PLC Based Solar Axis Dual Tracking System

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ABSTRACT

Abstract— *this paper has proposed and implemented a monitoring and control system through campus network of National Cheng Kung University to integrate with an industrial PLC and digital power meters to form a supervisory control and data acquisition (SCADA) system for a hybrid wind-Battery renewable energy system. The proposed system can perform real-time electrical data measurement and the measured data can be effectively transferred to a web-based remote monitoring center using intranet. This paper has also proposed a fuzzy controller of the PLC to switch the required value of excitation capacitors of the studied wind IG to control both voltage and power factor within the specified range. It can be concluded from the simulated and experimental results of this paper that the proposed web-control scheme based on the combined campus network and PLC is valid and feasible. The proposed web based monitoring and control system can be effectively employed to various forms of renewable energy located in remote areas*

Keyword: - *RGB, LDR, LED, LCD, PLC,SCADA, LMPS,DC,USB..*

1. INTRODUCTION

Due to the critical condition of industrial fuels which include oil, gas and others, the development of renewable energy sources is continuously improving. This is the reason why renewable energy sources have become more important these days. Few other reasons include advantages like abundant availability in nature, eco-friendly and recyclable. Many renewable energy sources like solar, wind, hydel and tidal are there. Among these renewable sources solar and wind energy are the world's fastest growing energy resources. With no emission of pollutants, energy conversion is done through wind and PV cells.

Day by day, the demand for electricity is rapidly increasing. But the available base load plants are not able to supply electricity as per demand. So these energy sources can be used to bridge the gap between supply and demand during peak loads. This kind of small scale stand-alone power generating systems can also be used in remote areas where conventional power generation is impractical. In this a wind-photovoltaic hybrid power generation system model is

studied and simulated. A hybrid system is more advantageous as individual power generation system is not completely reliable. When any one of the system is shutdown the other can supply power. Hybrid solar-wind applications are implemented in the field, where all-year energy is to be consumed without any chance for an interrupt. It is possible to have any combination of energy resources to supply the energy demand in the hybrid systems, such as oil, solar and wind. This project is similar with solar power panel and wind turbine power. Differently, it's only an add-on in the system.

Photovoltaic solar panels and small wind turbines depend on climate and weather conditions. Therefore, neither solar nor wind power is sufficient alone. A number of renewable energy expert claims to have a satisfactory hybrid energy resource if both wind and solar power are integrated within a unique body. In the summer time, when sun beams are strong enough, wind velocity is relatively small. In the winter time, when sunny days are relatively shorter, wind velocity is high on the contrast. Efficiency of these renewable systems show also differences through the year. In other words, it is needed to support these two systems with each other to sustain the continuity of the energy production in the system

2. RELATED WORK

Researcher group presented [1] the entire hybrid system comprises of PV and the wind systems. The PV system is powered by the solar energy which is abundantly available in nature. PV modules, maximum power point tracing systems make the PV energy system. The light incident on the PV cells is converted into electrical energy by solar energy harvesting means. The maximum power point tracking system with Perturb & absorb algorithm is used, which extracts the maximum possible power from the PV modules. The ac-dc converter is used to converter ac voltage to dc.

Wind turbine, gear box, generator and an AC – DC converter are included in the wind energy system. The wind turbine is used to convert wind energy to rotational mechanical energy and this mechanical energy available at the turbine shaft is converted to electrical energy using a generator. To coerce the maximum power from wind system we used a maximum power point tracing system.

Researcher group presented [2] both the energy systems are used to charge a battery using bi-directional converter. Bidirectional converter and the battery form the common additional load to the wind and PV energy systems.

Hybrid generation systems that use more than a single power source can greatly enhance the certainty of load demands all the time. Even higher generating capacities can be achieved by hybrid system. In stand-alone system we can able to provide fluctuation free output to the load irrespective of weathers condition. To get the energy output of the PV system converted to storage energy, and constant power delivered by the wind turbine, an efficient energy storage mechanism is required, which can be realized by the battery bank

Forward motion is achieved by driving the aft (back) props faster than the forward props. Sideways motion is achieved by running the left or right props faster. 'Rudder' movements (yaw), (turning left or right) are again achieved by slowing or speeding individual motors - and this control is reliant on the fact that two of the rotors rotate clockwise while the other two rotate counterclockwise so that, again, slowing or speeding individual motors (and props) will produce a change in attitude in the craft. The basic theory involved in working of an individual PV cell is the Photoelectric effect according to which, when a photon particle hits a PV cell, after receiving energy from sunbeam the electrons of the semiconductor get excited and hop to the conduction band from the valence band and become free to move. Movement of electrons create positive and negative terminal and also create potential difference across these two terminals. When an external circuit is connected between these terminals an electric current start flowing through the circuit.

3. PROPOSED SYSTEM

The photovoltaic system converts sunlight directly to electricity without having any disastrous effect on our environment. The basic segment of PV array is PV cell, which is just a simple p-n junction device. The equivalent circuit of PV cell. Equivalent circuit has a current source (photocurrent), a diode parallel to it, a resistor in series describing an internal resistance to the flow of current and a shunt resistance which expresses a leakage current many authors proposed more developed models for better accuracy and for different purposes. In some of the models, the effect of the recombination of carriers is represented by an extra diode. Some authors also used three diode models which included influences of some other effects that are not considered in previous models. But due to simplicity we use single diode model for our work Efficiency of a PV cell does not depend on the variation in the shunt resistance Rp of the cell but efficiency of a PV cell greatly depends on the variation in series resistance Rs. As Rp of the cell is inversely proportional to the shunt leakage current to ground so it can be assumed to be very large value for a very small leakage current to ground. As the total power generated by a single PV cell is very low, we used a combination of PV cells to fulfill our desired requirement. This grid of PV cells is knows as PV array. A small change in series resistance can affect more on the efficiency of a PV cells but variation in shunt resistance does not affect more. For very small leakage current to ground, shunt resistance assumed to be infinity and can be treated as open. After considering shunt resistance infinity

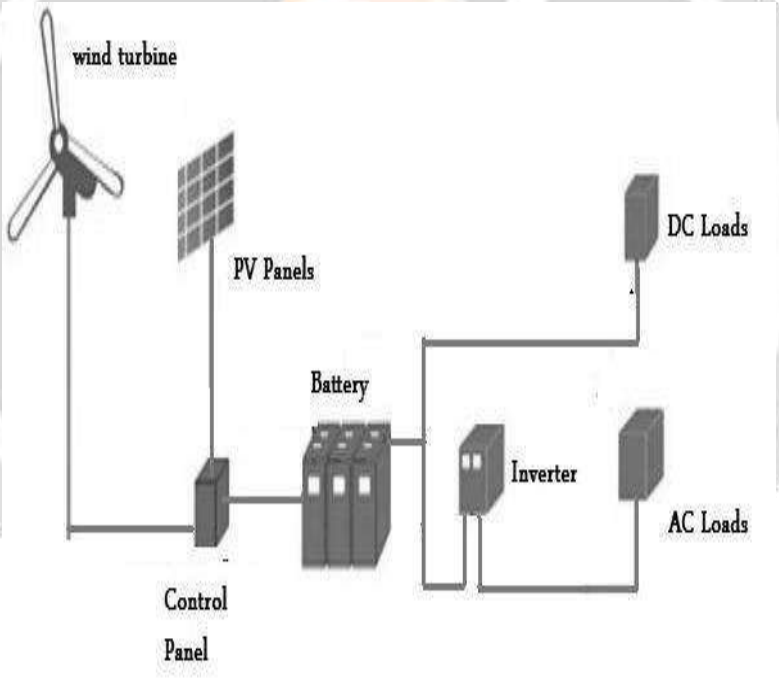

Fig -1: Block Diagram

3.1 Working

entire circuit but shaded portion cannot able to generate same current but have to allow the same current to flow, so shaded portion starts behaving like load and starts consuming power. When shaded portion starts to act as load this condition is known as hot-spot problem. Without appropriate protection, problem of hot-spot may arise and, in severe cases, the system may get damaged. To reduce the damage in this condition we generally use a bypass diode .Due to partial shading or total shading PV characteristic become more non-linear, having more than one maximum power point. So for this condition tracking of the maximum power point become very tedious. We can easily see the effect of shading on PV characteristics .There is wastage of power due to the loss contributed by reverse current which results in overheating of shaded cell

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4. CONCLUSIONS

This project deals with the design and execution of a solar tracker system dedicated to the PV conversion panels. The proposed single axis solar tracker device ensures the optimization of the conversion of solar energy into electricity by properly orienting the PV panel in accordance with the real position of the sun. The operation of the experimental model of the device is based on a DC motor intelligently controlled When a module or a part of it is shaded it starts generating less voltage or current as compared to unshaded one. When modules are connected in series, same current will flow in entire circuit but shaded portion cannot able to generate same current but have to allow the same current to flow, so shaded portion starts behaving like load and starts consuming power. When shaded portion starts to act as load this condition is known as hot-spot problem. Without appropriate protection, problem of hot-spot may arise and, in severe cases, the system may get damaged. To reduce the damage in this condition we generally use a bypass diode .Due to partial shading or total shading PV characteristic become more non-linear, having more than one maximum power point. So for this condition tracking of the maximum power point become very tedious. We can easily see the effect of shading on PV characteristics .There is wastage of power due to the loss contributed by reverse current which results in overheating of shaded cell

5. REFERENCES

[1] ***M. A. Panait, T. Tudorache:*** *A Simple Neural Network Solar Tracker for Optimizing Conversion Efficiency in Off-Grid Solar*

[2] ***Tiberiu Tudorache, Liviu Kreindler:****Design of a Solar Tracker System for PV Power Plants.*

[3]Y Jaganmohan Reddy , Y V Pavan Kumar, K Padma Raju, Anilkumar Ramsesh : *PLC Based Energy Management and Control Design for an Alternative Energy Power System with Improved Power Quality Gordon Ononiwu, Arinze Okoye, et al., "Design and Implementation of a Real Time Wireless Quadcopter for Rescue Operations", American Journal of Engineering Research, 5(9), 2016, 130-138.*

4]Hiren Patel and Vivek Agarwal: "Matlab based modeling to study the effect of partial sh*ading on PV* ***array characteristics,"*** *IEEE transaction on energy conversion, vol.23, no.1, March 2008.*