XIV International Congress of the Mexican Hydrogen Society
Cancun, Mexico, 2014

Multi-Objective Optimization of a Hybrid Generating System

Miguel Hernan[1], Victor M. Sanchez[1], R. Barbosa[1], J. Hernandez, Juan M. Ramirez[2,*]

[1]Universidad de Quintana Roo, Boulevard Bahía s/n, Chetumal, Q. Roo, México, 77019.
Tel: +5298350300; e-mail: vicsan.huerta@gmail.com
[2]CINVESTAV Guadalajara, Av. del Bosque 1145, Zapopan, Jalisco, México, 45019.
[*]Tel: +523337773600; e-mail: jramirez@gdl.cinvestav.mx

ABSTRACT

Renewable generating systems are a sustainable solution for the electrical energy production; however the costs associated with the initial investment and that usually these kind of electrical generating systems are over-sized with the aim of satisfying the electrical load connected to them, implies an increase in the costs of investment, maintenance and operation as well as a reduction of their overall efficiency. Therefore, sizing is an important issue in the design of renewable generation systems, in order to reach an efficient relationship between cost and benefit. Likewise, the random nature of the renewable sources increases the complexity for sizing a renewable generating system with regard to a conventional system. This paper is aimed to estimate the cost/sizing relationship of a hybrid energy solar-wind-diesel generator system using solar irradiation and wind data. The hybrid energy system uses the hydrogen as storage vector, so that it employs a fuel cell and electrolyzer for such task. The formulation is made up as a multi-objective optimization problem, solved by a genetic algorithm. The optimizer calculates the best system configuration to meet the commitment between the energy supply reliability and cost. Moreover, the optimizer allows an easy way for optimal sizing without depth knowledge of the relationship between the hybrid system costs and the generated power. Results are presented for a domestic installation load located in the south-east region of Mexico (Chetumal city).

Keywords: fuel cells; genetic algorithm, multi-objective optimization.