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# Modelling of Hybrid System (Solar and Wind) for Power Generation System

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**Abstract:- Solar energy and wind energy is combined to design hybrid system. This is the most encouraging among the sustainable power generation sources. The aim of this paper is to work on hybrid system for power generation in distribution system. They are using hybrid (solar and wind ) system for power generation.. 5 stage and 7 stage is used for generating power system for converting power AC to DC than filtering that technique. Further MPPT is used for enhancing the technology and the same concept is applied to the wind energy also. Wind technology is used along with MPPT technique to develop the quality of the power distribution and generation. So in the proposed system both technique i.e solar energy and wind energy is combined for enhancing power distribution. We have implementing of total scientific demonstrating and MATLAB/Simulink shows for the proposed the electrical piece of an aquaculture framework is actualized to track the framework execution. The reproduction comes about demonstrate the plausibility of control procedure.**

***Keywords:-*** *Hybrid system, PV array model, wind turbine model.*

## I. INTRODUCTION

Solar and wind being inexhaustibly accessible in nature, topologically reasonable for vitality reaping in remote territories settles on them most dependence decision. In any case, an independent framework comprising Solar based and wind vitality is subjective to climate condition and climatic change that makes it erratic. Again this variety of age may not coordinate the time dispersed load request, which offers ascend to lessening in system execution and life expectancy of the incorporated battery bank. Fortunately, this issue can be incompletely settled by a productive blend to shape a hybrid structure engineering that outmatches the shortcoming of one by the quality of another. Be that as it may, expanded number of related factors if there should be an occurrence of a hybrid structure in correlation with an independent framework makes it more complex to locate an ideal structure design. To discover an actually stable, effective and economically suitable framework ideal estimating is required. For a decentralized Micro Grid (MG) situation the reliable supply of slightest cost control alongside an achievable space necessity is vital. Hybrid design is expanding the world over to guarantee dependable and economic power generation [1]. Renewal Energy System can be associated together in a DC-transport, or AC-transport, or in a half and half DC/AC transports. The decision of the fitting design relies upon the sort of output control for most age and loads. Along these lines, it is smarter to utilize DC-transport coupling if most age and a few burdens are DC and to utilize AC-transport coupling on account of predominantly AC age and loads. In the event that the significant power wellsprings of the Hybrid Renewal Energy System create a blend of AC and DC control, at that point a half breed coupled mix conspire is ideal (i.e. crossover DC/AC-transports) [2].

## II. MODELING OF PV ENERGY SYSTEM

The solar radiation on tilted surface (Ht) can be gauge think about the solar insolation, surrounding temperature, and maker's information of the PV panel, incline of the PV panel and latitude and longitude of the site [2].

A PV structure comprises of numerous cells which interfacing in arrangement and parallel to give the coveted yield terminal voltage and current, and displays a nonlinear [3].

The Output energy of the PV structure ($P_{PV}$) is ascertained as communicated in the accompanying condition [2]:

$$P_{PV}(t) = H_t(t) * PVA * \mu_c(t)$$

Where, $\mu_c$ (t) is the hourly generated efficiency of the PV systems and can be obtain in term of the cell temperature as show in the follow condition [2]:

$$\mu_c(t) = \mu_{cr}[1 - \beta_t * (T_c(t) - T_{cr})]$$

Where, $\beta_t$ is the temperature coefficient, $\mu_{cr}$ and $T_{cr}$ are the theoretical solar cell efficiency and temperature at solar radiation flux. $\mu_{cr}$ and $\beta_t$ are generally given by the PV module manufacturer [2].

Tc(t) is the hourly solar cell temperature at ambient temperature (Ta), and can be obtaining from the following Conditions [2].

$$T_c(t) = T_a + \lambda H_t(t)$$

Where, k is the Ross coefficient, expresses the temperatures rise above ambient with increase solar instability [2].

## III. MODELING OF WIND ENERGY SYSTEM

Wind resource and the electric power yield from wind turbine at a specific area rely upon twist speed at the hub height, the wind turbine speed attributes. Wind speed at the hub stature of wind turbine is computed by the power law condition utilizing the wind speed information gathered at the anemometer height (An anemometer is a device used for measuring the speed of wind, and is also a common weather station instrument) [2].

$$u(h) = u(h_g)\left(\frac{h}{h_g}\right)^{\alpha}$$

Where, u(h) and u(hg) are Wind speed at hub point height (h) and anemometer height (hg) and a is the roughness factor. The value of a differs from site to site and from time to time at the same site [2].

There are three main factors that decide the output energy of a wind turbine, i.e. the output control curve (controlled by streamlined power proficiency, mechanical transmission and changing over power effectiveness) of a picked wind turbine, the wind speed dissemination of a chose site where the wind turbine is introduced, and the tower height. The power bend of the machine mirrors the streamlined, transmission and age efficiencies of the structure in a coordinated form [3].

The output energy of wind turbine is describe as far as wind speed from the ordinary power bend attributes of the wind turbine as following [2].

$$P_W(u) = \begin{cases} 0, & u < u_c \text{ or } u > u_f \\ P_r \dfrac{u^2 - u_c^2}{u_r^2 - u_c^2}, & u_c \le u \le u_r \\ P_r, & u_r \le u \le u_f \end{cases}$$

Where, PW is the wind turbine output power, Pr is the rate output power of wind turbine, Uc is the cut-in wind speed, Ur is the rate wind speed, and Uf is the cut-off wind speed [2].

## IV. MODELING OF HYBRID SYSTEM COMPONENTS

The objective of this work is to simulate the activity of PV-wind battery hybrid vitality framework as exact as could be expected under the circumstances. To accomplish this point, one needs an arrangement of mathematical models. In this area, the individual scientific model for every part is produced in MATLAB [3].

Different model procedures are created by scientists to demonstrate segments of hybrid sustainable power source framework (HRES). Execution of individual parts is either demonstrated by deterministic or probabilistic methodologies [3].

## V. MAXIMUM POWER POINT TRACKING

Maximum power point tracking (MPPT) is a procedure utilized with wind turbines and photovoltaic (PV) universes to boost control yield. PV universes exist in a few distinct setups. The most essential variant sends control from authority boards specifically to the DC-AC sun oriented inverter, and from that point straightforwardly to the electrical network. A moment performance, called a hybrid inverter, may part the power at the inverter, where a level of the power goes to the network and the rest of to a battery bank. The third form is associated at all to the framework however utilizes a committed PV inverter that highlights the MPPT [4].

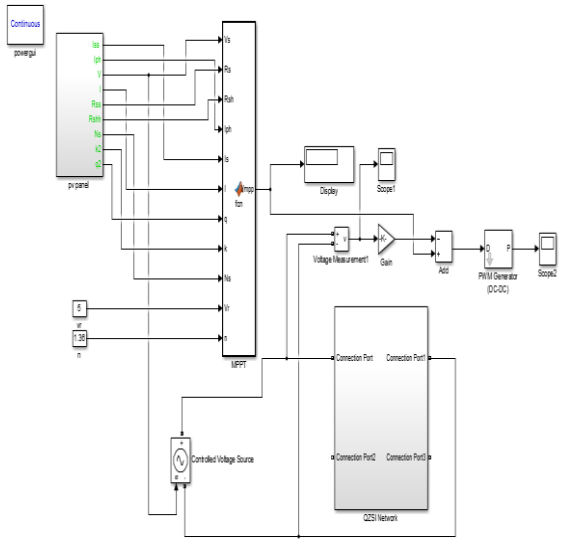


Fig 1:- Block diagram of PV Panel MPPT

In this design, control streams straightforwardly to a battery bank. A minor departure from these setups is that rather than just a single inverter, small scale inverters are conveyed, one for each PV board. New MPPT prepared strength inverters now exist that serve three capacities: network interfacing wind control and additionally PV, and fanning out power for battery charging [4].

## VI. PULSE WIDTH MODULATION (PWM)

Pulse Width Modulation (PWM) controls adjusts the obligation cycle proportion of the switches as the information voltage changes to produce a consistent voltage yield. The DC voltage get from the sun oriented and wind turbine is changed over to a square wave motion by changing between completely on and zero. In this manner the simple circuits is controlled carefully with the assistance of the Pulse Width Modulation (PWM) [5].

The cost of the system and utilization of energy is to a great degree limits with the PWM. In these days there are such a significant number of microcontrollers which is now incorporate on-chip PWM controllers, hence making application simple. Briefly, Pulse Width Modulation is a technique of encoding the analog signal levels to in the form of digitally. The determination of set point is determined by pattern of convention, battery type and the battery capacity. The duty cycle, D to obtain required output voltage [5].

D = Vo/Vi
Where:
D = Duty cycle
Vo = Output Voltage
Vi = Input Voltage

## VII. RESULTS

Simulation has been matlab of graphical environment for modelling, sizing and analyzing. In this result the waveform is shown into their frequency component. In this

perform of voltage signals containing harmonic component are analyzing section. Harmonic signal can recognize the magnitudes of the primary and accurately.

Step 1: Three phase, 5 Level ML (cascaded)

The 5-level cascaded MLI is simulated using MATLAB/SIMULINK tool.

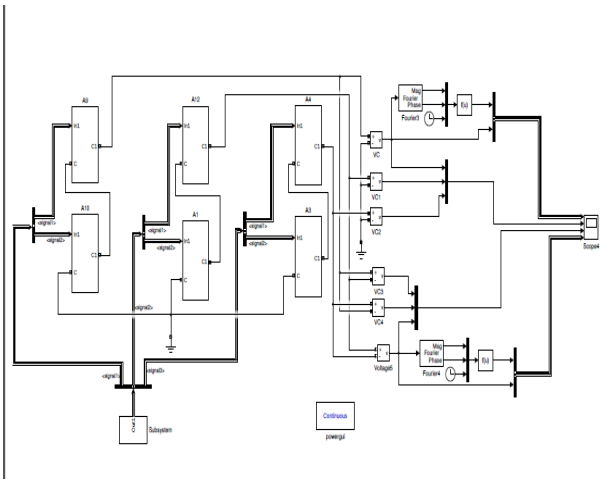

Fig 2:- Three phase, 5 Level ML ( cascaded)

Step 2: Subsystem

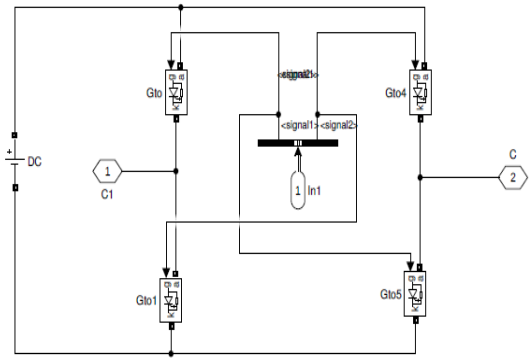


Fig 3:- Subsystem

Step 3: O/P Voltage waveforms

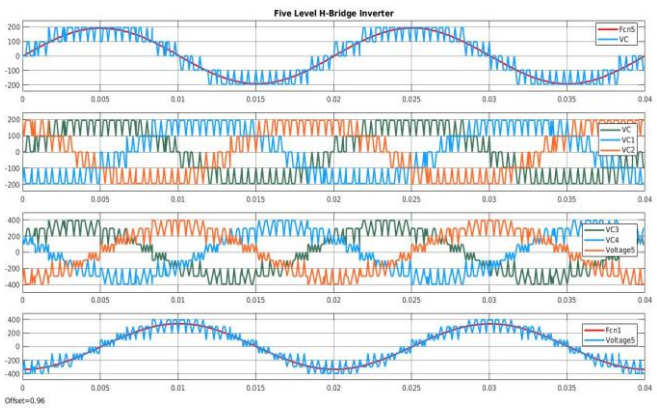


Fig 4:- O/P Voltage waveforms

Step 4: FFT Analysis

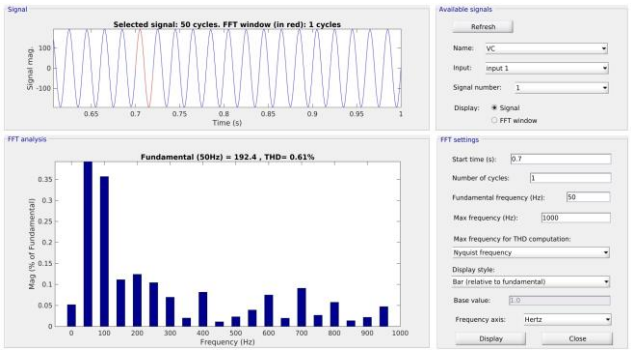


Fig 5:- FFT Analysis

## VIII. CONCLUSION

In this paper, work is hybrid system to generation of the power system for distribution system for grid. The solar and wind energy is used for generating power system. 5stage and 7stage inverter technology is used of generating power for converting power AC to DC than also filter that technique. Further MPPT is used for enhancing the technology and the same concept is applied to the wind energy also. So in the proposed system combine technique of solar and wind energy is used for enhancing power distribution. Also it reduces the harmonic distortion in figure 5 as shown for result the THD is reduced as compare to existing system. Hence it can be said that the proposed combined system is better than the existing system.

- *Future work*

In future scope on real time data along with grid technology for develop hybrid system by using other PSO selection method to enhancing quality of power generation and distribution.

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