ABSTRACT

VIEIRA, Rodrigo. *Renewable energy system for water dessalination.* 2018. 132 f. Dissertação (Mestrado em Engenharia Eletrônica) - Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 2018.

This work describes the development and analysis by digital simulations of a hybrid renewable energy system for feeding a small-sized desalination plant. The power renewable system must operate off the grid, and is based on wind turbine, solar panels and a bank of batteries. Based on a bibliographical research on several desalination methods, the reverse osmosis (RO) desalinator was chosen because it was considered the easiest commercial acquisition and the possibility of composing a low power system. The main elements in this process are a module with semipermeable membranes ("skid") and an induction type electric motor for the pumping of water under high pressure. Therefore, the power system is designed to meet the power demand of that engine. The performance of two hybrid system configurations that have been termed system topology 1 and 2 are analyzed. In both topologies the wind power converters are diode rectifier and DC-DC converter classic boost, the one for the photovoltaic solar array is a "boost"CC-CC converter, and a "buck-boost"converter manages the energy flow of the battery bank. This assembly forms the DC bus that feeds a three-level three-phase Neutral-Point Clamped (NPC) three-phase inverter. In the case of topology 2 the distinguishing point is the use of a voltage doubler that combines the two boost converters to form up the DC bus. This converter was developed by making a small modification to the classical topology of the quadrupler rectifier of Greinacher / Cockcroft-Walton. In each boost converter, a Maximum Power Point Tracking (MPPT) algorithm was implemented. In the case of battery bank modeling, given the complexity of this theme observed in the researched literature, a simplified and specific model for the system operation regime is realized. The analyzes were performed by considering different situations at extreme limits of maximum and minimum wind and solar irradiation to meet specific conditions of load demand. The commercial program PSIM is used in carrying out all analyzes.

Keywords: Solar-PV; Renewable Energy; Airgenerator; MPPT; Dessalination.