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Assessment of Solar Hydrogen Production in Energetic Hybrid PV-PEMFC System

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Abstract : This paper discusses the design and analysis of a hybrid PV-Fuel cell energy system destined to power a DC load. The system is composed of a photovoltaic array, a fuel cell, an electrolyzer and a hydrogen tank. HOMER software is used in this study to calculate the optimum capacities of the power system components that their combination allows an efficient use of solar resource to cover the hourly load needs. The optimal system sizing allows establishing the right balance between the daily electrical energy produced by the power system and the daily electrical energy consumed by the DC load using a 28 KW PV array, a 7.5 KW fuel cell, a 40KW electrolyzer and a 270 Kg hydrogen tank. The variation of powers involved into the DC bus of the hybrid PV-fuel cell system has been computed and analyzed for each hour over one year: the output powers of the PV array and the fuel cell, the input power of the elctrolyzer system and the DC primary load. Equally, the annual variation of stored hydrogen produced by the electrolyzer has been assessed. The PV array contributes in the power system with 82% whereas the fuel cell produces 18%. 38% of the total energy consumption belongs to the DC primary load while the rest goes to the electrolyzer.

Keywords : electrolyzer, hydrogen, hydrogen fueled cell, photovoltaic
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