



بسم الله الرحمن الرحيم

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Cairo University

**EVALUATING ECONOMIC AND
ENVIRONMENTAL IMPACTS OF
PHOTOVOLTAIC SYSTEMS ON COMMERCIAL
BUILDINGS AND GRID CONNECTION
REQUIREMENTS**

By

Yehia Abdelrehim Anwar Abdelrehim

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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Evaluating Economic and Environmental Impacts of Photovoltaic Systems on Commercial Buildings and Grid Connection Requirements

Key Words:

Photovoltaic systems, Energy auditing, Leadership in Engineering and Environmental Design (LEED), Grid connection requirements

Summary:

This thesis is divided into two parts. The first one has tried to enhance the energy production in Cairo Festival City Mall (CFCM) by utilizing the unusable areas and installing a Photovoltaic (PV) plant on rooftop to reduce the energy consumed from utility grid that will lessen fossil fuels consumption and thus improve the environmental issues. In addition, LEED (Leadership of Engineering and Environmental Design) standards have been applied to evaluate this large commercial building and to check its status and how many points it will achieve when utilizing PV generation on site. Besides, the gained profit when selling the generated energy from the PV plant to the utility grid through Feed-In-Tariff (FIT) program is also evaluated.

On the other hand, the second part discusses the grid connection parameters of a PV power plant. A case study of 5 MW PV plant in Sharm El-Sheikh has been studied to check its compatibility with the grid parameters for a successful interconnection or not, and the environmental impacts have been discussed and compared with the traditional resources as well. A comparison of the electrical energy output of different simulation programs available nowadays for PV systems such as; PVSyst, and SAM design and the actual energy output from an existing PV plant with the same characteristics have also been carried out.

DISCLAIMER

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references sections.

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