Abstract

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Numerical Simulation of PV-Hydrogen Electrolyzes System

A numerical simulation was developed for a PV-Hydrogen Electrolyzes system. The system is simply consisted of a PV that feeds Hydrogen electrolyzes cell by electric power. The system was successfully installed and experimentally tested. Each system component was numerically modeled and the governing equations were solved as a steady solution for each time step. The simulation was running along the simulation period of time. TRNSYS 15 program was used to establish the simulation. The simulation results are verified with the corresponding measured data for the same system geometry and under the weather conditions of Egypt. It is found that the simulated Hydrogen flow rate approximately agrees with that produced experimentally where the maximum Hydrogen generation is about 43 ml/min. The difference between the measured and predicted H2 flow rate during the day hours is about 4 %. The daily overall efficiency of the system is ranged from 2.8 to 4.2 % in both simulated and experimentally data. The overall efficiency of the system along the year is approximately between 2.45 to 2.75 % and that is according to the total solar radiation incident and the amount of electric power delivered to the Hydrogen cell with the amount of hydrogen produced as well as the total hydrogen produced annually was 41407931.97 liters. The simulation program is approximately validated and can be used for the predication of the considered system performance.