Fuzzy based Hybrid Energy Storage System Micro Grids Integration for Power Quality Improvement

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***Abstract*— Renewable energy technologies gives us much cleaner, abundant energy gathered from self-renewing resources such as the sun, wind etc. Increase in power demand leads to increase in power failure. Hence, renewable energy sources acts as constant load provider. A converter topology for hybrid wind/photovoltaic energy system is proposed. In reality, combining both solar and wind power sources provides us with much needed power generation. By using Renewable energies we have getting advantages of nil fuel cost and environmental impacts got reduced. In this paper, we will see a SEPIC converter topology is used for the hybrid power sources. Two inputs, one from wind energy and another from solar PV panel are given to the converter and maximum power is extracted by using fuzzy logic maximum power point tracking method. Depending on the availability of the energy sources this configuration allows two sources to supply the load separately or simultaneously. The output is given to inverter which converts dc to ac and then applied load. This hybrid energy is given to the three phase inverter. It will convert that DC voltage into AC voltage. This AC voltage is given to the load. The sinusoidal PWM technique is applied to the inverter to control the output voltage and the Fuzzy controller compensates reactive power in the grid. Simulation is carried out in MATLAB/ SIMULINK.**

Keywords*— *SEPIC Controller, Inverter

INTRODUCTION

SOLAR ENERGY

One of the most popular types of renewable energy is which abundantly available from nature is solar power . sun is the source of solar energy, which supplies our whole blue planet with the energy.we need to survive. Using solar PV panels, we can harvest energy directly from sunlight and convert it to electricity that powers our homes and businesses. Solar energy is widely used to produce hot water or charging the battery systems. Solar energy brings the benefits both for our bank account and for the environment. The price of solar is constantly dropping day by day and installing solar panel on home will almost save money over the lifetime of your installation. More important thing to take into consideration is producing solar energy doesn't pollute or release fossil fuels, which means we can dramatically reduce the environmental impact by installing solar.

Wind power

Another type of renewable energy that we used to get with every day is the wind. When you feel the wind, you're simply feeling air moving from place to place due to the uneven heating of Earth's surface. We can generate electricity by capturing the power of wind using massive turbines when they spin. While this method is not always a practical solution for an individual homeowner, but wind power is becoming increasingly popular for utility-scale applications. Huge and massive wind farms spanning many square miles can be seen around the nook and corner of the world. In case of environmental friendly, like solar energy, wind power is pollution-free and is a growing as an important renewable energy source supplying electricity to grids around the world. More than six percent of the electricity used in the U.S in the year 2017 have been produced by wind farms.

the two sources is now possible to supply the load separately or simultaneously depending on the availability of the energy sources using this configuration . The output is given to inverter which converts dc to ac and then applied load. This hybrid energy is given to the three phase inverter. It will convert that DC voltage into AC voltage. This AC voltage is given to the load. The sinusoidal PWM technique is applied to the inverter to control the output voltage and the Fuzzy controller compensates reactive power in the grid. Simulation is carried out in MATLAB/ SIMULINK.

EXISTING MODEL

We all know that the buck boost converter is a DC to DC converter. The output voltage came from buck boost converter of the DC to DC converter is less than or greater than the input voltage. Duty cycle gives the value of magnitude of output voltage. These converters popularly known to as step up or step down transformers and these names are coming from the analogous step up and step down transformer. The input voltages will be processed to step up/down to some level of more than/ less than the input voltage. According to the low conversion energy, the input power is equal to the output power. In this model we can see that buck-boost converter is being used. Even though it has so many advantages, one disadvantage is also there.

DISADVANTAGES: Output is inverted.

PROPOSED MODEL

In this project, we can see the energy of both wind and solar is tapped and Is passed to grid using SEPIC Converter and fuzzy logic controllers are used. The SEPIC converter is highly capable of operating from an input voltage that is greater or less than the much regulated output voltage. Aside from being able to function as both a buck and boost, the SEPIC design also has minimal active components, a simple controller, and clamped switching waveforms which provide low noise operation.

ADVANTAGES:

SEPIC Converter have non-inverted output (the output has the same voltage polarity as the input), using a series capacitor to couple energy from the input to the output (and thus will respond quickly to short-circuit output), and being capable of true shutdown: when the switch is turned off, its output drops to 0 V, following a fairly hefty transient dump of charge.

BLOCK DIAGRAM

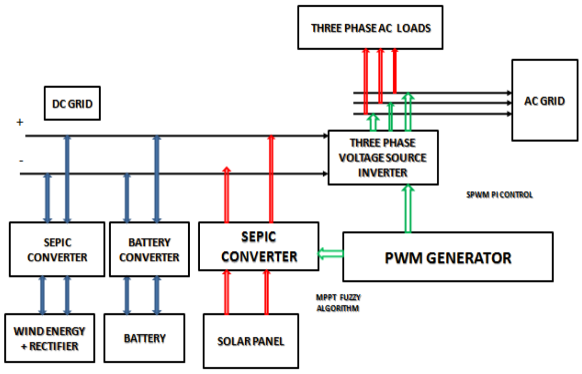

Fig 1. Proposed Block Diagram

This block explains how the voltage generated from hybrid system is being finally given to the AC grid. The energy tapped from the solar panel and the wind turbine is fed to the SEPIC Converter (Single Ended Primary inductor converter).SEPIC which is DC to DC converter will convert the voltage to suitable efficient level. Then this voltage is fed to the DC grid. The battery along with the setup will continue to store energy till its limit is reached. The 3 phase voltage source inverter will convert the voltage from DC to AC, which is suitable for the working of Stepup transformer. The Transformer the converts the voltage level to higher level and is then fed to the AC grid for the transmission.

SIMULATION DIAGRAM

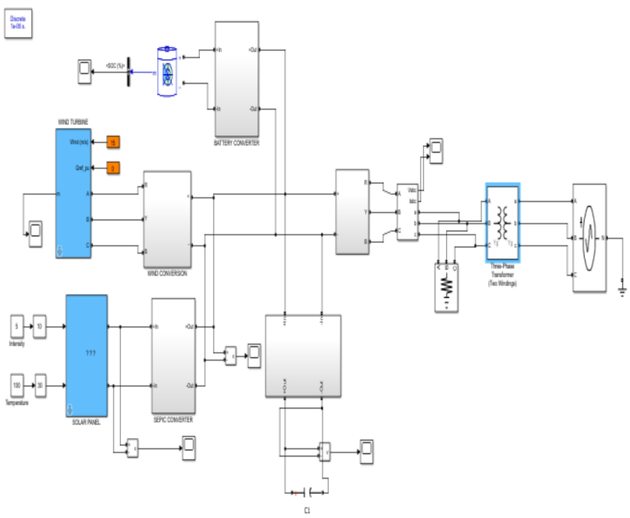

Fig 2. Proposed Simulation Diagram

Fig 3. Battery SOC

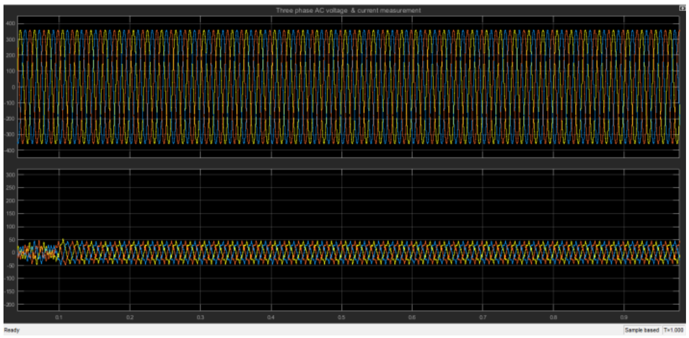

Fig 4. AC Voltage and Current Measurement

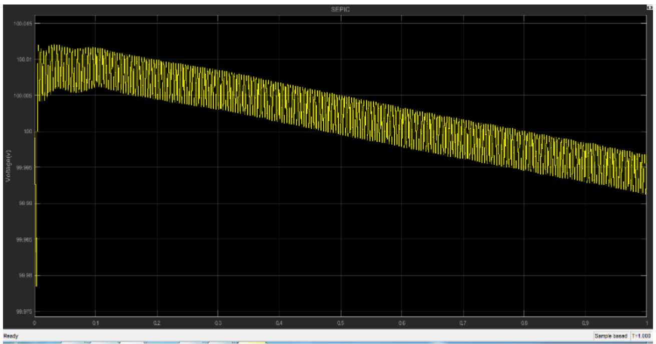

Fig.4 SEPIC Controller measurements

CONCLUSION

This paper mainly concentrates on combined energy tapping of both Wind and solar energy using fuzzy logic controller and using SPIC Controller and inverter, voltage is converted to AC which then supplied to AC grid.

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