

Abstract

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Modeling and Simulation of a Hybrid Power Generation System of Wind Turbine, Micro-Turbine and Solar Heater Cells

This paper is devoted to study the conversion of wind and solar energies into Electrical energy in a stand-alone hybrid power generation system. The hybrid system consists of a 230 kW wind turbine, a 30 kW micro-turbine and solar heaters of double-parallel flow. Solar heaters are being used to partially preheat the air entering the combustion chamber of the micro-turbine in order to decrease the amount of fuel consumption. The dynamic behavior and simulation results are being discussed to extract the maximum energy obtained from a variable speed wind power generation system. The hybrid model has been simulated under several wind speed conditions. A Supervisory controller is designed that was able to manage between the maximum energy captured from the wind turbine and the generated energy by the micro-turbine to meet the load demands and wind power fluctuation due to wind speed variation. Solar heaters saved amount of fuel on average 15.4 U.S. Dollars/hr monthly according to the data provided in the year 2013.