Study on the Addition of Solar Generating and Energy Storage Units to a Power Distribution System

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Abstract: Installation of micro-generators based on renewable energy in power distribution system has increased in recent years, with the main renewable sources being solar and wind. Due to the intermittent nature of renewable energy sources, such micro-generators produce time-varying energy which does not correspond at certain times of the day to the peak energy consumption of end users. For this reason, the use of energy storage units next to the grid contributes to the proper leveling of the buses' voltage level according to Brazilian energy quality standards. In this work, the effect of the addition of a photovoltaic solar generator and a store of energy in the busbar voltages of an electric system is analyzed. The consumption of the solar irradiation available in a locality. The power summation method is validated with analytical calculation and is used to calculate the modules and angles of the voltages in the buses of an electrical system based on the IEEE standard, at each hour of the day and with defined load and generation profiles. The results show that bus 5 presents the worst voltage level at the power consumption peaks and stabilizes at the appropriate range with the inclusion of the energy storage during the night time period. Solar generator maintains improvement of the voltage level during the period when it receives solar irradiation, having peaks of production during the 12 pm (without exceeding the appropriate maximum levels of tension). **Keywords :** energy storage, power distribution system, solar generator, voltage level

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