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A Non Isolated Bidirectional DC-DC Converter for Zero Voltage Switching with Magnetic Coupling

¹Priyanka D, M.E., ²Hema P, M.E.,

¹Department of Electrical and Electronics Engineering, Power Electronics and Drives, Jay Shriram Group of Institutions, Tiruppur, Tamil Nadu 638660

²Assistant Professor, Department of Electrical and Electronics Engineering, Jay Shriram Group of Institutions, Tiruppur, Tamil Nadu 638660

ABSTRACT

This paper describes and performance an adaptive neuro-fuzzy inference system (ANFIS) based energy management system (EMS) of a grid-connected hybrid system for smart grid application. The hybrid system consists of wind turbine (WT) and solar photovoltaic (PV) panels as a primary energy sources. The rectified wind output and solar panel output is given to LUO converter for boost up the DC voltage in order to connect them to a central DC grid. Then, the power has taken from the DC grid and it is given to the AC smart grid system through H-bridge inverter. The smart grid system consists of new bidirectional intelligent converter, high frequency ac-dc rectifier and low voltage dc-dc converter hybrid switching dc-ac converter. The smart grid system satisfied the load requirement and in case if the demand is low it will return the excess power to the grid also. On the whole, this proposed system utilizes the best use of solar and wind energy system so that the power can be generated at any time and satisfied the load demand

INTRODUCTION

Hybrid energy system is the combination of two energy sources for giving power to the load. In other word it can defined as “Energy system which is fabricated or designed to extract power by using two energy sources is called as the hybrid energy system.” Hybrid energy system has good reliability, efficiency, less emission, and lower cost. In this proposed system solar and wind power is used for generating power [1-3].

Solar and wind has good advantages than other than any other non-conventional energy sources. Both the energy sources have greater availability in all areas. It needs lower cost. There is no need to find special location to install this system [4- 6].

In recent years the number of technological developments on the design of prototypes for energy electricity by using energy sources not

conventional, such as solar, wind, hydro, biomass and bio fuels, geothermal, cells fuels. Renewable energy sources such as Solar Energy and Wind energy are the sources that energy captured and stored by nature. A generating system with a single power source non-conventional energy does not supply electricity required. Due to global warming new energy sources need to be used such as solar and wind energy. Renewable energy is becoming more important. Solar and Wind energy is pollution free and inexhaustible. All regions of the world have renewable resources of one type or another. Thus a study on renewable energies focuses more and more attention. Use of renewable energy sources for power generation many studies have been carried out. Due to their unpredictable nature, the solar and wind energy systems are highly unreliable. Other energy source can compensate for

Author for correspondence:

Department of Electrical and Electronics Engineering, Power Electronics and Drives, Jay Shriram Group of Institutions, Tiruppur, Tamil Nadu 638660.

Email: priyanghaa3e@gmail.com

the difference, when a source is unavailable or insufficient in meeting the load demands [7-10].

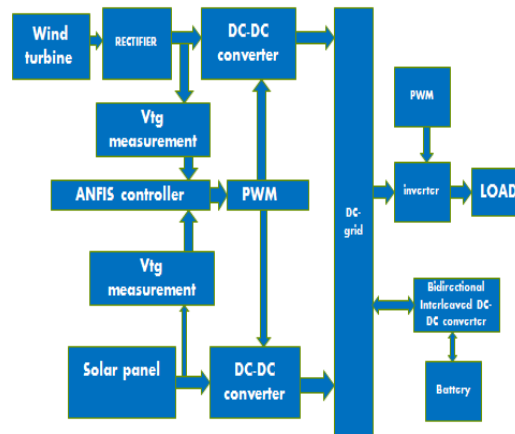
SOLAR ENERGY

Energy is basically radiant energy emitted by the sun, another term called as Solar Power. Solar energy is form of radiant light and heat from Sun, which is used in many technologies such as solar heating, photovoltaic's, solar thermal energy and molten sail power plants. Solar energy is very important source of renewable energy. Its technology is classified as passive solar and active solar, it is mainly depend upon how it will be capture and distribute solar energy or convert in to solar power. Active solar techniques include in photovoltaic systems, concentrated solar power and solar water heating. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-

dispersing properties and designing spaces that naturally circulate air. Solar energy available in large magnitude makes it a highly appealing source of electricity.

As Solar Cell term specifies when to capture energy from sunlight and Photovoltaic cell term is used when the light source is not specified. Generally solar cells are present in the Solar panels. As the Sun energy illuminates on the solar cells the current is produced form the separation of excited electrons and holes take place. This will happen because of electric field is present, which includes p-n junction at depletion region. By the photovoltaic effect current will be produced. The light falling on the cell is directly proportional to output current source. In the absence of sunlight, solar cell is not active. At that time solar cell is worked as diode (p-n junction). I-V characteristics of cell are determined by diode. Sometimes there are readymade Solar panels are used in solar

BLOCK DIAGRAM



- In proposed system we implemented PI controller for estimation of harmonics and voltage ripples in DC line so dynamic response of PI control is quick
- Then harmonics is low and DC grid voltage is more accurate
- We implemented VSI so harmonics create in system is low
- Due to VSI harmonics compensation Harmonic will less then 2% in proposed system

- Implementation of PI controller will reduce the response time for DC grid voltage stabilization

SOLAR-WIND HYBRID POWER SYSTEM

The electric system that combines solar energy and wind energy is named as hybrid power system, which offers several advantages over either single system. In much of the areas, wind speeds are low in the summer when the sun shine brightest and longest. In winters less sunlight is available and

wind is stronger. Hybrid systems produce power when it will be needed. The peak operating time for wind and solar occurs at different times of day and year. Many hybrid power systems are stand alone systems which are not connected to an electricity distribution system. When neither the wind nor the solar system is generating power, the hybrid system provides power through batteries. The engine generator can provide power and recharge batteries, when batteries run low. Modern electronic controllers can operate hybrid systems automatically, by adding engine generator which makes the system complex. Other components needed for the system should be small in size due to engine generator. During non charging period the storage capacity must be large enough to supply electrical need. The solar energy system output and wind energy system output are added together in parallel because if one source is absent the other one can compensate for it. Solar energy system and

wind energy system can work separately and together.

CONCLUSION

Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can be utilize where it generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. People should motivate to use the non-conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is cost effective solution for generation. It only need initial investment. It has also long life span. Overall it is good, reliable and affordable solution for electricity generation.

RESULTS

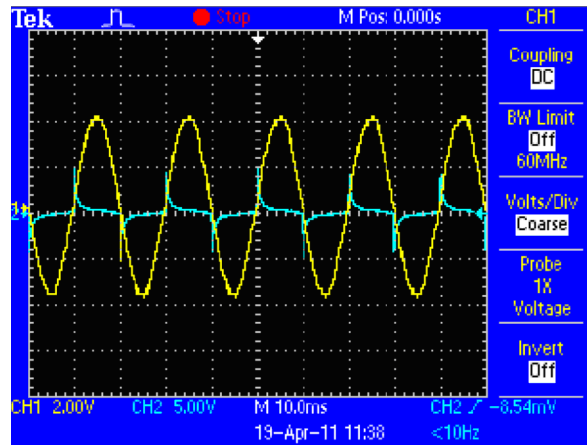
Input DC



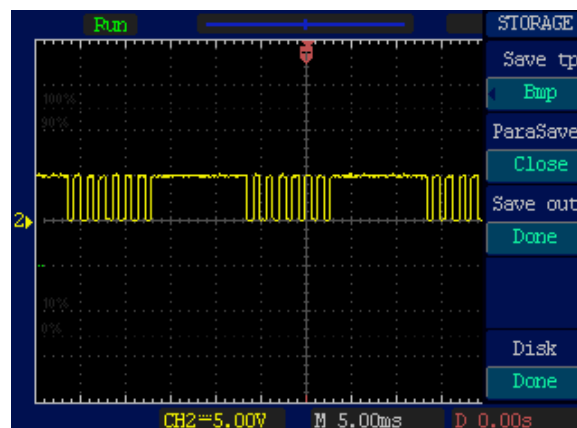
Output DC grid voltage



Output AC voltage



Gate pulse



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