STUDY OF AC/DC MICROGRID

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ABSTRACT

This paper presents a stand-alone hybrid Solar-Wind energy system for applications in isolated areas. Microgrid is a part of the power distribution system which uses renewable energy based of power generation connected to the grid system. The AC-DC Microgrid consist of solar cells, wind turbine, battery as a energy storage system, AC grid and AC-DC load. The islanded AC-DC Microgrids are interconnected through bi-directional DC-DC/AC converter. In this technology operation of a DC Microgrid which can operated at Grid connected system and to ensure stable operation during faults and various network disturbances in grid and islanding connected mode. The wind & solar system are connected to the common load through Boost Derived Hybrid Converter.

Keywords: Non-conventional energy, Hybrid energy system, Boost-Derived Hybrid Converters, Microgrid, etc.

1. INTRODUCTION

Nowadays, Microgrid technology using renewable energy based on distributed power generation system combined with power electronic system will produce the concept of future network technologies. The intergration of renewable energy sources and energy storage systems has been one of the new trends in power electronic technologies. The main advantage of microgrid development are providing good solution to supply power in case of an emergency and power outage during power interruption in the main grid. The Microgrids is a local energy network that includes renewable energy sources and storage systems. It can be connected to the main grid or works isolated when there is a blackout at the main grid and continues to supply their local loads in islanded mode. Microgrid is used to generate, distribute and control power in small section .Microgrids are design to provide continuous power and balance customer local demand. This paper presents both DC and AC loads supplied by different kinds of energy sources efficiently by power electronic converters. The architecture involving the hybrid converter in which both the operations are performed by a single converter.

In this paper, Hybrid Converter is designed. Hybrid Converter work as both Inverter & Chopper. Working of Hybrid Converter depends on the switching of MOSFET. Input of Hybrid Converter is DC and it gives AC & DC as output with the help of Inverter and Chopper and then it is supplied to the loads.

2. COMPONENTS

BLOCK DIAGRAM EXPLANATION:

1) PHOTOVOLTAIC CELL: Solar energy is one of the cleanest and greenest technologies. A solar cell is a fundamental device for conversion of photon energy into pollution-free electricity. The photons in sunlight hit solar panel and are absorbed by semiconducting materials, such as doped silicon. An array of solar cells converts solar energy into a usable amount of direct current (DC) electricity. An inverter can converts the power to AC. Although solar energy is led by thermal power plant. Therefore, solar energy play a dominant role in Indian Power Scenario due to various benefits it offers over other non-conventional sources.

To harvest the solar energy, most common way is to use photo-voltaic panels which will receive photon energy from sun & convert to electrical energy. Solar technologies are broadly classified as passive and active. Solar depending on way they detain, convert & distribute solar energy. Although Solar Energy in India is led by Solar thermal power plant, it is expected that Solar PV in India will prove to be the single largest source of power in the times to come. It is thus no surprise that Solar Energy is & will continue to play an dominant role in Indian power scenario due to various benefits it offers over than renewable sources.

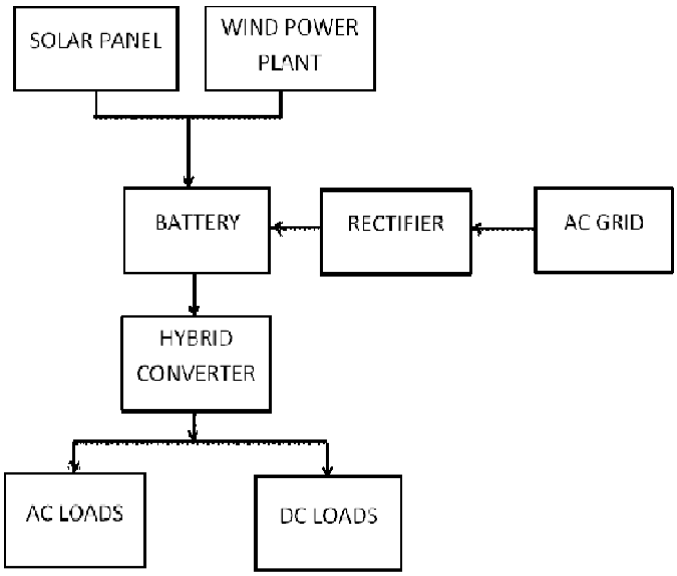

Fig No.:1 Block diagram of AC-DC micro-grid

2) WIND POWER PLANT: A wind turbine is also called as a wind energy converter, it converts kinetic energy to the electrical energy. Manufacturing of wind turbines are in wide range. Wind turbines are manufactured in two types for vertical axis and horizontal axis. For battery charging or for power traffic warnings signs smallest turbines are used. For making contribution to domestic power supply larger turbines are used. Array of large turbines, is called as wind farms. This becoming a important source of renewable energy and this is used by many countries to reduce the use of fossil fuel which are limited. Wind turbines can rotate either in vertical direction of horizontal direction as per their construction.

3) BATTERY STORAGE: Battery storage stored energy which generate at one time for use later whenever there is need of energy. A device which stored energy is known as battery or accumulator. Battery storage power stations use for low leveling storing electrical energy at times of low demand for use during peak periods. It is charged from renewable energy sources like solar panel. Deep cycle batteries are design for the purpose of discharging to a lower capacity between 50%-80% than conventional battery. Deep cycle of our battery is C10.

Lithium-Ion Solar Batteries are the Ideal Match for Solar Energy Storage Needs. We have a Solar Energy System with energy storage, the power generated when the sun is out. If the existing energy storage system for our solar system is inefficient. Typical Lead Acid Batteries used for solar energy storage have many problems including: they are almost never adequate to handle generated energy storage needs, do not efficiently and effectively store generated power, do not last long, are they are very heavy and made of a toxic material.

4) HYBRID CONVERTER: The system has various types of loads i.e. DC and AC loads, which are capable of being interfaced with different conventional and non-conventional energy sources. This interfacing is achieved by means of different electronic converters. Single phase inverters are used the DC output voltage of the PV array into AC voltage to be connected to the electric utility grid. It is composed of DC voltage source (PV array) an input decoupling capacitor and four power switching blocks. After the inverter an LC harmonics filter is used to eliminate the high frequencies in the output inverter voltage. Each block of the switching blocks consists of a semiconductor switch (MOSFET/IGBT) and anti parallel diode. To create proper gating signals for switches, pulse with modulation is used.

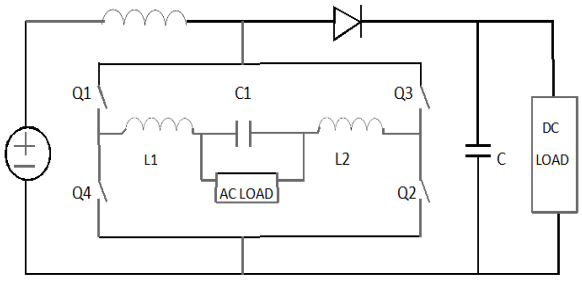

Fig No.2: Hybrid Converter

The Switched Boost Inverter (SBI), is Hybrid Converter topology, which can achieve similar advantages as ZSI with lesser number of passive components and supply simultaneously AC as well as DC loads.

5) POWER FROM AC GRID: An electrical grid is also known as power grid. It is an interconnected network which starts from generating station called as producers and ends at consumer. Due to weather conditions, if the generation is less then the power can be taken from the grid to drive the loads.

6) AC & DC LOADS: By using DC as input and getting both AC and DC as output.

3. RESULTS AND DISCUSSION

The integration of solar panel & wind plant, as a dc input sources has been studied. The analysis/study of loads which consumes less power is carried out.

4. CONCLUSION

Depending upon the requirement these renewable energy sources are connected to the main grid or operate separately. As renewable energy sources are intermitted in nature, energy storage schemes are required to store the energy. The intergration of renewable energy sources and energy storage systems has been one of the new trends in power electronic technologies using it efficiency of the system will be increase.

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