UPGRADING EXISTING EDUCATIONAL BUILDINGS TO A ZERO-NET ENERGY

By

Nehad Mokhtar Ahmed Khattab

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In
Electrical Power and Machines Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the supervision of

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Approved by the

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Title of Thesis:
(Upgrading Existing Educational Buildings to a Zero-Net Energy)

Key Words: Zero energy buildings, Demand side management, existing educational buildings, PV panels, Egypt.

Summary: In this thesis, proposed strategies are developed and applied to a building existing in Egypt. These strategies aimed to improve the building energy efficiency and to reduce the energy consumption and show the effects of adding renewable energy system to this building. The study utilized a case study for an educational building existing in El shorouk city in Egypt, Initially, it studied the characteristics of the building and its load profile along with its meteorological. The first phase of the proposed solution is to implement some strategies to minimize energy used for building lighting, air conditioning and improve the load profile. The cost analysis is done for all applied strategies in addition to estimate saved energy for each strategy. The second phase of the solution is to include a PV system connected to the Grid in the building. The PV-system is simulated using HOMER software in order to choose the most economical and friendly environmental renewable energy system to be integrated into the building to turn it into (NZEB). The PV SYST software is used to get the suitable arrangement of the PV system, which chooses to be added to the building under study. An economic study is applied by HOMER for different PV systems to get an adequate size. This economic study considered the cost of energy and determined the payback period.

ACKNOWLEDGMENT

First of all, I wish to offer my great thanks to Allah who gives us the faith and hope to succeed.

Although my next few words couldn‘t express my deep feelings and respect towards my supervisors, but it may at least indicates some of those feelings.

I am honored to record my deepest sense of gratitude and thanks to ***Prof. Dr. Mahmoud Gilany*** for the efforts he had exerted in this research, his helpful discussions, constructive criticism and the understanding he has shown throughout this work. I do really appreciate very much his fruitful comments to this thesis.

I owe special thanks to ***Dr. Mahmoud M. Sayed*** for his guidance, valuable discussion and also the useful suggestions during the research period.

My special thanks are also extended to all the staff of the Electric Power and Machines Department in El-Shorouk Academy specially **Dr. Hatem Seoudy** and **Eng. Galal Abdella** for their continuous encouragement, care and support.

There are no enough words to thank my best friends **Huda Elsherbeny** and **Hadeer Shaheen** for their support of me.

I would like to dedicate a lot of thank my beloved family (my mother, my father, my sisters). You are all an inspiration to me. You have sincerely encouraged me, like no one else, from the early beginning and throughout the way.

Thank you all!

Nehad Khattab

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