International Journal of Scientific Research & Engineering Trends
Volume 5, Issue4, July-Aug-2019, ISSN (Online): 2395-566X

Design and Implementation of Wind-Solar Hybrid Power Generation System

M.Tech. Scholar Akshay Chouhan, Asst. Prof. Deepak Bhataniya
Department of Electrical and Electronics Engineering
Jawaharlal Institute of Technology
Borawan, MP, Khargone, India

Abstract **- The ongoing upsurge in the interest of PV (AC/DC SMART GRID) frameworks is because of the way that they produce electric power without hampering nature by straightforwardly changing over the sun oriented radiation into electric power. Anyway the sun oriented radiation never stays consistent. It continues changing for the duration of the day. The need of great importance is to convey a consistent voltage to the network regardless of the variety in staggered inverter. We have planned a circuit to such an extent that it conveys steady and ventured up dc voltage to the heap. We have examined the open circle attributes of the PV exhibit with variety in staggered inverter levels. At that point we coupled the PV exhibit with the lift converter so that with variety in burden, the changing info current and voltage to the converter pursues the open circuit normal for the PV cluster intently. At different disconnection levels, the heap is shifted and the comparing variety in the info voltage and current to the lift converter is noted. It is noticed that the changing info voltage and current pursues the open circuit qualities of the PV exhibit intently.**

Keywords-**PV, AC/DC SMART GRID**

I. INTRODUCTION

The Conventional wellsprings of vitality are quickly exhausting. In addition the expense of vitality is rising and in this way photovoltaic framework is a promising option. They are rich, contamination free, dispersed all through the earth and recyclable. The block factor is it's high establishment cost and low change effectiveness. In this manner our point is to build the effectiveness and power yield of the framework. It is likewise necessitated that steady voltage be provided to the heap independent of the variety in sun based irradiance and temperature.

PV clusters comprise of parallel and arrangement blend of PV cells that are utilized to create electrical power contingent on the air conditions (e.g sun powered illumination and temperature). So it is important to couple the PV exhibit with a lift converter. In addition our framework is planned so that with variety in burden, the adjustment in info voltage and power sustained into the converter pursues the open circuit qualities of the PV cluster.

Our framework can be utilized to supply steady ventured up voltage to dc loads. As electric dispersion innovation ventures into the following century, numerous patterns are getting to be detectable that will change the prerequisites of vitality conveyance. These changes are being driven from both the interest side where higher vitality accessibility and proficiency are wanted and from the supply side where the coordination of dispersed age and pinnacle shaving advances must be obliged [1]. Today electrical power request is especially expanding. So to create the required power, assets utilized for this design are additionally increment. Subsequently legitimate use of intensity is required at whatever point surplus power is accessible. This can be accomplished by putting away the surplus power through batteries as DC and this put away vitality can be re-used by the change gadget called it as "INVERTER" by changing over DC control into AC control. The sustainable power sources have been colossally expanding its creation, out of every one of those sustainable power sources sun based is prevalent and it needs an inverter for the change. The staggered inverters are the headway in power gadgets. Presently a-days staggered inverters in writing are refreshing as per the powerful ability. Henceforth, staggered inverters are fit for having great voltage range and low voltage stress gadgets. Power electronic inverters are getting to be mainstream for different modern drives applications. Lately, inverters have even turned into a need for some usage, for example, engine controlling and control frameworks [2].

II. OBJECTIVES OF THIS WORK

- To propose and build up a cross breed AC/DC miniaturized scale lattice (with blend of Photovoltaic PV and a hydrogen stockpiling framework as reinforcement) that comprises of both air conditioning and dc systems associated together by bidirectional converter.
- The Proposed Hybrid smaller scale framework would improve the dynamic execution of the Grid associated PV

System (GPV (AC/DC SMART GRID) S) in multi day ahead market.

- This work manages framework incorporation and controller structure for power the executives of a lattice associated Micro network framework.
- A two level control framework is actualized, containing a supervisory controller, which guarantees the power balance between irregular PV ages, Hydrogen based vitality stockpiling, and dynamic burden request, just as neighbor hood controllers for the photovoltaic, electrolyze, and energy component unit.
- The coordination control calculation is proposed for smooth power move between air conditioning, dc connections and Tie Line for stable framework activity under different age and burden conditions.
- Profile of AC and DC transport voltages has been broke down particularly, when the working conditions or burden limits change under the different methods of activity.
- The proposed Micro network can be beneficial in a dissemination framework having voltage vacillations in close region to the sunlight based Farm.
- The control procedure has been proposed for voltage guideline using proposed Micro matrix as static synchronous compensator (Hybrid).
- In network associated mode, power can be imported from the matrix to charge the electrolyze or it very well may be infused into the lattice to support the power provided by the Micro framework to contribute the recurrence steadiness.

1. MATLAB/SIMULINK based reproductions have been completed and results are given to demonstrate the adequacy of the proposed control technique. The principle goal of this proposition is the advancement of a cross breed smaller scale network which will diminish the procedure of numerous switch changes related with individual AC and DC framework by the blend of

- AC and DC sub-framework
- Photovoltaic PV framework and

So as to examine the activity of small scale network framework both the displaying and controlling of the framework are significant issues. Subsequently the control and demonstrating (to be examined detail in Chapter 4) are likewise the piece of this proposition work. As a piece of the proposal work the general framework is reenacted utilizing MATLAB condition. In reproduction work the framework is demonstrated utilizing diverse state conditions [3].

III. GENERAL INFORMATION REGARDING SMART GRID

As electric dispersion innovation ventures into the following century, numerous patterns are getting to be recognizable that will change the necessities of vitality conveyance. These alterations are being driven from both the interest side where higher vitality accessibility and proficiency are wanted and from the supply side where the joining of dispersed age and pinnacle shaving innovations must be suited [4]

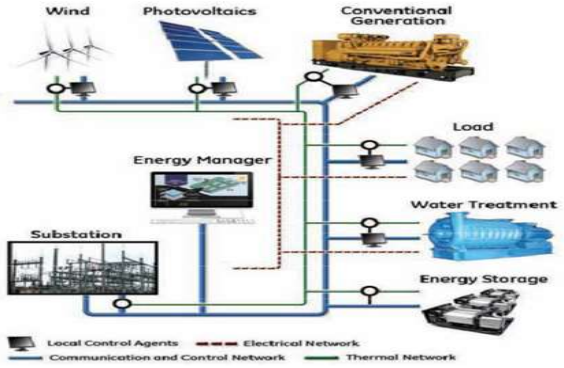

Fig.1 Smart grid power system.

Power frameworks as of now experience impressive change in working necessities basically because of deregulation and because of an expanding measure of appropriated vitality assets (DER). Much of the time DERs incorporate various innovations that permit age in little scale (miniaturized scale sources) and some of them exploit sustainable power source assets (RES, for example, sunlight based, wind or hydro vitality. Having miniaturized scale sources near the heap has the benefit of lessening transmission misfortunes just as avoiding system clogs.

In addition, the likelihood of having a power supply interference of end-clients associated with a low voltage (LV) conveyance framework (in Europe 230 V and in the USA 110 V) is reduced since contiguous miniaturized scale sources, controllable burdens and vitality stockpiling frameworks can work in the islanded mode if there should arise an occurrence of serious framework aggravations. This is recognized these days as a miniaturized scale lattice. Figure 3.1 portrays a run of the mill Smart lattice. The particular Smart matrix has the comparative size as a low voltage dissemination feeder and will uncommon surpass a limit of 1 MVA and a geographic range of 1 km. For the most part over 90% of low voltage local clients are provided by underground link when the rest is provided by overhead lines.

The Smart network frequently psupplies both power and warmth to the clients by methods for joined warmth and power plants (CHP), gas turbines, energy components, photovoltaic (PV) frameworks, wind turbines, and so forth. The vitality stockpiling frameworks for the most part incorporate batteries and flywheels [2].The putting away gadget in the Smart matrix is identical to the pivoting store of enormous generators in the customary network which guarantees the harmony between vitality age and utilization particularly during fast changes in burden or age [5].

IV. PHOTOVOLTAIC SYSTEM

The photoelectric impact was first noted by French physicist Edmund Becquerel in 1839. He suggested that specific materials have property of delivering little a mounts of electric flow when presented to daylight. In 1905, Albert Einstein clarified the idea of light and the photoelectric impact which has turned into the fundamental rule for photovoltaic innovation. In 1954 the primary photovoltaic module was worked by Bell Laboratories. A photovoltaic framework utilizes at least one sunlight based boards to change over sun powered vitality into power. It comprises of different segments which incorporate the photovoltaic modules, mechanical and electrical associations and mountings and methods for directing and additionally changing the electrical yield [6].

1. Photovoltaic arrangements Photovoltaic cell

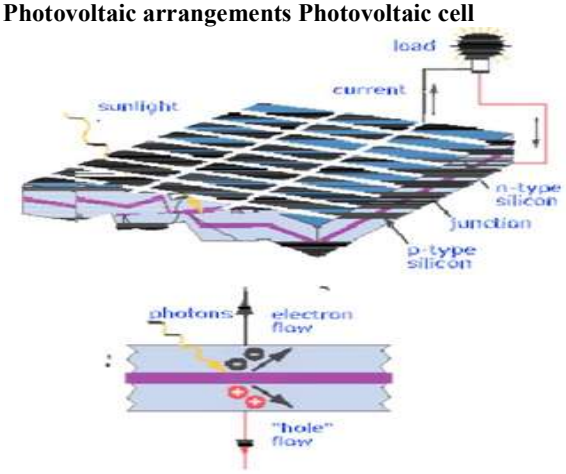

Fig.2 Basic structure of PV cell.

2. Photovoltaic array

A photovoltaic cluster (PV framework) is an interconnection of modules which thus is comprised of numerous PV cells in arrangement or parallel. The power delivered by single module isn't sufficient to meet the prerequisites of business applications, so modules are associated with structure cluster to supply the heap. In an exhibit the association of the modules is same as that of cells in a module. The modules in a PV exhibit are generally first associated in arrangement to get the ideal voltages; the individual modules are then associated in parallel to enable the framework to deliver progressively current. In urban uses, by and large the exhibits are mounted on a housetop. PV exhibit yield can straightforwardly bolster to a DC engine in agrarian applications [7-8-9].

V. WIND ENERGY

Wind vitality is a changed over type of sunlight based vitality which is created by the atomic combination of hydrogen (H) into helium (He) in its center. The H and He combination procedure makes heat a electromagnetic radiation streams out from the sun into space every which way. Despite the fact that solitary a little bit of sun powered radiation is captured by the earth, it gives practically the majority of earth's vitality needs [10].

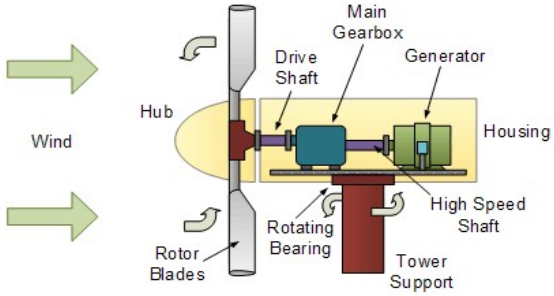

Fig.3 Wind based power generation.

Wind results from the development of air because of climatic weight angles. Wind streams from districts of higher weight to areas of lower weight. The bigger the barometrical weight inclination, the higher the breeze speed and along these lines, the more noteworthy the breeze control that can be caught from the breeze by methods for wind vitality changing over apparatus. The age and development of wind are confounded because of various elements. Among them, the most significant variables are uneven sun based warming, the Coriolis Effect because of the world's self-turn, and neighborhood geological conditions

1. Wind energy characteristics

Wind vitality is a unique type of motor vitality in air as it streams. Wind vitality can be either changed over into electrical vitality by power changing over machines or straightforwardly utilized for siphoning water, cruising boats, or crushing addition.

2. Wind power

Active vitality exists at whatever point an object of a given mass is in movement with a translational or rotational speed. At the point when air is in movement, the active vitality in moving air can be resolved as-

$$E_k = \frac{1}{2} m\bar{u}^2 \quad \text{.....(1)}$$

3.Turbine power output

$$P_T = \tfrac{1}{2} * \square * A * v_3 *$$

Where m is the air mass and u– is the mean wind speed over a suitable time period, Cp = 16/27. The wind power can be obtained by differentiating the kinetic energy in wind with respect to time, i.e.:

$$P_w = \frac{dE_k}{dt} = \frac{1}{2} mu^2 \quad \text{.....(2)}$$

However, only a small portion of wind power can be converted into electrical power. When wind passes through a wind turbine and drives blades to rotate, the corresponding wind mass flow rate is

$$\dot{m} = \rho A \overline{u} \quad \ldots\ldots\ldots\ldots (3)$$

Where r is the air density and A is the swept area of blades. Substituting (3) into (2), the available power in wind P w can be expressed as

$$P_w = \tfrac{1}{2} \rho A \overline{u}^3 \quad \ldots\ldots\ldots\ldots (4)$$

An assessment of eqn (4) uncovers that so as to get a higher breeze control, it requires a higher breeze speed, a more extended length of cutting edges for picking up a bigger cleared region, and a higher air thickness. Since the breeze power yield is relative to the cubic intensity of the mean breeze speed, a little variety in wind speed can bring about a huge change in wind control.

VI.RESULT AND DISCUSSION

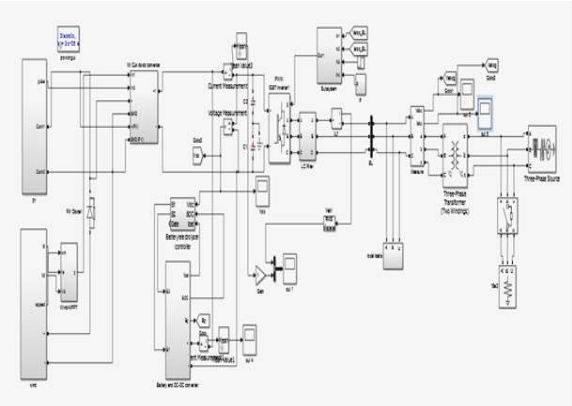

Fig.4 Complete Smart Grid Solar and WIND based power generation.

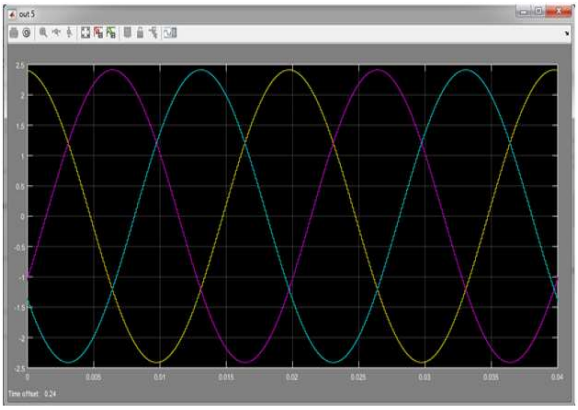

Fig.5 Complete Smart Grid Solar and WIND based power generation Output voltage.

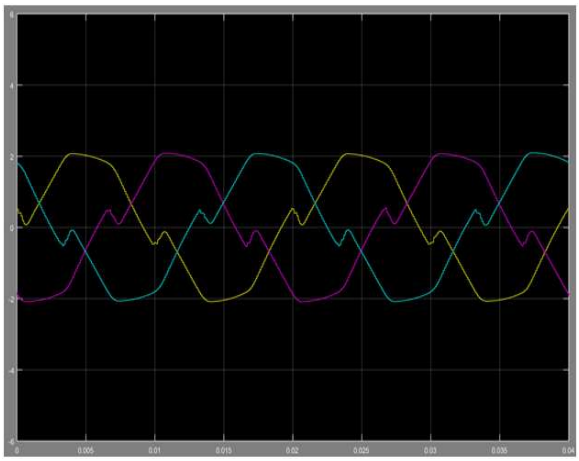

Fig.6 Complete Smart Grid Solar and WIND based power generation Current.

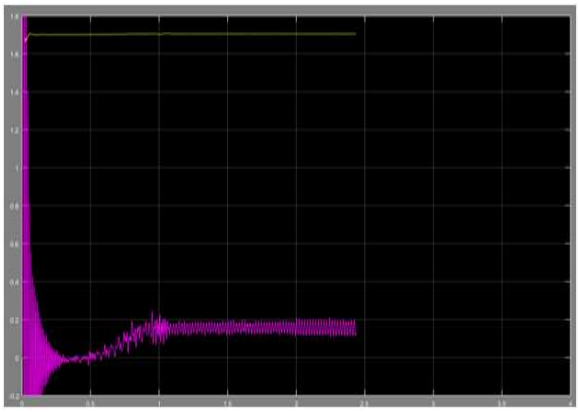

Fig.7 Complete Smart Grid Solar and WIND based power generation Converter across outputs.

V. CONCLUSION

The demonstrating of cross breed Smart lattice for power framework setup is done in MATLAB/SIMULINK condition. The present work basically incorporates the lattice tied method of activity of crossover network. The models are created for every one of the converters to keep up stable framework under different burdens and asset conditions and furthermore the control system are considered. MPPT calculation is utilized to saddle most extreme power from DC sources and to arrange the power trade among DC and AC lattice. In spite of the fact that the cross breed lattice can lessen the procedures of DC/AC and AC/DC transformations in an individual AC or DC matrix, there are numerous handy issues for the usage of the half and half network dependent on the present AC ruled foundation. The effectiveness of the all out framework relies upon the decrease of change misfortunes and the expansion for an additional DC interface. The half and half lattice can give a solid, high caliber and increasingly effective capacity to shopper. The cross breed matrix might be attainable for little detached

modern plants with both PV frameworks and wind turbine generator as the real power supply.

VI. SCOPE OF FUTURE WORK

- The displaying and control should be possible for the islanded method of activity.
- The control instrument can be created for a Smart lattice containing unequal and nonlinear burdens.

REFERENCES

[1]. S. Bose, Y. Liu, K. Bahei-Eldin, J.de Bedout, and M. Adamiak, "Tie line Controls in Smart grid Applications," in iREP Symposium Bulk Power System Dynamics and Control VII, Revitalizing Operational Reliability, pp. 1-9, Aug. 2007.

[2]. R. H. Lasseter, "Smart grids," in Proc. IEEE-PES'02 , pp. 305-308, 2002.

[3]. Michael Angelo Pedrasa and Ted Spooner, "A Survey o f Techniques Used to Control Smart grid Generation and Storage during Island Operation," in AUPEC, 2006.

[4]. F. D. Kanellos, A. I. Tsouchnikas, and N. D. Hatziargyriou, "Smart grid Simulation during Grid-Connected and Islanded Mode of Operation," in Int. Conf. Power Systems Transients (IPST'05), June. 2005.

[5]. Y. W. Li, D. M. Vilathgamuwa, and P. C. Loh, Design, analysis, and real-time testing of a controller for multi bus Smart grid system, IEEE Trans. Power Electron., vol. 19, pp.

[6]. 1195-1204, Sep. 2004.

[7]. R. H. Lasseter and P. Paigi, "Smart grid: A conceptu al solution," in Proc. IEEE-PESC'04 , pp. 4285-4290, 2004.

[8]. F. Katiraei and M. R. Iravani, "Power Management St rategies for a Smart grid with Multiple Distributed Generation Units," IEEE trans. Power System, vol. 21, no. 4, Nov. 2006.

[9]. P. Piagi and R. H. Lasseter, "Autonomous control of Smart grids," in Proc. IEEE-PES'06 , 2006, IEEE, 2006.

[10]. M. Barnes, J. Kondoh, H. Asano, and J. Oyarzabal, " Real-World Smart grids- an Overview," in IEEE Int. Conf. Systems of Systems Engineering, pp.1-8, 2007.

[11]. Chi Jin, Poh Chiang Loh, Peng Wang, Yang Mi, and Frede Blaabjerg, "Autonomous Operation of Hybrid AC-DC Smart grids," in IEEE Int. Conf. Sustainable Energy Technologies, pp. 1-7, 2010.7, no. 3, pp. 1053–1066, Jun. 2012.