Review of Hybrid Micro-Grid

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ABSTRACT

This paper describes the work done on the new technology of AC-DC Microgrid. The AC-DC Microgrid consists of solar cells, wind turbine, battery as an 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 operate at Grid connected system. The major technical contribution of this paper is to study AC commercial grid and DC Microgrid. Recently, there are many problems regarding increasing energy demand and decreasing fossil energies, the renewable energies have to be integrated with the utility grid. The modeling and simulation of AC-DC Microgrid along with hybrid converter are done using MATLAB SIMULINK.

Keywords: Non-conventional energy, Storage device, Microgrid.

1. INTRODUCTION

These days, fossil fuel is recognized as a main reason of air pollution, especially in carbon emission. Energy source is changed from fossil fuel to eco-friendly source by means of renewable energy. Energy storage is used to improve the instability and unpredictability due to renewable source. Renewable resources are photovoltaic system, solar cell, wind turbine, battery and almost all that sort of things also can be operated in DC power. Therefore DC distribution system or DC microgrid is being developed.

It Consist of four parts:
1. Distribution system
2. Distributed generation sources (DG)
3. Energy storage (ES)
4. Controllers and loads

In this paper, Hybrid Converter is also 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.

The objectives of this paper are to proposed DC microgrid to controls onsite generation and power demand to meet the objectives of providing power and injecting power into the utility grid if required.

2. METHODS AND MATERIAL

1) **SOLAR PLANT**: Solar energy is one of the cleanest and greenest technologies. It is expected that solar energy in World will prove to be the single largest source of power. Therefore solar energy plays a dominant role in Indian Power Scenario due to various benefits it offers over other non-conventional sources.

A PV system or a solar panel is one of the most used sources of renewable energies. It relies on sun rays to generate electricity and is made up of several solar cells made from silicon and protected by layers of glass. PV systems contain invertors that transform the DC obtained from solar power to AC ready to be used.

Different types of solar panels exist such as crystalline silicon, thin-film, monocrystalline and

polycrystalline. Those types differ in their structure, efficiency, cost, production, and maintenance. For instance, monocrystalline, which is made of of silicon ingots, has high efficiency rates reaching up to 20% because of the purity of the silicon used, a high cost and a low maintenance. Monocrystalline produces high power and generates electricity four times more than thin-film solar panels. Whereas polycrystalline solar panel, which is made of square silicon ingots, has a lower cost but also a lower efficiency compared to monocrystalline solar panels.

2) **WIND PLANT**:

A wind turbine is also called as a wind energy converter; it converts kinetic energy to the electrical energy. Wind turbines generate electricity thanks to the motion of air due to wind which creates kinetic energy that is converted to electric power. Wind power, which is dependent of the speed of wind and the way the blades catch the wind, is generated because the moving air turns a shaft that turns a generator. Two types of wind turbine can be found a horizontal and a vertical one.

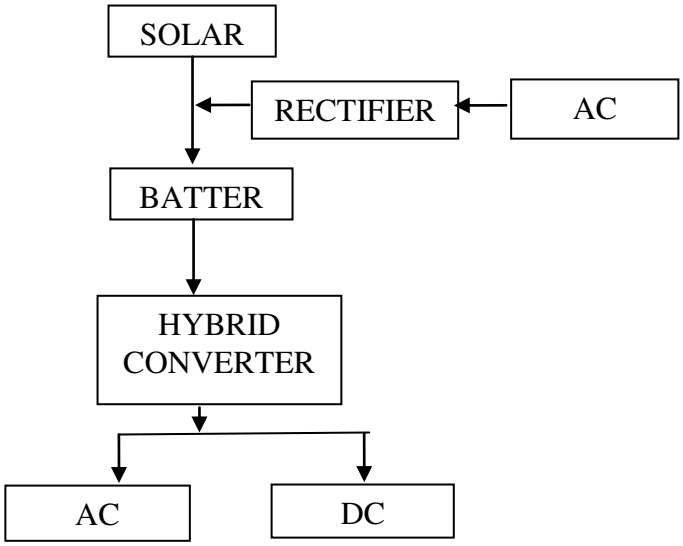
3) **BATTERY STORAGE**: The use of PV systems and wind turbine to generate energy in a microgrid implies the use of an energy storage system (ESS). Whether the microgrid is connected to the main grid or is working on island mode, it is very important to use an ESS. When the microgrid is on island mode, the demand of the loads of the microgrid needs to be met even if the peak of demand does not match the peak of renewable energy generation. That is to say that the energy generated using solar power and the one generated using wind need to be stored using a convenient and efficient ESS in order to be used when demand peaks. Without that system and if the peaks do not match, the generated energy will be unexploited and lost.

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 levelling storing electrical energy at times of low demand for use during peak periods. It is 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 foregoing 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. With this in mind, to drive DC and AC loads concurrently from single DC input in a single step, a new technology of Boost Derived Hybrid Converter provides simultaneous DC and AC to loads from a "Single Switch Controlled Boost Converter". Hybrid converter requires lesser number of switches to provide AC and DC output with an increased reliability.

BLOCK DIAGRAM:



3. CONCLUSION

Micro-grid is an extension of main grid providing on-site generation capable of fulfilling its local load demand. It is concluded that micro-grid is to be added to the main grid to increase the reliability, improve power quality, avoid the use of depleting fossil fuels, and reduce greenhouse emissions. The micro-grid is connected to islanded or isolated and grid connected modes. 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. It is desirable to develop reliable micro-grid operation and effective energy storage algorithms which would enhance the performance of hybrid power systems.

4. REFERENCES

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