Ain Shams University
Faculty of Engineering
Electronics and Communications Engineering Department

Design of PV System to Power BTS Unit

A Thesis

Submitted in Partial Fulfillment of the Requirements of the Degree of

Master of Science in Electrical Engineering

Submitted By

Khaled Hossam Youssef Abd Elhamid

Supervised By

Prof. Dr. Wagdy Refaat Anis

Professor in the Electronics and Communications Engineering Department
Faculty of Engineering – Ain Shams University

Prof. Dr. Ismail Mohamed Hafez

Professor in the Electronics and Communications Engineering Department
Faculty of Engineering – Ain Shams University

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Name: Khaled Hossam Youssef Abd Elhamid

Thesis: Design of PV System to Power BTS Unit

Degree: Master of Science in Electrical Engineering

Examiners Committee

Name and Affiliation	Signature
Prof. Dr. Salah Sayed Ibrahim Elagooz Shrouk Academy, Faculty of Engineering, Electronics and Communications Engineering Dept.	….....
Prof. Dr. Abdelhalim Abdelnaby Zekry Ain Shams University, Faculty of Engineering, Electronics and Communications Engineering Dept.	….....
Prof. Dr. Ismail Mohamed Hafez Ain Shams University, Faculty of Engineering, Electronics and Communications Engineering Dept.	….....
Prof. Dr. Wagdy Refaat Anis Ain Shams University, Faculty of Engineering, Electronics and Communications Engineering Dept.	….....

Date: ..... / …….. / ……

STATEMENT

This thesis is submitted to Ain Shams University for the degree of Master of Science in Electrical Engineering.

The work included in this thesis was carried out by the author at the Electronics and Communications Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

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

Name : Khaled HossamYoussef

Signature:

Date : …….. / …….. / …….

CURRICULUM VITAE

KHALED HOSSAM YOUSSEF

CAIRO, EGYPT
KHFKHALID@GMAIL.COM
KHFKHALID@YAHOO.COM

01148878884
01022988461

Electronics and Communication Engineer

Profile

I am A highly motivated individual with a keen eye for detail. I am looking for an opportunity to prove my worth and advance my career as far as possible. I consider myself to be an effective team player with excellent leadership skills and an analytical approach to the solving of problems. My experience includes high pressure management roles, implementation of new use of operating systems, products and sales techniques. I am fully experienced with the recruitment processing and candidate selection. I believe given a chance I would become an asset to any company immediately

EDUCATION

Electronics and communication, Master of Engineering August 2011 – Present

Ain-Shams University, Cairo, Egypt

Studies focused in advanced electronic and communication .and I will focus in network communication security. And I will build a new strategy of communication security.

Electronics and communication, Bachelor of Engineering August 2005 – May 2009

High Institute of Engineering, El shrouk, Egypt
Average Grade : Good

Specialized in different types of electronics analog and digital , use the suitable methods to measure it's output and work in PCB boards. Also Specialized in different types of communication digital and analog, Computer networks and computer network security.

EXPERIENCE

Site Engineer , Alkan networks

February 2012 – Present

Company name, Alkancit , Cairo

A Specialist company which work as sub-contractor for Ericsson which work with different jobs in Vodafone and Etisalat.

Position: Site Engineer.

Duties: >Install new BTS stations (2G, 3G and Transmission).

> Filed maintenance engineer which responsible to fix any down telecom devise as (2G, 3G, Transmission and ISP) in my location area inside BTS station or BSC stations.

Skills

ICDL
MS Office Suite

MCSE

Windows XP.
Windows server 2003.

ISA 2006.

Implementing and Administering Security.

Planning and Maintaining a Windows Server 2003.

Programming

VHDL
C
C++
C#

Certifications

ICDL
DDL Edexcel

-Undertake learning Needs analysis.

-Deliver learning

Lab engineer trainer, ITEC (Edexcel)

November 2010 – Jan 2012

Cluster Name, Amerria , Cairo

A Specialist technical training cluster that focuses in a vocational education system and it belong to Edexcel in England management rules.

Position: Teaching + maintaining the lab .
Duties: >Teaching to learners the healthy and safety in workshops.
> Teaching all the components and machines
>> Teaching the steps they will follow it to test the electronic system .
> Making observation in their work and give them effective feedback.
> Deliver their results to the cluster manager.
> If there any problem in the lab I will fix it.

Technical support engineer , Dataonline.com

November 2009 – September 2010

Company Name, Data online, Cairo

A Specialist company which work in build systems and deliver technical support to other systems which include computers, networks, faxes, centrals and mobiles networks all of that are connected with each other by using servers to manage all of that.

Position: Technical support engineer.

Duties: >Ask the customer about their system's problem.
> Test the system instructions and find the problem.
> Tell the customer how it will be cost.
> Fixing the problem then delivering contract of maintenance.
> Visiting the customer once a month.

Technical Engineer, Triple A

August 2009 – November 2009

Company Name, Triple A, Cairo

A legal organization that specializes in producing the electronic boards and fixing the damage in the electronic boards.

Position: Test the electronic boards + Fix the electronic boards.
Duties: > Test the electronic boards with the professional ways.
> Cold calling and responding to inbound enquiries.
> Deliver my best solution with a little cost.
> Development and integration of new products.

programmers.

-Develop Assessment Practice.

-Manage Review AND Evaluation.

-Maintain Professional Practice.

-Quality Assuring Vocational Qualifications.

C# programming language.

Satellite communication .

Microcontroller programming (ATMEL).

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I can't forget to thank my great grandfather **Abd el fath abd el hamid heagzy** (**Allah** mercy on him) who was endless sources of advice, guidance and help. I pray to **Allah** to grant him his mercy, satisfaction and paradise.

I wish to express my deepest thanks to my dear friends and brothers**Eng. Belal Yousef** (M.Sc.) and **Eng. Mohamed Nageh**(M.Sc.)For their continuous encouragement, support and help.

Khaled Hossam

2016

ABSTRACT

The problem of providing electrical energy to mobile BTS stations either in remote or urban areas may be solved to the greatest extent if renewable-energy sources are used. In remote areas, where electric utility isn't available, photovoltaic (PV) stand-alone system, using storage batteries represented a good solution, although it is expensive. In urban areas, PV on the grid system is an economical solution. In such a system, during sunshine hours the power generated by PV system supplies a part of its energy to BTS station, and the rest of the energy is supplied to grid utility. During the night where no solar-energy is available, the system is supplied by grid utility, i.e. you get back during the night, the energy supplied during the day to the grid. It is also possible to have a hybrid system using a diesel generator combined with PV to supply BTS stations in remote areas. The economics of the different proposed systems are the criterion of selecting the optimum system in Egypt. The major criterion is the cost per generated kWh is the crucial rule to decide which system is optimized. This work considers every above system.

Keywords:

Base Transceiver Station (BTS), photovoltaic (PV), Power Supply Unit (PSU), Battery Fuse Unit (BFU), Array factor (F_A). State Of Charge (SOC), Automatic Transfer Switch (ATS), Diesel Generator (DG).

Published paper:

Khaled Hossam, Dr. Adel R. Mikhail, Dr.Ismail M. Hafez and Dr. Wagdy R. Anis "Optimum design of PV systems for BTS in remote and urban areas," International Journal of scientific &technology research,Vol.5, pp.355-363, ISSN 2277-8616, June 2016.

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SUMMARY

This thesis discusses one of the hotspot topics in powered base transceiver station(BTS) with different systems. All these systems focus on using renewable-energy source as PV solar-energy source in urban and remote areas. Also, design of each system depends on BTS loadsand BTS configuration. Systems are simulated by Math-Lab programs with measured indoor and outdoor BTSs loads in Cairo Egypt. Economics is calculated for each system.

Chapter one: It discusses short introduction about BTS, BTS configuration system, overview of PV solar-energy source and problem facing powered BTS.

Chapter two: It discusses short introduction about the components of BTS, two examples of BTS loads are discussed.Different proposed systems used to power BTS loads with the block diagram for each system are studied. Moreover, an overview about publishing papers concerning BTS power systems is included.

Chapter three: It discusses system modules for different solutions used to operate BTS loads overall the year and simulation Math-Lab program design for each system.With the effects of climatic conditions,solar irradiance, temperature, cloudy days,tilt angles and the energy output of the PV array. PV module characteristic is included in the simulation program.

Chapter four: It discusses overview economies calculations in US dollar ($) for each system model according to mobile operator's requirements and international market prices.

Chapter five: It contains conclusions and future work for this thesis.

This thesis includes five appendices and they are appendix (A) Simulation program to calculate energy generated from PV system, Appendix (B) Simulation Program For on the grid PV system, Appendix (C) Simulation program of Stand-Alone system, Appendix (D) Simulation program for hybrid PV and diesel generator systemand the appendix (E) Simulation program for Stand-Alone and diesel generator running at cloudy days.

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