

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 8, Issue 8, August 2019

## A Hardware Testbed of Grid Connected Wind Solar Power System

Ashok Kumar Yadav, Harish Maheshwari

Research Scholar (Power System), RIET, Jaipur, India

Assistant Professor, RIET, Jaipur, India

**ABSTRACT:** Energy is crucial when it comes to development of economy and advancement of any nation on social basis. Native sources of energy are required to be investigated so as to get optimum level to eliminate dependency on foreign fuels, bounded by resolving economic, social as well as environmental aspects. This results in rapid growth in the research and investigation and additionally speculation in renewable form of energy industries in such a manner that fulfills the demand in energy and minimizes the dependency on fossils.

Wind as well as solar form of energy are emerging due their huge availability and ease in reachability so as to generate electricity. The present work aims on the distributed hybrid renewable form of energy system which comprises of wind and solar energies.

### I. INTRODUCTION

Human beings have utilized the energy of wind as source for several decades. Along with combination of hydro power, it has been utilized as form of energy for many years [1]. In the later years of the 19<sup>th</sup> century, several experiment were conducted to run and generate electricity using windmills which was the result as the growing field in the sector of electrical engineering.

Then after the power of wind has been grown rapidly specifically in the later 30 years. In the year 1999, more than 10000 MW capacity of wind power was implemented across the world. The present year also gives the data where wind power plants are installed more compared to the nuclear plants.

Electrical energy is bought in the same way as any other item or product is imported in the market and thus its quality is determined. They are often termed as Power quality standards in with reference to electric power. Any device that is connected to the grid of electricity should be at the level of these standards so as to particularly overcome the important problems when occurs at the time when windmills are installed, the type of wind flow and the electricity parameters all together as per the standards.

### II. PV CELLS

The energy from solar can be transformed in two types, which are solar thermal and solar photovoltaic energy

- Solar Thermal: it is almost similar to the generation of traditional AC generation by steam turbine, but the only difference is at the place of fossil fuels it captures heat comprising the concentrated solar illuminations. This heat is used to produce steam and is kept in thermally insulated tanks and is used during intervals of sunlight or at night.
- Solar Photovoltaic: it use cells that are made up of some sort of semiconductor materials mostly silicon that absorbs energy from incident sunshine in DC electricity. To make up for night time or when there is an intermittency of sunlight, the energy generated is required to be stored into a battery.

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 8, Issue 8, August 2019

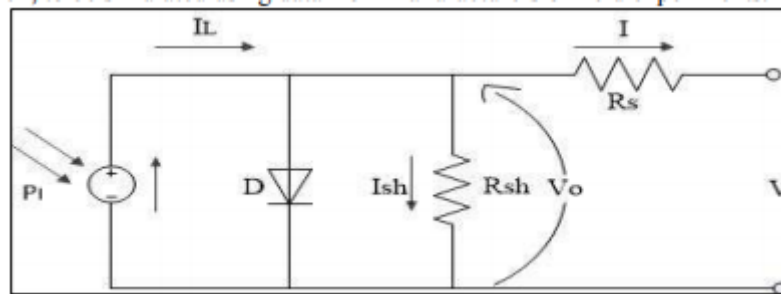


Fig.1 Equivalent electrical circuit of PV module

### III. OUTLINE COMPRISING GENERATION AND TRANSMISSION OF WIND POWER

The system for preserving the wind power transforms the wind energy to electrical form of energy, that is imposed in the grid of electricity. The linking of the turbines of the wind along with the grid might be at lower voltage, higher voltage, and medium type voltage including the system of extra high voltage. As maximum turbines are linked to medium type voltage in the grid, the future of big wind farm plants might possess to be linked with higher and extra high system of voltage (transmission framework).

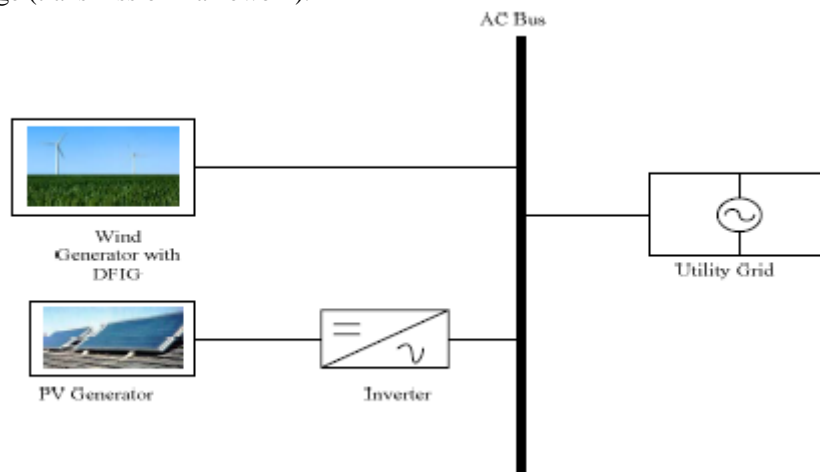


Fig. 2 Block Diagram of Proposed work

### IV. COMPONENTS OF FRAMEWORK

The rotor of turbine, box comprising gear, as well as generator are the primary three parts for preserving the energy. The rotor, that is the part which is driving in the transformation of system, transforms the energy of wind to mechanical form. The generator along with the fluctuating speed to the turbines including an inverter of electronic type absorbs the mechanical form of power from the rotor, transforming in electrical form and then imposing in the transmission grid. The box comprising the gear is utilized to adapt the speed of rotor to the speed of the generator it is needed.

The basic parts of the grid to have linking of the wind turbines are the transformer along with the sub station that has the precautionary tools and the electric meter within. The wind turbines in the farm have their separate transformer as the losses are comparatively high among the voltage lines. They transform the level of voltage from the turbine to medium level of voltage on the system dispersion. To neglect on going low cables of voltage the transformers are situated at the turbine side directly. In smaller turbines it is possible to link them to the lower voltage directly to the

## International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

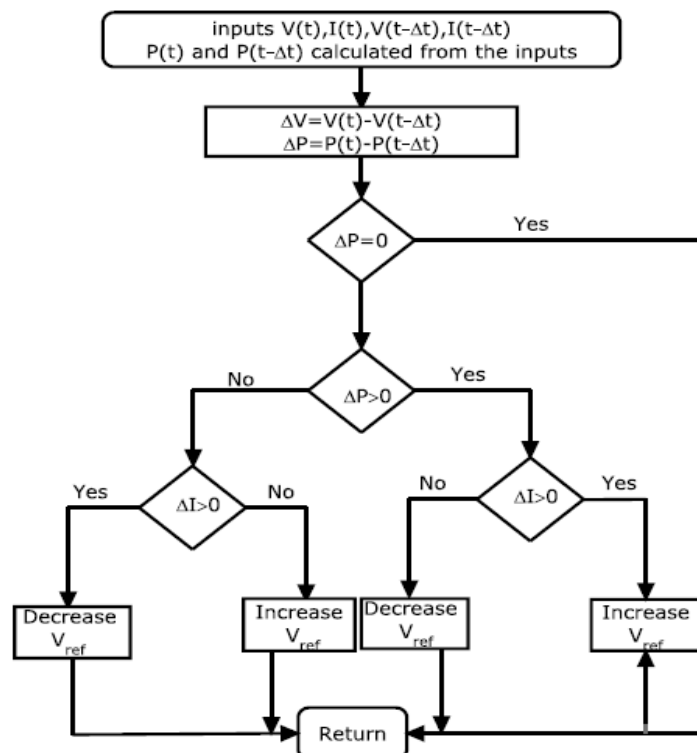
Vol. 8, Issue 8, August 2019

grid and no transformer is needed. A farm of wind comprising small turbines might utilize single transformer to link to the grid. For every big farm that have high power a separate substation is required for the conversion of medium voltage to high voltage liner.

Among a single turbine wind and grid, the common point of coupling PCC is a circuit breaker which is to be implemented to give non-linking ability at times of faults. The circuit breaker is generally situated at the voltage that is medium within a sub station, altogether with the meter. The meter comprises of self voltage and transformers of current. Based on the single situations the on going system of transmission the linking to the grid might be carried out as feeder of radial type or type of a ring.

### Method of Perturbation Observation (P&O)

According to the modifications comprising power the pathway of perturbation is investigated. If there is alteration in power that is positive then the value of the voltage will increase in right hand side direction and if it turn out to be negative then it will go on the other direction thus declining the voltage. Hence, the direction of the perturbation is fixed weather the voltage in the existing system is higher compared to the previous ones, as per which the alteration in power regulating the signal for control is calibrated by PWM. As per the algorithm, the process is initially steady until it attains the speed of steady state. The regulation action might hinder the output power attained the maximum values.



**Fig.3 Flow Chart of (P&O) Algorithms**

From the flowchart it is summarized that:

When  $dp > 0$  and  $dv > 0$ , which illustrates that power is in the left side of MPP and thus the voltage is higher, similarly when  $dp < 0$  and  $dv > 0$  power is right side of MPP and thus the voltage is declined. At  $dp = 0$  that is the maximum powerpoint

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 8, Issue 8, August 2019

The inverter changes over the DC yield from non-customary vitality into valuable AC control for the associated burden. This cross breed framework works under typical conditions which incorporate ordinary room temperature on account of sun powered vitality and ordinary breeze speed at plain region on account of wind vitality. The reenactment results are exhibited to represent the working guideline, practicality and unwavering quality of this proposed framework.

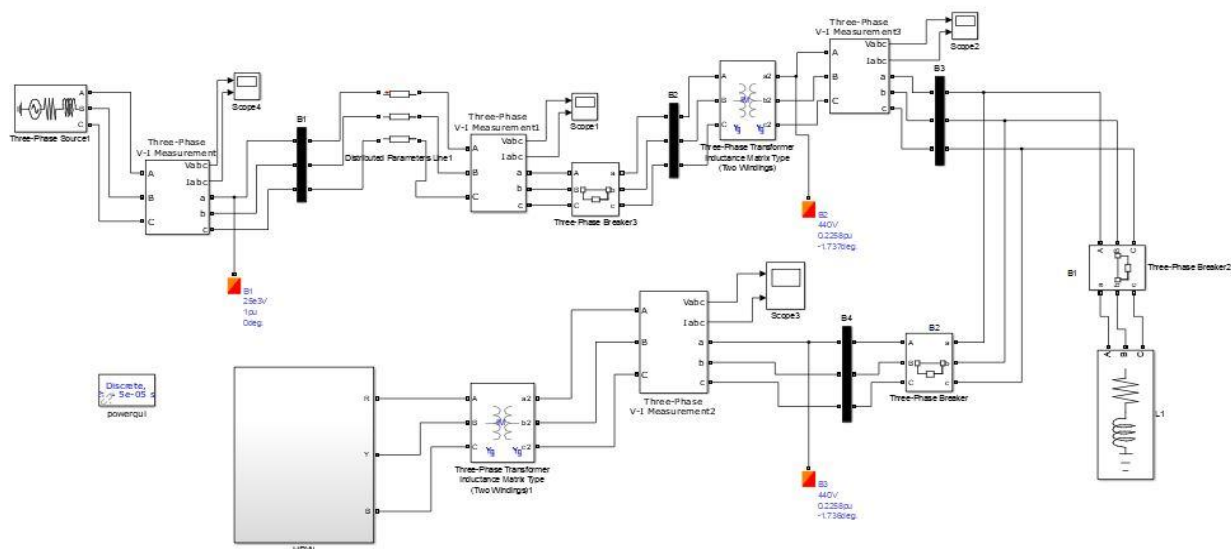


Fig.4 Proposed Model of Grid Connected wind solar power system

## V. SIMULATION RESULTS

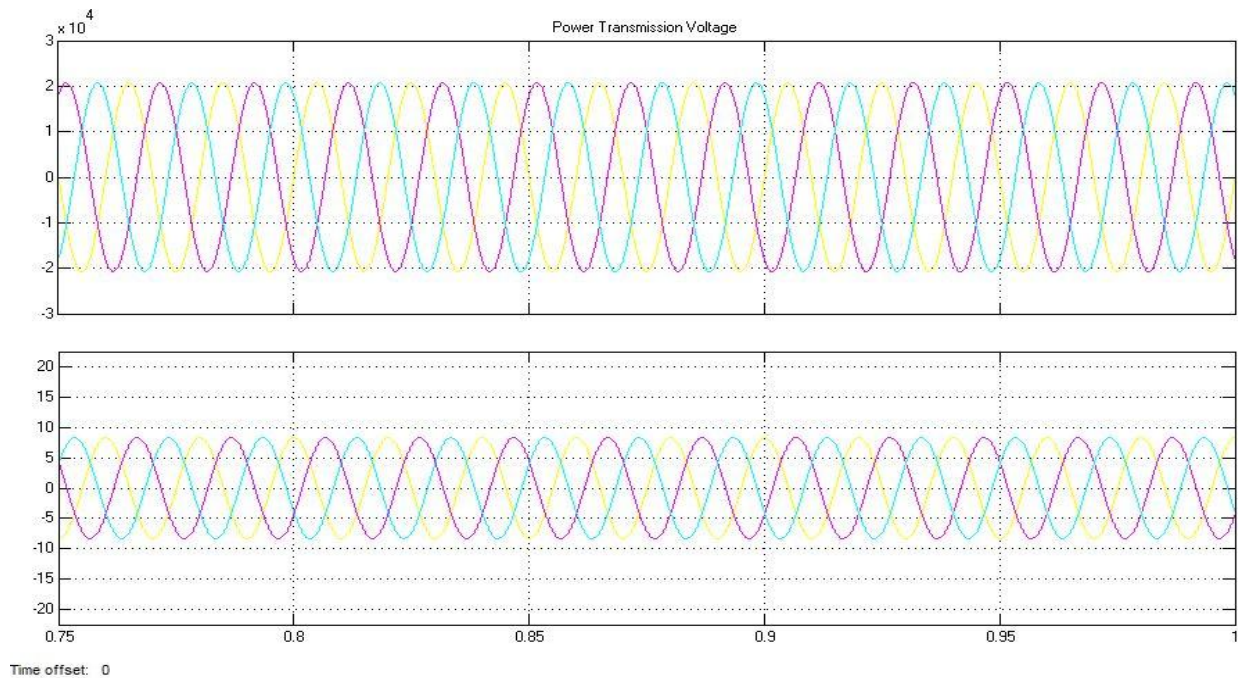
The primary aim was to generate self sufficient and effective hybrid system that can be utilized for commercial as well as household purpose and hence being cost effective that elevates more utilization of green energy. The research in the dissertation is dependent on the charge controller which traces the maximum power output from the solar cells apparatus. This is enabled by utilizing P&O algorithm and transmits that power to the load respectively. Attempts was made to work out a hybrid system working on solar and wind in connection with grid.

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 8, Issue 8, August 2019



**Fig. 5 Power Transmission voltage**

## VI. CONCLUSION

A model of PV module is created and analysed in changing temperature and irradiation. Design and simulation of boost converter is done. To alter the pulse from gate comprising high frequency MPPT algorithm with boost converter is utilized.

The MPPT techniques that is P&O strategies are utilized for most extreme PowerPoint following. The calculations from P&O method is non-complex in function and need few hardware input in comparison to the process of incremental conductance, however the losses in power is big in this process with respect to incremental conductance as the result parameters from the range of PV fluctuates in the MPP. So as to accomplish most extreme productivity of

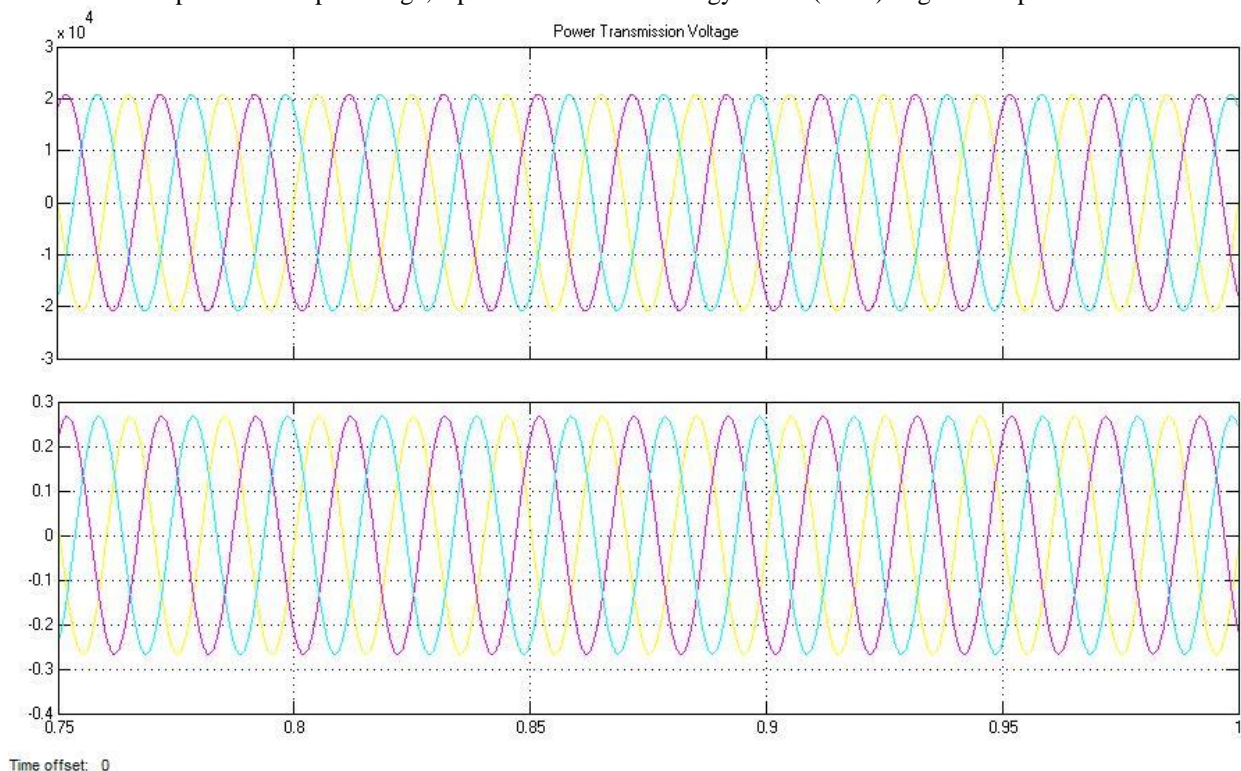
## International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 8, Issue 8, August 2019

photovoltaic power age, a proficient control strategy that is (P&O) ought to be picked



**Fig. 6 Power Transmission voltage of distributed generation**

### VII. CONCLUSION

A model of PV module is created and analysed in changing temperature and irradiation. Design and simulation of boost convertor is done. To alter the pulse from gate comprising high frequency MPPT algorithm with boost convertor is utilized.

The MPPT techniques that is P&O strategies are utilized for most extreme PowerPoint following. The calculations from P&O method is non-complex in function and need few hardware input in comparison to the process of incremental conductance, however the losses in power is big in this process with respect to incremental conductance as the result parameters from the range of PV fluctuates in the MPP. So as to accomplish most extreme productivity of photovoltaic power age, a proficient control strategy that is (P&O) ought to be picked

### REFERENCES

- [1.] Abderrahim, T. and Said, B. (2017) 'Control and Management of Grid Connected PV-Battery Hybrid System Based on Three- level DCI', pp. 439-444.
- [2.] Al-durra, A., Reznik, A. and Muyeen, S. M. (2014) 'Performance Analysis of a Grid-tied Inverter for Renewable Energy Applications'.
- [3.] Chen, F. (2012) 'Modeling Grid Connection for Solar and Wind Energy', pp. 1-6.
- [4.] Dali, M., Belhadj, J. and Roboam, X. (2010) 'Hybrid solar e wind system with battery storage operating in grid - connected and standalone mode: Control and energy management e Experimental investigation V bat', *Energy*. Elsevier Ltd, 35(6), pp. 2587-2595. doi: 10.1016/j.energy.2010.03.005.
- [5.] Gupta, P. and Tripathi, S. K. (2014) 'Analysis of Grid-Tied Hybrid Wind PV Generation System', (November), pp. 447-451.
- [6.] Hassan, S. Z. *et al.* (2015) 'Stand-alone / Grid-tied Wind Power System with Battery / Supercapacitor Hybrid Energy Storage', (DI), pp. 1-6.

## International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: [www.ijirset.com](http://www.ijirset.com)

Vol. 8, Issue 8, August 2019

- [7.] Mahmud, N., Zahedi, A. and Mahmud, A. (2016) 'Dynamic voltage regulation of grid-tied renewable energy system with ANFIS'.
- [8.] P, L. R. S. *et al.* (2014) 'Design and Simulation of Grid Connected Hybrid Solar-WECS Using SIMULINK / MATLAB', pp. 241–247.
- [9.] Patel, S., Prajapati, N. and Patel, T. (2016) 'Grid Connected Solar and Wind Hybrid System', 2(12), pp. 300–307.
- [10.] Phap, V. M., Yamamura, N. and Ishida, M. (2016) 'Design of Novel Grid-Tied Solar - Wind Hybrid Power Plant Using Photovoltaic Cell Emulating System', (1), pp. 186–189.
- [11.] Soetedjo, A. *et al.* (2017) 'A Hardware Testbed of Grid-Connected Wind-Solar Power System', 1(2), pp. 52–56.
- [12.] Soysal, O. A. (2014) 'Case Study : Performance of a Small Grid-Tie Wind-Solar Generation System', (2007), pp. 2007–2008.