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بالرسالة صفحات

لم ترد بالاصل

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
ELECTRICAL POWER AND MACHINES DEPARTMENT

ENGINEERING AND ECONOMICAL FEASIBILITY STUDY FOR RENEWABLE ENERGY APPLICATION IN AN ISOLATED TOURIST VILLAGE

A Thesis

Submitted to the Faculty of Engineering, Ain Shams University for the Degree of Doctor of Philosophy

in

Electrical Engineering

BY

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The work in this Thesis was carried out by the author in the Department of Electrical Power and Machines, Faculty of Engineering, Ain Shams University.

No part of this Thesis has been submitted for a degree or a qualification at any other university or institution.

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ABSTRACT

Conventional energy supply employing natural resources like oil and natural gas, are not only quantitatively limited but also quantitatively has series environmental implications. Looking for a clean and unlimited energy supply has occupied a sizable share of research for the past few decades. Wind and solar energy come on top of the clean, and unlimited energy resources. However, the cost associated with such ideal energy supply limits the spreading of these resources in practical application. The most viable application of these energy resources is to feed the electrical load in an isolated area that satisfies certain weather conditions. The north coast of Egypt could be one of the ideal sites where the wind and solar energy can be utilized for energy supply.

This Thesis presents a management technique of a hybrid system employing wind and solar as major energy supply while diesel and batteries as a back up supply. This hybrid energy system is to supply energy for an isolated tourist village located on the north coast of Egypt. The cost of energy supply is minimized in a two phase process. In the first phase, an investigation of alternative approaches to minimize energy consumption, as natural ventilation and sun cooking has been conducted. Besides, the load considered is split up into two classes, class to be fed by DC power supply like refrigerators and lighting, while the other class, as water heating and cooking is fed by an AC supply. In the second phase, the management of these energy resources to minimizing the energy cost meanwhile satisfying natural and technical constraints is represented. The conventional optimization techniques may not consider the uncertainty associated with the weather conditions of the site. Hence a fuzzy-sets based optimization algorithm is utilized to handle such weather uncertainty. This work entailed modelling and analysis based on fuzzy optimization algorithm to reach the optimal sizing of the photovoltaic and wind unit to minimize the overall cost.

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