

HIGHER TECHNICAL INSTITUTE

MECHANICAL ENGINEERING COURSE

DIPLOMA PROJECT

AN INVESTIGATION INTO THE COST
EFFECTIVENESS OF PHOTOVOLTAIC
APPLICATIONS IN A RESIDENTIAL HOUSE

M/989

MALAES VASILIS

2004

HTI

MECHANICAL ENGINEERING COURSE

DIPLOMA PROJECT

**AN INVESTIGATION INTO THE COST
EFFECTIVENESS OF PHOTOVOLTAIC
APPLICATIONS IN A RESIDENTIAL HOUSE**

M/989

MALAES VASILIS

2004

HIGHER TECHNICAL INSTITUTE	PROJECT NO
	3533

AN INVESTIGATION INTO THE COST EFFECTIVENESS OF PHOTOVOLTAIC APPLICATIONS IN A RESIDENTIAL HOUSE

M/989

By

Malaes Vasilis

Project report submitted to the
Department of Mechanical Engineering
of the Higher Technical Institute

Nicosia Cyprus

in partial fulfillment of the requirements for the diploma of

TECHNICAL ENGINEERING

In

MECHANICAL ENGINEERING

June 2004

HIGHER TECHNICAL INSTITUTE	PROJECT NO
	3533

Acknowledgements

The completion of this project would have not been attained without the appreciable help of all the persons who contributed to it and whom like to thank.

First of all I would like to express my sincere thanks and appreciation for the help and guidance give to my throughout this project by my supervisor Dr. Ioannis Michaelides.

My special thanks to mister to Mr. Haris Karajian for the advice and the information he offered me, also for his help in using PV Grid Con V7. XLS program.

CONTENT

SECTION	PAGES
Acknowledgements	
Summary	
Introduction	
PART A	
CHAPTER 1: Current developments in the field of photovoltaic solar energy conversion	
1.1 Introduction	6-7
1.2 What are the fundamentals of PV	8
1.3 What era appropriate applications	9
1.4 What so special about PV	10-11
1.5 How a PV system works	12-13
1.6 PV Cells, Modules and Arrays	14-15
1.7 How PV Cell works	16-25
1.8 Powering a house	26-27
1.9 Obstacles	28-29
1.10 DC to AC	30
1.11 How PV Cell are made	31
1.12 Types of PV Systems	32-36
1.13 Why batteries are used in some PV Systems	37

PART B

CHAPTER 2: Grid connected system and applications

2.1 What is a grid-connected photovoltaic power system, and what are its main features?	38-39
2.2 Solar Power Generation Systems.	40
2.3 <i>Net metering</i>	41-43
2.4 Can a PV System be installed on my building?	44-46
2.5 Choosing the right inverter	47-52
2.6 Legislation.	53-55

PART C

CHAPTER 3: Determination of power needs and cost evaluation

3.1 Calculation of the power needs.	56-57
3.2 copy of PV Grid con V7.XLS	58
3.3 Cost evaluation	59-62

PART D

4. Conclusions	63-65
----------------	-------

1.1 Introduction.

Photovoltaic (PV) devices transform sunlight directly into electricity. They have been around for about thirty years, doing exotic things like generating electricity for satellites in space. But the real value of PV lies in its potential to produce electricity on earth, and to do so cheaply enough to compete with conventional sources of electricity like nuclear, coal, oil, and natural gas.

It is important to think of photovoltaic solar energy converters as systems rather than as 'solar cells'. What is required of photovoltaic converters is the delivery of electrical power to satisfy the demand of a given load. Such loads may range from small, single-purpose devices, such as navigation lights, over single-family residence, commercial or public buildings, and industrial plants of any size, to a community or an entire utility network.

These loads generally require power delivery on demand, at a fixed voltage, and, in some cases, at precisely controlled frequency and phase. Consequently, the converter system may contain in addition to the solar collector, a voltage regulator, electrical energy storage, an inverter, and possibly other subsystems.

The scope of this project is to be familiarized with the student the whole system in order to present the best possible system and the reason why according to Cyprus demand. The student binds with the research of Cyprus and external market and basically to explain the reasons of using solar systems and understands how the complete system works.