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Comparison of the Control Strategies of an Active Filter of a Photovoltaic Generation System Connected to the Three-Phase Network

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Abstract. With the aim to improve the quality of the energy a photovoltaic generator is connected to the electrical network by associating the functionalities of shunt active power filter. In this work, a system consists of a field of solar panels, a three-phase voltage inverter connected to the grid and a non-linear load constituted by a diode rectifier bridge supplying a resistive load in series with an inductor is proposed. To compensate for harmonic currents and reactive power, as well as the injection of active solar energy into the network, Direct current and power controls are used. To find the maximum power point tracking (MPPT) the global method is applied. However, the compensation of the harmonic currents, the correction of the power factor and the injection of solar power towards the electrical network are guaranteed by the direct commands, the simulation of the system under Matlab/Simulink environment prove its robustness. According to the levels of the solar PV power injected and consumed by the nonlinear load, several regimes are approached.

Keywords: Photovoltaic system · Direct power control · Shunt active filter · MPPT

1 Introduction

This Solar energy captured with photovoltaic panels is a viable alternative to electricity generation, as it is a renewable source, both clean, unlimited and with a very low level of risk. Its potential is very important on the scale of the need for human activity; it is also very widely distributed throughout the globe, which gives it an interest shared by all. With the price of photovoltaic (PV) modules rising and the price of fossil fuels increasing, the exploitation of this resource with PV generation systems becomes viable and profitable [1, 2]. The rapid growth in the use of non-linear loads in power systems tends to degrade the quality of electrical energy supplied to consumers. Renewable energy has already attracted much interest of several researchers. Among them, Takagi and Fujita [3], to improve the quality of energy (PQ), introduced an application of the Active Power Filter (APF) in the photovoltaic (PV) renewable energy system, In order to prove it is powerful in detecting the reduction of total harmonic distortion (THD)

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