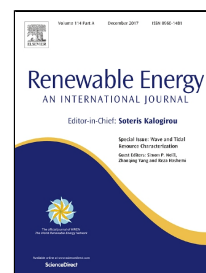


Accepted Manuscript

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Javad Mahmoudimehr, Masoume Shabani



PII: S0960-1481(17)30812-1
DOI: 10.1016/j.renene.2017.08.054
Reference: RENE 9152
To appear in: *Renewable Energy*
Received Date: 18 April 2017
Revised Date: 04 August 2017
Accepted Date: 21 August 2017

Please cite this article as: Javad Mahmoudimehr, Masoume Shabani, Optimal Design of Hybrid Photovoltaic-Hydroelectric Standalone Energy System for North and South of Iran, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.08.054

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Javad Mahmoudimehr*, Masoume Shabani

Department of Mechanical Engineering, Faculty of Engineering, University of Guilan, Rasht, Iran

Abstract

This study is concerned with the optimal design of a hybrid photovoltaic-hydroelectric standalone energy system for coastal areas in the north and south of Iran. In this regard, a novel approach, which is a combination of a straightforward quasi-steady operational strategy and Genetic Algorithm, is employed. Investment cost and loss of power supply probability (LPSP) are considered as objective functions. Number of PV modules, turbine capacity, charge and discharge pipes diameters, and reservoir volume, installation height and depth to diameter ratio constitute the set of design variables. To the best of our knowledge; it is the first time that such a wide range of design variables is being considered. The results show that the proposed approach is able to reach a design with the full satisfaction of fluctuating power demand and system constraints. In this case, for the yearly-averaged demand of 32.4kW, the investment cost is obtained to be 2.13M\$ and 1.59M\$ for the north and south of Iran. Moreover, a compromise between objective functions results in 26.1%/17.6% reduction in investment cost at the expense of 13.8%/11.1% increase in LPSP for the north/south region. The paper compares in detail the optimal system designs and operations obtained for the two regions.

Keywords: Photovoltaic array; Hydro storage technology; Standalone energy system; Optimal design

* Corresponding author, Assistant Professor, Department of Mechanical Engineering, Faculty of Engineering, University of Guilan, P.O.Box 3756, Rasht, Iran, Tel.: +98 131 66 90 274-8, E-mail address: mahmoudimehr@guilan.ac.ir; mahmoudimehr@alumni.iust.ac.ir.

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