

Power Quality Enhancement in Grid with Interconnection of Hybrid Power System

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ABSTRACT

Scarcity of power has been one of the nightmare issues for mankind in the modern age. Renewable Energy Sources (RES) working parallel with conventional power plants are playing a lead role in narrowing the difference between supply and demand. Among all the available renewable energy sources wind-solar hybrid systems are the most popular one. Due to their natural advantage of being complimentary to each other, they are assuring reliability to the utility. Power quality issues arising due to the usage of non-linear loads at the point of common coupling are addressed with the help of power electronic device interfacing RES to the grid. The work presented in this paper consists of Modeling and Simulation of wind-solar hybrid energy system and interfacing it to the grid through the interfacing inverter. A suitable control strategy which will add shunt active filter functionality to the RES interfacing device to the grid is also undertaken.

Keywords-Active power filter (APF), distributed generation (DG), distribution system, grid interconnection, power quality (PQ), renewable energy.

I. INTRODUCTION

Fossil fuels are our main source of energy and they are depleting. Fossil fuels are non renewable and environmentally damaging. Due to increasing air pollution, global warming concerns, diminishing fossil fuels and their increasing cost have made it necessary to look towards renewable sources as a future energy solution. There are many Renewable Energy Sources (RES) such as wind, solar, tidal power, biomass etc. Solar energy has great potential to supply energy with

minimum impact on the environment, since it is clean and pollution free. In finding solutions to overcome a global energy crisis, the Photo Voltaic (PV) system has attracted significant attention in recent years. The government is providing incentives for further increasing the use of grid-connected PV systems. Conventionally, grid connected Photo Voltaic energy conversion systems are composed of an inverter.

Renewable Energy Sources are increasingly integrated at the distribution level due to increase in load demand which utilize power electronic converters. There is a disturbance in the electrical network due to the extensive use of these power electronic devices. The disturbances are due to the use of non-linear devices. These will introduce harmonics in the power system thereby causing equipment overheating, damage devices, EMI related problems etc[1],[2]. Harmonics is considered as one of the most essential problems in electrical power systems. Harmonics in power distribution system are current or voltage that are integer multiples of fundamental frequency. For example if the fundamental frequency 50Hz, then 3rd is 150Hz, 5th is 250Hz. Ideally, voltage and current waveforms are perfect sinusoids. However, because of the increased popularity of electronic and non linear loads, these waveforms become distorted. This deviation from a perfect sine wave can be represented by harmonic components having a frequency that is an integral multiple of the fundamental frequency. Thus a pure voltage or current

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