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Design Hybrid Wind-Solar Energy System Renewable Energy Sources like Wind and Photovoltaic Energies

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Abstract: ***Presently multi day's power is most required office for the individual. All the customary vitality assets are draining step by step. So we need to move from traditional to non-regular vitality assets. In this the blend of two vitality assets is happens for example wind and sun based vitality. This procedure upbraids the feasible vitality assets without harming the nature. We can give continuous power by utilizing half and half vitality framework. Essentially this framework includes the reconciliation of two vitality framework that will give ceaseless power. Sun oriented boards are utilized for changing over sun based vitality and wind turbines are utilized for changing over wind vitality into power. This electrical power can use for different reason. Age of power will be happens at reasonable expense. This paper manages the age of power by utilizing two sources join which prompts produce power with moderate expense without harming the nature balance.***

Keywords: Fuel cell, Photovoltaic, Wind energy conversion, Wind Turbines

I. INTRODUCTION

Power is most required for our everyday life. There are two different ways of power age either by ordinary vitality assets or by non-customary vitality assets. Electrical vitality request increments in word so to satisfy request we need to produce electrical vitality. Presently multi day's electrical vitality is created by the regular vitality assets like coal, diesel, and atomic and so forth. The primary downside of these sources is that it produces squander like slag in coal control plant, atomic waste in atomic power plant and dealing with this wastage is in all respects exorbitant. What's more, it additionally harms he nature. The atomic waste is extremely hurtful to person moreover. The traditional vitality assets are exhausting step by step. Before long it will be totally disappears from the earth so we need to discover another approach to create power. The new source ought to be dependable, contamination free and efficient. The non-regular vitality assets should be great elective vitality assets for the customary vitality assets. There are numerous non-customary vitality assets like geothermal, tidal, wind, sun oriented and so forth the tidal vitality has downsides like it can just executed on ocean shores. While geothermal vitality needs very ale venture to remove heat from earth. Sunlight based and wind are effectively accessible in all condition. The non-ordinary vitality assets like sun based, wind can be great elective source. Sunlight based vitality has disadvantage that it couldn't deliver electrical vitality in stormy and overcast season so we have to beat this downside we can utilize two vitality assets so any of source comes up short other source will continue producing the power. Also, in great climate condition we can utilize the two sources join.

II. HBBRID ENERGY SYSTEM

Half and half vitality framework is the blend of two vitality hotspots for offering capacity to the heap. In other word it can characterized as "Vitality framework which is created or intended to remove control by utilizing two vitality sources is called as the mixture vitality framework." Hybrid vitality framework has great unwavering quality, effectiveness, less outflow, and lower cost. In this proposed framework sunlight based and wind control is utilized for creating power. Sun oriented and wind has great points of interest than other than some other non-traditional vitality sources. Both the vitality sources have more noteworthy accessibility in all territories. It needs lower cost. There is no compelling reason to discover unique area to introduce this framework.

A. Solar Energy

Sun based vitality is that vitality which is gets by the radiation of the sun. Sun based vitality is available on the earth persistently and in plenteous way. Sun oriented vitality is uninhibitedly accessible. It doesn't deliver any gases that mean it is sans contamination. It is moderate in expense. It has low support cost. Just issue with nearby planetary group it can't create vitality in terrible climate condition. In any case, it has more prominent proficiency than other vitality sources. It just needs beginning speculation. It has long life expectancy and has lower emanation.

B. Wind Energy

Wind vitality is the vitality which is removed from wind. For extraction we use wind factory. Ii is sustainable power sources. The breeze vitality needs less expense for age of power. Upkeep cost is likewise less for wind vitality framework. Wind vitality is available very nearly 24 hours of the day. It has fewer outflows. Beginning expense is additionally less of the framework. Age of power from wind is rely on the speed of wind streaming. The significant detriments of utilizing free sustainable power source assets are that inaccessibility of intensity forever. For conquering this we utilize sun oriented and wind vitality together. With the goal that any one wellspring of intensity comes up short other will deal with the age. In this proposed framework we can utilize the two sources join. Another way is that we can utilize any one source and keep another source as a remain by unit. This will prompts progression of age. This will make framework dependable. The primary detriments of this framework are that it needs high introductory expense. Then again, actually it is dependable, it has fewer outflows. Kept up expense is less. Life expectancy of this framework is more. Proficiency is more. A primary preferred standpoint of this framework is that it gives persistent power supply

III. DESIGN OF HYBRID ENERGY SYSTEM

For design of the hybrid energy system we need to find the data as follows

A. Data required for Solar System

1) Annual mean daily duration of Sunshine hours

2) Daily Solar Radiation horizontal (KWH/m2/day)

B. Data required for Wind System

1) Mean Annual Hourly Wind Speed (m/sec)

2) Wind Power that can be generated from the wind turbine

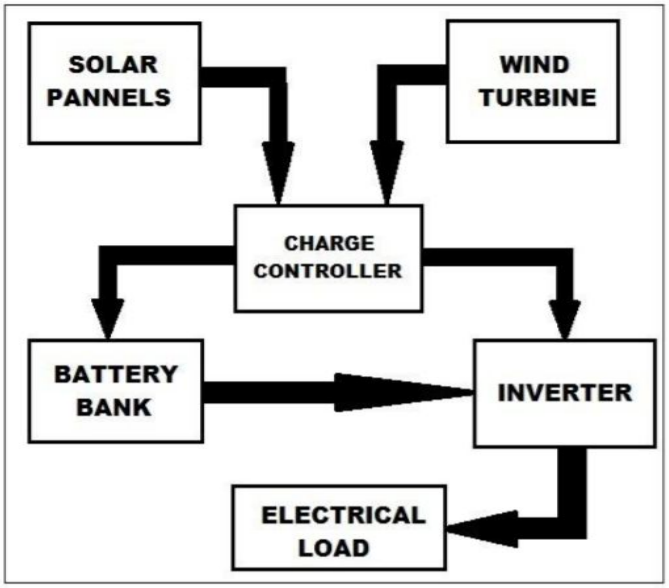

Figure 1: Block diagram of Hybrid energy generation system

Above figure shows the block diagram of the hybrid power generation system using wind and solar power. This block diagram includes following blocks.

a) *Solar Panel:* Sun based board is use to change over sunlight based radiation to the electrical vitality. The physical of PV cell is fundamentally the same as that of the established diode with a PN intersection shaped by semiconductor material. At the point when the intersection ingests light, the vitality of assimilated photon is exchanged to the electron proton arrangement of the material, making charge bearers that are isolated at the intersection. The charge bearers in the intersection district make a potential inclination; get quickened under the electric field, and course as flow through an outside circuit. Sunlight based exhibit or board is a gathering of a few modules electrically associated in arrangement parallel blend to produce the required flow and voltage. Sun oriented boards are the medium to change over sunlight based power into the electrical power.

b) *Wind Turbine:* Wind turbine is that framework which separates vitality from wind by turn of the sharp edges of the breeze turbine. Fundamentally wind turbine has two sorts one is vertical and another is even. As the breeze speed expands control age is likewise increments. The power produced from wind isn't persistent its fluctuating. For acquire the non-fluctuating force we need to store in battery and afterward give it to the heap.

c) *Charge Controller:* Charge controller has essential capacity is that it control the source which is to be dynamic or dormant. It at the same time charge battery and furthermore offers capacity to the heap. The controller has over-charge security, hamper, shaft perplexity assurance and programmed dump load work. It additionally the capacity is that it ought to change the power according to the heap request. It include the both the power so the heap request can satisfy. What's more, when control isn't producing it should remove control from battery and offer it to the heap.

IV. CHARACTERISTICS OF PV SYSTEM

The photovoltaic cell changes over the light vitality into electrical vitality relying upon the illumination of the sun and temperature in the environment. Fundamentally PVC is a PN intersection diode [3] [4]. Be that as it may, in PN intersection diode DCI AC source is expected to work, however here light vitality is utilized as a source to create DC yield. PVC is a present control source not a voltage control source. The identical electrical circuit graph of PVC is appeared in the Figure 2.

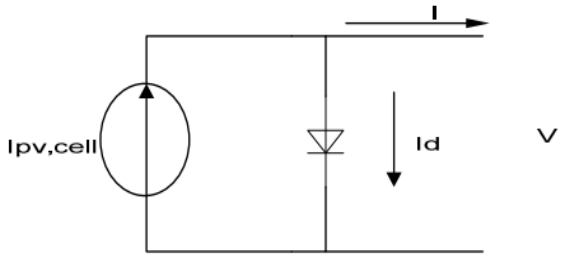

Figure 2: Show ideal photovoltaic cell equivalent circuit

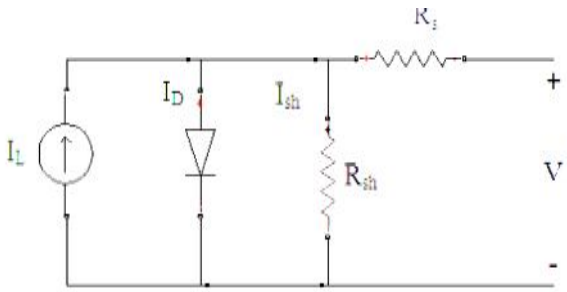

Figure 3: Equivalent Electrical Circuit of PVC

$$I_D = I_0[\exp(V + IR_S)/KT - 1] \quad (1)$$

Therefore PVC output current is given in equation 2.

$$I = I_L - I_D - I_{Sh} \quad (2)$$

$$I = I_L - I_0[\exp(q(V + IR_S))/KT - 1] - (V + IR_S)/R_{Sh} \quad (3)$$

Where I_D the diode is current, R_{sh} is the shunt resistance, I_L is the light generated current of solar array. Sun powered cell is fundamentally a p-n intersection manufactured in a slender wafer or layer of semiconductor. The electromagnetic radiation of sun powered vitality can be specifically changed over power through photovoltaic impact. Being presented to the daylight, photons with vitality more prominent than the band-hole vitality of the semiconductor are assimilated and make some electron-gap sets corresponding to the occurrence light. Affected by the interior electric fields of the p-n intersection, these transporters are cleared separated and make a photocurrent which is specifically corresponding to sunlight based insolation. PV framework normally shows a nonlinear I-V and P-V qualities which fluctuate with the brilliant force and cell temperature.

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V. WIND ENERGY SYSTEMS

Wind vitality has the greatest offer in the sustainable power source part [1], [3]. In the course of recent years, lattice associated wind limit has dramatically increased and the expense of intensity created from wind vitality based frameworks has decreased to one-6th of the comparing an incentive in the mid-1980s [3]. The critical highlights related with a breeze vitality transformation framework are:

A. Available wind energy
B. Type of wind turbine employed
C. Type of electric generator and power electronic circuitry employed for interfacing with the grid.

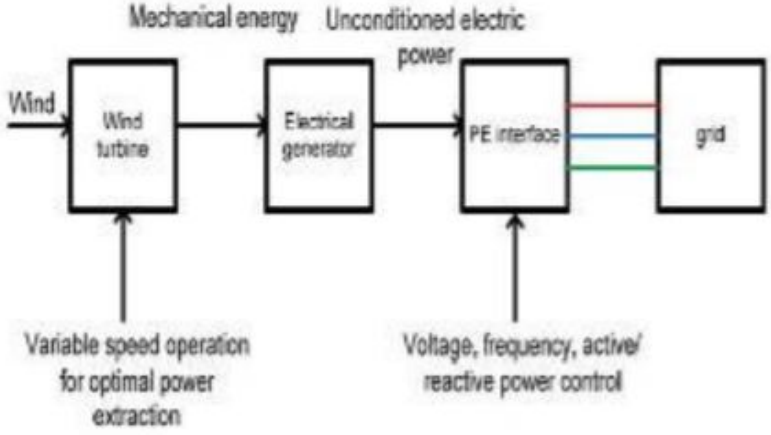

Figure 4: Variable speed wind energy conversion system

Wind vitality – Wind speeds, gaseous tension, environmental temperature, earth surface temperature and so on., are profoundly between connected parameters. Because of the characteristic multifaceted nature, it is unreasonable to expect a careful material science based forecast system for wind power/maintainability. Be that as it may, circulation based models have been proposed, and utilized to foresee the supportability of wind vitality change frameworks [4]. Point by point clarification of the breeze vitality assets is past the extent of this paper. In view of studies it has been accounted for that the variety of the mean yield control from a multi-year time frame to the following has a standard deviation of under 0.1 [4]. It very well may be finished up with sensible certainty that breeze vitality is a reliable wellspring of clean vitality. In view of the streamlined rule used, wind turbines are arranged into drag based and lift based turbines. In light of the mechanical structure, they are arranged into flat hub and vertical pivot wind turbines. Regarding the pivot of the rotor, wind turbines are grouped into fixed speed and variable speed turbines. By and by the emphasis is on even hub, lift based variable speed wind turbines [2], [3].

Power electronic circuits assume a urgent empowering job in factor speed based breeze vitality change frameworks. Fixed speed wind turbines are easy to work, solid and powerful. Anyway the speed of the rotor is fixed by the framework recurrence. As result, they can't pursue the ideal streamlined productivity point. If there should arise an occurrence of changing breeze speeds, fixed speed wind turbines can't follow the ideal power extraction point. In factor speed wind turbines, control electronic hardware in part or totally decouples the rotor mechanical recurrence from the lattice electrical recurrence, empowering the variable speed task. The sort of electric generator utilized and the network conditions manage the prerequisites of the power electronic (PE) interface. Fig. 1 delineates a variable speed wind vitality transformation framework. The electrical generator prominently e m p l o y e d for halfway v a r I a b l e speed wind vitality transformation frameworks are doubly-bolstered acceptance generators [5]. Fig. 2 portrays a doubly-bolstered acceptance generator where the rotor circuit is constrained by the power converter framework through the slip rings and the stator circuit is associated with the lattice. This technique is beneficial as the power converter needs to deal with a part ~ 25% - 50 % of the complete intensity of the framework [5]. The power converter framework utilizes a rotor side air conditioning dc converter, a dc interface capacitor, and a dc-air conditioning inverter associated with the lattice as appeared in Fig.

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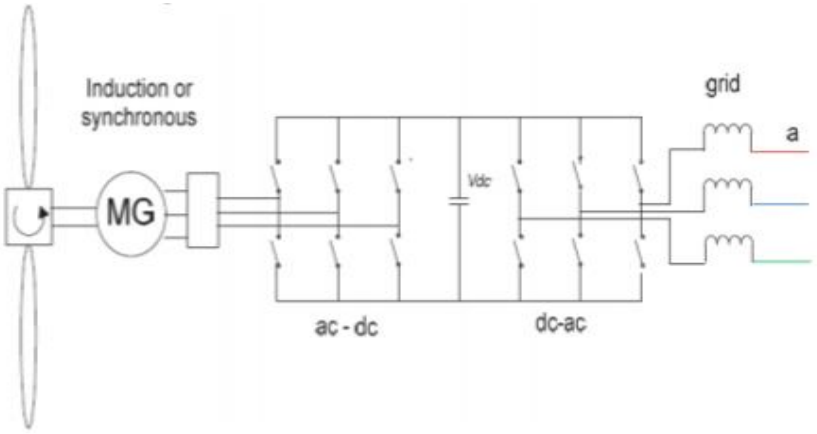


Figure 5: Fully variable wind energy conversion system

VI. PROPOSED CALCULATION

The total power generated by this system may be given as the addition of the power generated by the solar PV panel and power generated by the wind turbine.
Mathematically it can be represented as,

$$P_T = N_w \times P_w + N_s \times P_s \quad (4)$$

Where,
P_T is the total power generated
P_W is the power generated by wind turbines
P_S is the power generated by solar panels
N_w is the no of wind turbine
N_s is the no of solar panels used

A. Calculations for Wind Energy

The power generated by wind energy is given by,
Power = (density of air * swept area * velocity cubed)/2

$$P_w = \frac{1}{2}\rho(A_w)(V)^3 \quad (5)$$

Where,
P is power in watts (W)
ρ is the air density in kilograms per cubic meter (kg/m³)
A_W is the swept area by air in square meters (m²)
V is the wind speed in meters per second (m/s).

B. Calculations for Solar Energy

To determine the size of PV modules, the required energy consumption must be estimated. Therefore, the power is calculated as

$$P_s = I_{ns}(t) \times A_s \times Eff\ (pv) \quad (6)$$

Where, Ins (t) = isolation at time t (kw/ m2)
A_S = area of single PV panel (m2)
Eff(pv) = overall efficiency of the PV panels and dc/dc converters.
Overall efficiency is given by,

$$Eff\ (pv) = H \times PR \quad (7)$$

Where,
H = Annual average solar radiation on tilted panels.
PR = Performance ratio, coefficient for losses.

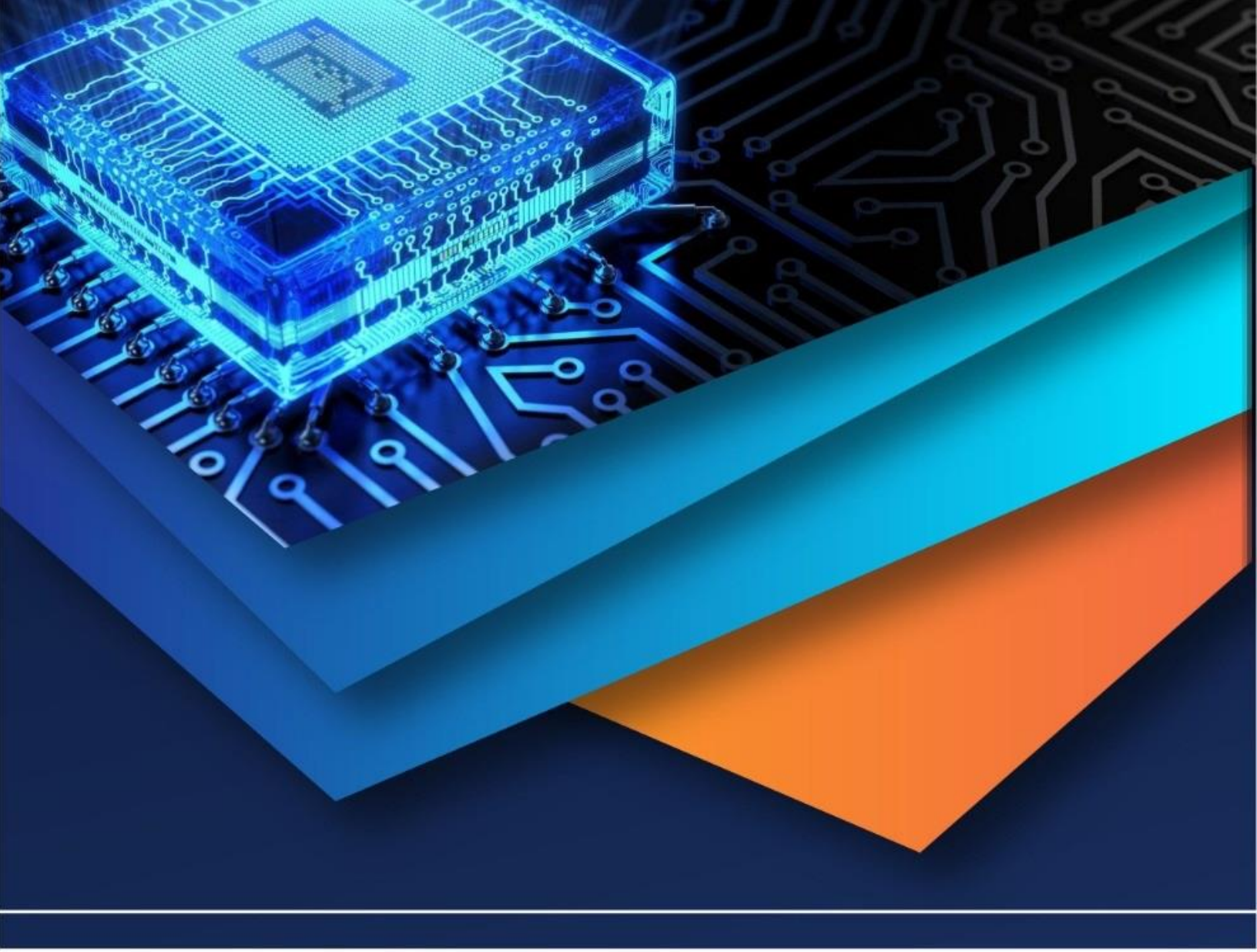
VII. CONCLUSION

Half breed control age framework is great and viable answer for power age than traditional vitality assets. It has more noteworthy proficiency. It can give to remote spots where government can't reach. So the power can be use where it created with the goal that it will diminish the transmission misfortunes and cost.

Cost decrease should be possible by expanding the creation of the hardware. Individuals ought to rouse to utilize the non-traditional vitality assets. It is profoundly ok for the earth as it doesn't deliver any discharge and unsafe waste item like customary vitality assets. It is savvy answer for age. It just need introductory venture. It has additionally long life expectancy.

REFRENCES

[1] Joanne Hui, Alireza Bakhshai, and Praveen K. Jain, "A Hybrid Wind-Solar Energy System: A New Rectifier Stage Topology," IEEE Conference, February 2010.
[2] Trishan Esram, and Patrick L. Chapman, "Comparison of Photovoltaic Array Maximum Power Point Tracking Technique," IEEE Trans. on energy conversion, vol. 22, no. 2, june 2007.
[3] [Cody A. Hill, Matthew Clayton Such, Dongmei Chen, Juan Gonzalez, and W.Mack Grady, "Battery Energy Storage for Enabling Integration of Distributed Solar Power Generation," IEEE Transactions on smart grid, vol. 3, no. 2, June 2012.
[4] Hao Qian, Jianhui Zhang and Jih-Sheng Lai, "a grid-tie battery energy storage system," IEEE Conference, June 2010.
[5] Sharad W. Mohod, and Mohan V. Aware, "Micro Wind Power Generator With Battery Energy Storage For Critical Load," IEEE systems journal, vol. 6, no. 1, march 2012
[6] S.K. Kim, J.H Jeon, C.H. Cho, J.B. Ahn, and S.H. Kwon, "Dynamic Modeling and Control of a Grid-Connected Hybrid Generation System with Versatile Power Transfer," IEEE Transactions on Industrial Electronics, vol. 55, pp. 1677-1688, April 2008.
[7] Nabil A, Ahmed and Masafumi Miyatake, "A Stand – Alone Hybrid Generation System Combining Solar Photovoltaic and Wind Turbine with Simple Maximum Power Point Tracking Control," IEEE Conference, August 2006.
[8] S. Jain, and V. Agarwal, "An Integrated Hybrid Power Supply for Distributed Generation Applications Fed by Nonconventional Energy Sources," IEEE Transactions on Energy Conversion, vol. 23, June 2008.
[9] Matthew Clayton Such, Cody Hill, "Battery Energy Storage and Wind Energy Integrated into the Smart Grid," IEEE Conference, January 2012.
[10] Hao Qian, Jianhui Zhang, Jih-Sheng (Jason) Lai,Wensong Yu, "A High-Efficiency Grid-Tie Battery Energy Storage System," IEEE transactions on power electronics, vol. 26, no. 3, march 2011
[11] Niraj Garimella and Nirmal-Kumar C. Nair, "Assessment of Battery Energy Storage Systems for Small-Scale Renewable Energy Integration," IEEE Conference, January 2009.
[12] Dezso Sera, Tamas Kerekes, Remus Teodorescu and Frede Blaabjerg, "Improved MPPT Algorithms for Rapidly Changing Environmental Conditions," IEEE Conference, September 2006.



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