

THE UNIVERSITY OF CHICAGO
PHYSICS DEPARTMENT
5300 S. DICKINSON DRIVE
CHICAGO, ILLINOIS 60637

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RELIABILITY AND ECONOMIC ASSESSMENT OF HYBRID
PHOTOVOLTAIC/WIND SYSTEM WITH BATTERY
STORAGE AT UNIVERSITI MALAYSIA
TERENGGANU (UMT) RENEWABLE
ENERGY STATION

By
Fadilah Binti Abd Wahab

A project report submitted in partial fulfillment
of the requirements for the award of the degree of
Bachelor of Applied Science (Physics Electronic and Instrumentation)

DEPARTMENT OF PHYSICAL SCIENCES
FACULTY OF SCIENCE AND TECHNOLOGY
UNIVERSITI MALAYSIA TERENGGANU
2008



**JABATAN SAINS FIZIK
FAKULTI SAINS DAN TEKNOLOGI
UNIVERSITI MALAYSIA TERENGGANU**

PENGAKUAN DAN PENGESAHAN LAPORAN PITA I DAN II

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk :
RELIABILITY AND ECONOMIC ASSESSMENT OF HYBRID PHOTOVOLTAIC/WIND SYSTEM WITH BATTERY STORAGE AT UNIVERSITI MALAYSIA TERENGGANU (UMT) RENEWABLE ENERGY STATION oleh **FADILAH BINTI ABD WAHAB**, no. matrik: **UK 12399** telah diperiksa dan semua pembedaan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains Gunaan (Fizik Elektronik & Instrumentasi) Fakulti Sains dan Teknologi, UMT.

Disahkan oleh:


.....
Penyelia Utama **ENGKU ABD GHAPUR BIN ENSKU ALI**
Nama: **Pensyarah**
Cop Rasmi: **Jabatan Sains Fizik
Fakulti Sains dan Teknologi
Universiti Malaysia Terengganu
21030 Kuala Terengganu**

Tarikh: **5/5/08**

.....
Penyelia Bersama (jika ada)
Nama:
Cop Rasmi


Tarikh:


.....
Ketua Jabatan Sains Fizik
Nama: **PROF. DR. SENIN BIN HASSAN**
Cop Rasmi: **Head
Department of Physical Sciences
Faculty of Science and Technology
University Malaysia Terengganu
21030 Kuala Terengganu**

Tarikh: **4 Mei 2007**

DECLARATION

I hereby declare that this thesis entitled Reliability and Economic Assessment of Hybrid Photovoltaic/Wind System with Battery Storage at Universiti Malaysia Terengganu (UMT) Renewable Energy Station is result of my own research except as cited in the references.

Signature : 
Name : FADILAH ABD WAHAB
Matrix No : UK 12399
Date : 5th MAY 2008

ACKNOWLEDGEMENT

In the name of Allah S.W.T, I am so grateful because of His allowance I finally successfully finished my final year project and project report entitled Reliability and Economic Assessment of Hybrid Photovoltaic/Wind System with Battery Storage at Universiti Malaysia Terengganu (UMT) Renewable Energy Station on the given time.

First of all, I would like to give my special gratitude to my judicious supervisor, Puan Nur Farizan Binti Munajat, whose has given me the guidance along my ways to finish my final year project. I really appreciate her perspective advices, ideas and all comments that have helped me to improve myself.

I also like to express my deepest appreciation to all lecturers of Faculty Science and Technology especially to Dr. Mohd Zambri Bin Ibrahim and lecturers in the Department of Physical Sciences for all the support, co-operation, guidance, help and advice. Their judgment and opinion helped me to more focus and give the best in doing my final year project.

A special thank you also I dedicate to my family especially to my lovely parents, Encik Abd Wahab Bin Salimin and Puan Sopiah Binti Zainol for all their supports, love and encouragement. Lastly I would like to give my appreciation to all my friends and course mates especially to Shabanun Salwa Binti Mohd Yusof, Aimi Liyana Binti Azlan, Naimah Binti Ismail, Mardhiah Binti Rahim and Nor Shazlinda Binti Rosli who had together sharing ideas, joy and sorrow during the way to complete this final year project.

Thank you.

ABSTRACT

The study of reliability and economic assessment of hybrid photovoltaic (PV)/wind system with battery storage at Universiti Malaysia Terengganu (UMT) renewable energy station is presented in this paper. The study aims at finding the configuration, among a set of systems components, to achieved the desired system reliability requirements, with the value of levelized cost of energy. It is describes a study for analyzing the probability of power supply failure in hybrid photovoltaic/wind power system incorporating a storage battery bank, and also analyzes the reliability of the systems. An analysis of the complementary characteristics of solar irradiance and wind power for Universiti Malaysia Terengganu (UMT) renewable energy station is also presented. For the loss of power supply probability (LPSP) analysis, the calculation objective functions and restraints are set up for the design of hybrid systems and to assess their reliability. Applying this method to hybrid photovoltaic/wind system with battery storage in Universiti Malaysia Terengganu (umt) renewable energy station, the results show that the configurations systems did not meet the desired system reliability requirements ($LPSP = 0$) with the lowest LCE in order to power supply residential household located in the area of the study.

ABSTRAK

Penilaian system yg boleh dipercayai dan ekonomi bagi sistem hibrid fotovoltaik/angin dengan simpanan bateri di Stesen Kajian Sumber Tenaga Keterbaharuan Universiti Malaysia Terengganu (UMT) dibentangkan dalam kajian ini. Kajian yang dilakukan bertujuan mencari konfigurasi diantara komponen-komponen sistem untuk memenuhi keperluan sistem yang boleh dipercayai seperti yang diinginkan dengan nilai bagi paras kos untuk tenaga. Ia mengenai kajian untuk menganalisis kemungkinan kegagalan bekalan kuasa dalam sistem hibrid fotovoltaik/angin bergandingan dengan kumpulan simpanan bateri, dan juga menganalisis sistem yang boleh dipercayai. Analisis sifat-sifat saling melengkapi bagi kuasa sinaran suria dan angin untuk Stesen Kajian Sumber Tenaga Keterbaharuan Universiti Malaysia Terengganu (UMT) juga dibentangkan. Untuk analisis kemungkinan kehilangan bekalan kuasa (LPSP), objektif pengiraan fungsi dan sekatan diatur untuk rekabentuk sistem hibrid dan untuk menaksir sistem yang boleh dipercayai. Kaedah ini digunakan untuk sistem hibrid fotovoltaik/angin dengan simpanan bateri di Stesen Kajian Sumber Tenaga Keterbaharuan Universiti Malaysia Terengganu (UMT), dan keputusan menunjukkan bahawa sistem konfigurasi tidak memenuhi keperluan sistem yang boleh dipercayai seperti yg diinginkan (LPSP = 0) dengan nilai yang terendah bagi paras kos untuk tenaga (LCE) untuk bekalan kuasa seisi rumah di kediaman yang terletak di kawasan kajian.