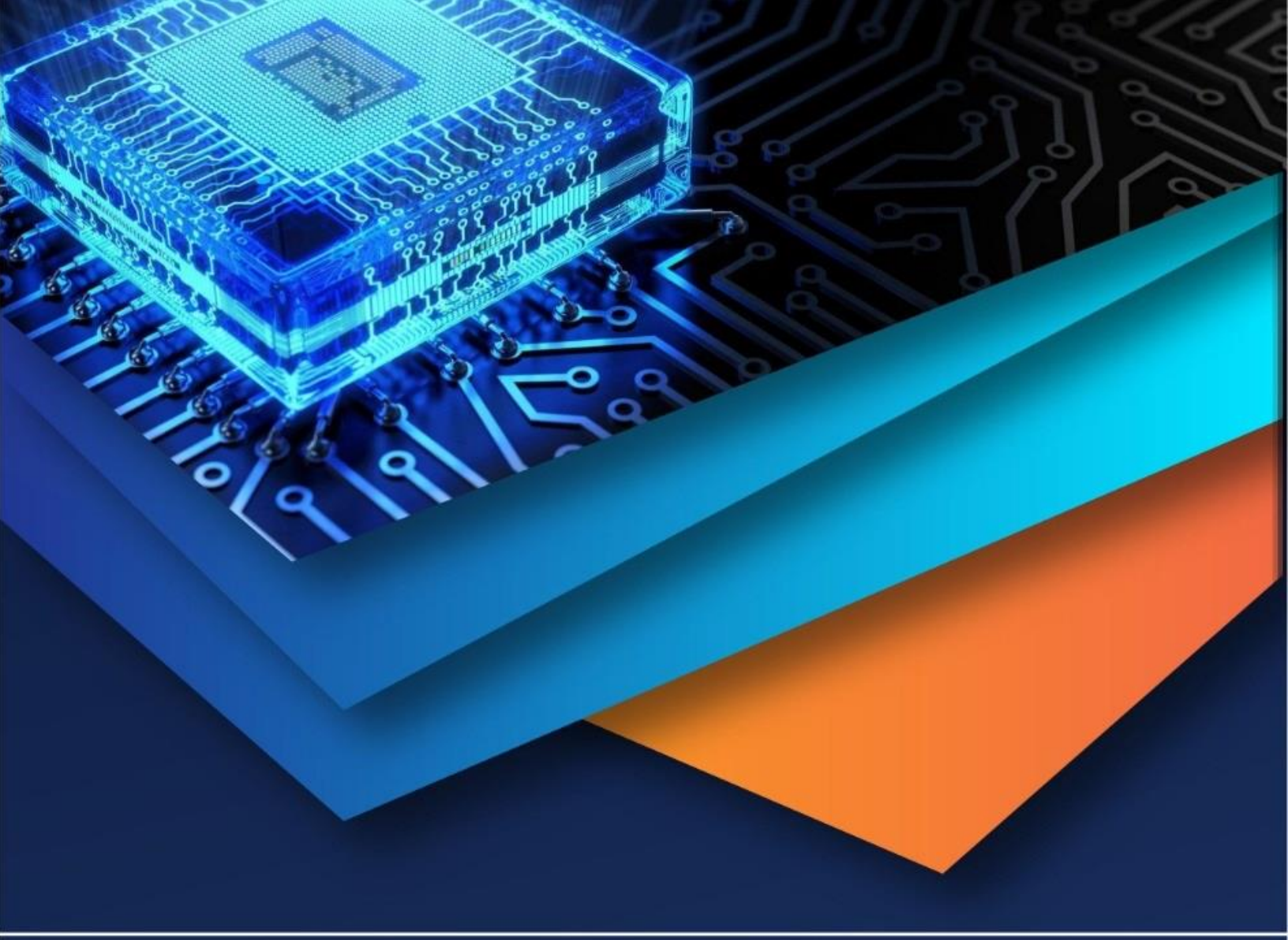
VI. CONCLUSIONS

Obviously, a complete hybrid power gadget of this nature can be too high priced and too hard work in depth for lots business era Departments. The improvements to guidance, in particular in making electrical strength measurements extra bodily, intuitive and real-world are sizable and the prices and hard work involved in a few model of the thoughts in this paper to a smaller scale setup are reasonable. In different locations, different energy sources could be used. as an example hybrid mixtures of wind power, sun electricity, geothermal electricity, hydroelectric electricity, tidal power, biomass generated strength, strength from incineration of strong wastes, and many other technologies may be taken into consideration relying on nearby interests and resources. The key detail of this take a look at mattress idea presented in this paper are or more renewable power resources connected to an energy grid with complicated electrical interactions.

REFERENCES

[1] J. Bhagwan Reddey, D.N. Reddy—Probablistic Performance Assessment of a Roof Top Wind, Solar Photo Voltaic Hybrid Energy System‖, Engineering Science and Education Journal, Vol. 2, No.4, pp. 281-298, February 2008.
[2] Stanley R. Bull, ―Renewable Energy Today and Tomorrow‖, Proceedings of the IEEE, vol. 89, no.8, pp.316-381, August 2001.
[3] R.Chedid&H.Akiki,―AdecisionSupportTechniquefortheDesignofHybridSolar-WindPowerSystem‖,IEEETransactionof EnergyConversionVol.13,No.1,pp.154-176, March 1998.
[4] Nabil A. Ahmed & Masafumi Miyatake,―A Stand-Alone Hybrid Generation System Combining Solar Photo voltic and Wind Turbine with Simple Maximum power Point Tracking Control‖.
[5] RiadChedid&SafurRahman,―UnitSizingandControlofHybridWindSolarPowerSystems‖,IEEETransactionofEnergyCon version,Vol.12,No.1, pp.181-195, March 1997.
[6] Jozef Paska, Piot & Biczel, Mariusz Klos,―Experience with Hybrid Power Generating System‖.
[7] RajeshGopinath,SangsunKim,Jae-HongHahn,PrasadNo.Enjeti,MarkB.Yeary andJoW.Howze,―DevelopmentofaLowCostFuelCellInverterSystemwithDSP Control‖,IEEETransactiononPowerElectronicVol19, No. 5pp.654-854,Sept.2004.
[8] Jin Wang, Fang Z. Peng, Joel Anderson, Alan Joseph and Ryan Buffen Barger,―Low System for Residential Power Generation‖. IEEE Transaction on Power Electronics, pp.660-687, Vo.19, No.5, Sept2009.
[9] J. Bhagwan Reddey, D.N. Reddy—Probablistic Performance Assessment of a Wind, solar Photo Voltaic Hybrid Energy System‖.
[10] Dr. Recayi Pecen, Dr. MDSalims, Dr. Marc Timmerman,―A Hybrid Sola-wind Power Generation System as an Instructional Resource for Industrial Technology Students‖,Vol.16,No.3,pp.565-600,May/July 2000.
[11] Sunny W.Y. Tam and Tom Chang,,―Kinetic Evolution and Acceleration of the Solar Wind‖, Geophysical research letter,Vol.26,No.20,pp.3189-3192,October1999.

©IJRASET (UGC Approved Journal): All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)