Analysis of PV-Hybrid Isolated Power Systems

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***Abstract* - As we know that the solar, hydro, wind are all renewable sources of energy. This work mainly correlates the PVarray with the hybrid model of isolated power system just to control the parameters of measurement like voltage, current and others. In the current global energy scenario, importance of power generation from renewable energy sources is increasing day by day. Energy crisis is mainly presented by the promotion of various distributed energy sources. Due to the economic & environmental advantages of the distributed generation sources, above play a major role in power generation, additionally stress on generation system is also removed due to hybrid model.**

***Index terms* - MPPT, PV hybrid model, multi-junction cell.**

I. INTRODUCTION TO PV SYSTEM

Now a days, consumption of energy is increasing, idea of exploring renewable energy sources are also growing. Due to our limited energy sources, renewable energy sources are the future energy sources. Significant processes are made over the later years in development and research of the renewable power systems such as sea, wind, solar energy and wave systems. With these resources, the sun power energy can be used nowadays as most reliable, and environmental friendly energy source. Although sun power energy systems can be suffer with high costs and low efficiencies. To control these problems, maximum power can be extracted from PV panel while using the MPPT methods to optimize an efficiency of all the PV system. Photovoltaics offer consumers the ability to generate electricity in a clean, quiet and reliable way. Photovoltaic systems are comprised of photovoltaic cells, devices that convert light energy directly into electricity. Because the source of light is usually the sun, they are often called solar cells. The word photovoltaic comes from "photo," meaning light, and "voltaic," which refers to producing electricity. Therefore, the PV process is "producing electricity directly from sunlight.".The photovoltaic technology can be made attractive option because the features various merits like as low maintenance requirement, environmental friendliness and absence of fuel cost. The efficiency of converting energy from PV generation system may low because sun power cell exhibits to the nonlinear voltage and current and power versus voltage characteristics. These nonlinear characteristics contain weather functions conditions like as panel temperature and solar insolation. This is used to maintain the maximum power point tracking algorithm, efficient operation which can quick response and extract the maximum power from PV arrays in the real time becomes important in PGSs.
Photovoltaic (PV) cells are made up of at least 2 semi-conductor layers. One layer containing a positive charge, the other a negative charge. Sunlight consists of little particles of solar energy called photons. As a PV cell is exposed to this sunlight, many of the photons are reflected, pass right through, or absorbed by the solar cell.When enough photons are absorbed by the negative layer of the photovoltaic cell, electrons are freed from the negative semiconductor material. Due to the manufacturing process of the positive layer, these freed electrons naturally migrate to the positive layer creating a voltage differential, similar to a household battery.When the 2 layers are connected to an external load, the electrons flow through the circuit creating electricity. Each individual solar energy cell produces only 1-2 watts. To increase power output, cells are combined in a weather-tight package called a solar module. These modules (from one to several thousand) are then wired up in serial and/or parallel with one another, into what's called a solar array, to create the desired voltage

II. TERMS USED

Multi- junction cell: These multi-junction star cells are often found within the 2 configurations in series/tandem or in parallel. For these thin-film star cells with hetero-junctions, for the improved performances all layers contain the lattice constants/ crystalline structures. Moreover, the discontinuities in lattice constants area unit result in dislocations or defects at interface which will be most well-liked to the recombination sites.
MPPT: Maximum Power Point Tracking, frequently referred to as MPPT, is an electronic system that operates the Photovoltaic (PV) modules in a manner that allows the modules to produce all the power they are capable of. MPPT is not a mechanical tracking system that "physically moves" the modules to make them point more directly at the sun. MPPT is a fully electronic system that varies the electrical operating point of the modules so that the modules are able to deliver maximum available power. Additional power harvested from the modules is then made available as increased battery charge current. MPPT can be used in conjunction with a mechanical tracking system, but the two systems are completely different.
Today, RES are gaining importance because of skyrocketing costs of fossil fuels, energy crisis, global warming and acid rains. The world's population living in geographically isolated rural areas has a great probability. As these areas are not electrically connected, there is scarcity of electrical power to lighten up these areas. In hilly or mountainous regions where small tributaries of river are available, mini hydro power is the best option to generate electricity as they are non-polluting, inexhaustible, clean and environment friendly, thus, it is considered as green energy.
*Hydro power and PV hybrid system:*Hydro power is available mostly in hilly or mountainous regions due to owing of river tributaries. To install micro/mini hydro plants in such regions, proper modeling and simulation of hydraulic, mechanical and

electrical components is required considering coupling interactions between all of them. The design of controller to maintain fixed speed, head and discharge is also dealt with hybrid Systems such as PV-Hydro are of utmost importance these days as they complement each other in need. Such type of electrical system which have at least one distributed energy source and the load connected to it can be called as micro grid. Further having the option of intentional islanding and transition from grid parallel mode to isolated mode is allowed. The transition can be made in such a way that it has minimum load disruption, this means that if there is fault in any distributed energy source, the system can feed the load by taking the supply from the utility without any delay or if the fault is in the main grid then there should be no impact on the load, thus working very efficiently.

III. RELATED WORK

K. pavankumarreddy*et.al* presented hybrid wind solar energy system using maximum power point tracking. The objective in this work is to improve the ability of grid interface hybrid generation system. The performance of MPPT based hybrid system is implemented by using Mat lab/Simulink.**Zakariya M. Dalala**,*et.al* proposed design and analysis of wind energy conversion system by using MPPT. The proposed algorithm uses direct current which acts as perturbing variable. By using dc link voltage slope, the algorithm is capable of detecting sudden change in the wind speed.**Siddharth Joshi***et.al* presented MPPT algorithm for wind and solar energy conversion standalone system.in this work, algorithm is implemented in PSIM 9.1.4 software. The maximum power point tracking is obtained of order of 98.32% and 80% for solar and wind respectively.**BinayakBhandari,** In this paper, a novel off-grid hybrid power system comprised of solar photovoltaic, wind, and hydro energy sources has been presented. This paper presents a novel approach for connecting renewable energy sources to a utility mini-grid.**SweekaMeshram***et.al* proposed modeling of grid connected dc linked pv/hydro hybrid system. The simulation is done in Matlab/Simulink. This proposed approach is cheaper and having less complexity in comparison with AC linked hybrid system. The performance of proposed system is very efficient.**P.V.V Rama Rao***et.al* presented Modeling and Simulation of Utility Interfaced PV/Hydro hybrid Electric Power System. The simulation is done in Matlab/Simulink. In this work, HEPS and HTG has been simulated. The proposed approaches use real imaginary theory.

Jayesh G. Priolkar proposed analysis of PV hydro isolated power systems. The analysis in this paper is done by using Matlab /Simulink. The simulation results it is found that PV Hydro-Battery energy storage system performs efficiently under different dynamic conditions, maintaining voltage & frequency within the limits.**Qais, M.M. Othman** *et.al* presented Optimal Sizing and Operational Strategy of PV and Micro-Hydro.in this paper hybrid RE system is formulated by using HOMER software. This paper explained thoroughly on the best incorporation of hybrid RE system.**David Lara***et.al* Power converter with MPPT for small wind-electric pumping systems has been proposed. In this paper, an AC–DC–AC direct-drive power converter was implemented for a wind electric pumping system. Experimental trials at different pump pressures were conducted. With a MPPT tracking system with variable V/f, a power value of 1.3 kW was obtained at a speed of 350 rpm and a maximum operating hydraulic head of 50 m. At lower operating heads pressures (between 10 and 40 m), variable V/f control increases the power generated by the PMG compared to the linear V/f control.**Nayanar, V., Kumaresan***et.al* Wind-Driven Induction Generators Supplying DC Micro grid based on MPPT controller has been presented. In this paper, proposed algorithm is independent of the machine and wind-turbine parameters. . This approach has been implemented using dsPIC30F4011 controller.

IV.CONCLUSION

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