



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

FACULTY OF ENGINEERING

**DEPARTMENT OF AGRICULTURAL MECHANIZATION
AND IRRIGATION ENGINEERING**

**DESIGNING OF A PV SOLAR ENERGY SYSTEM FOR THE
ADMINISTRATION BLOCK AND HOSTELS OF BUSITEMA
UNIVERSITY MAIN CAMPUS**

BY

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**SUBMITTED IN PARTIAL FULFILMENT FOR THE AWARD OF A BACHELORS
DEGREE IN AGRICULTURAL MECHANIZATION AND IRRIGATION ENGINEERING
OF BUSITEMA UNIVERSITY**

MAY - 2013

ABSTRACT

Electricity is an integral utility in modern society with links to everything from human subconscious fear of the dark to the practical need for working illumination in an industrialized world. The entire world essentially runs on electricity in one form or another. Electricity is among the key issues emphasized under the national Poverty Eradication Action Plan (PEAP), which is the key government framework for ensuring poverty eradication through creation of an enabling environment for rapid economic development and social transformation. At 69.5KWh per capita in 2009, Uganda's Electricity was one of the lowest in the world. Increased per capita consumption has been cited as the key impetus for development in countries like Malaysia and Korea. During the 2010-2011 periods, the country's electricity supply continued to struggle to meet demand. By May 2011, a peak demand was estimated at 450MW against actual generation of 310MW. This resulted in prolonged load shedding (up to 24hrs) as electricity supply was actively rationed. Both domestic and industrial consumption was affected by this rationing.

Therefore the core intention of this project was to design PV solar Energy system for the administration block and hostels of Busitema University main campus located at Busitema, formally the National College of Agricultural Mechanization which is along Jinja-Tororo high way, 25km south-west of Tororo or 183km east of Kampala.

The detailed objectives were: to carry out the baseline survey to determine the existing power needs, to design and size the system components and to carry out an economic analysis of the system. The basic methodology and the key elements of the system design, data collection methods which were used include: desk study, consultations, interviews, baseline surveys, site photography and obtaining metrological data.

An energy audit was carried out in the administration block and hostels and it was found that the hostel peak demand was 112A and 48A for the administration block. A system capable of supplying electrical energy for academic purposes in the hostels and administration block was designed and component sizing was carried out. Major system components such as PV modules, charge controller, battery array and inverters were specified considering the insolation levels of 5.49 sunshine hours per day. An estimation of the total system costing of Uganda shillings 856,143,375/= was made which included together with the possible ways of lowering the system cost without compromising the total system performance. The payback period was for the administration block and the hostels were 2 years and 11 years respectively.

The following recommendations were made: implementation of the PV solar design in a phased manner and should be updated to cope with electricity demands of the University, encourage both students and staff on electric energy saving culture, design of the power distribution system in the administration block and hostels, employing of qualified technical staff to maintain the system and to design a solar hybrid system with the generator.

DEDICATION

I dedicate this report to my beloved grandfather Mzee Burasiyo Kanyima and parents Rev.can. and Mrs Joyce Bashaija and to our great family friend Rev. Janet M Pratt for their love and sacrifices from the time I came into this world up to today.

May the almighty God bless them abundantly.

ACKNOWLEDGEMENT

I received a lot of good will and support during my academic carrier, project preparation and the subsequent writing of this report. My first thanks goes to Busitema University administrators, Faculty of engineering, Department of Agricultural Mechanization and Irrigation Engineering, teaching and non teaching staff, my supervisors and fellow students for their intellectual and material support.

I am exceedingly grateful to my all my teachers since my church school up to date for the noble service to me and the nation.

In the same vein, I am extremely appreciative to the Rutangas, Prof. Ijuka Kabumba and Mr Mwijuka Johnson, Kazooba Tadeo for their moral and material support, and then also to my former bosses Ms Jane Katembwe and Capt. J B Tumusiime, and my current boss Capt. Jimmy Otim for giving me permission to pursue this course.

I am greatly indebted to my academic supervisors and Mr Kilama George for going an extra mile to see that they get the best out of me especially when the going got tougher. This is the true genius of a patriotic teacher.

I owe a special debt to my room mates and classmates at the University. Unforgettable among these are; Mr. Kamwesiga Justus, Ssekiziyuvu Atanans, Senfuma Ibrahim and Bakyenga Bob and Kazibwe Godfrey. You have been an inspiration to me.

Last but not least, I extend a gesture of gratitude to the rock of my family and great friend, my wife Patience Mugisha, and to my children Joshua and Rukiri, I love you all more than you can imagine, for your immeasurable contributions, care, comfort, challenges, consolations and more so for allowing me to go for further studies.

May God bless Uganda.

DECLARATION

I, Mugisha Emmanuel Bashaija declare that the content of this report on my project 'Designing of a PV solar energy system for the administration block and hostels of Busitema University main campus' is the result of my findings and is to the best of my knowledge not been presented by anyone in the same field of training.

Signature.....

Reg. No.: BU/UG/2009/152

Date: 4th July 2013



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LIST OF ACROYNMS

BU	Busitema University
CFLs	Compact fluorescent tube
CIA	Central Intelligence Agency
ERA	Electricity Regulatory Authority
FAO	Food for Agriculture Organisation
HEP	Hydro Electric Power
IEA	International Energy Agency
MS	Micro Soft
MW	Mega Watt
PV	Photo Voltaic
REPU	Renewable Energy Policy for Uganda
TWh	Tera Watt hour
UEDCL	Uganda Electricity Distribution Company Limited
UEGCL	Uganda Electricity Generation Company Limited
UNBS	Uganda National Bureau of Standards
UNIDO	United Nations Industrial Development Organization
Ush	Uganda shilling

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CHAPTER ONE

1. INTRODUCTION

1.1 Back ground

In South Africa, Johannesburg city in its growth and development strategy 2040 warned people on its official website on April 27th 2013 that load shedding was to continue. People were urged to use electricity sparingly to cut the need for planned power outage. ESKOM-South Africa the utility company conducts load shedding on a rotational basis in some areas even more than once daily, because there is high demand and shortage of capacity. Consumers are requested to use electricity sparingly in order to reduce the amount of load shedding.

In March 2013, Hamid Rahman reported that there was a load shedding crisis in Pakistan in fact facing an acute shortage of electricity since 2007. In some commercial and residential areas like Karachi, load shedding goes on up to 10 hours and industrial load shedding up to 8 hours. The government is being blamed. For example in 2009., the minister for water and power promised that load shedding would be no more by December 2009 but it came to pass without the load shedding gone.

Bhwan Thapaluyu, a Nepal based economist, author, analyst, poet and journalist recently reported a dire electricity crisis in Nepal. Darkness grows beneath the Everest where load shedding goes for 8 hours daily. Fearing for future power crisis, China is investing USD 125 billion in power plants over the next five years.

Recent forecasts as contained in the East African Power Master Plan have been updated by UETCL to reflect the actual mega watt and mega watt hour in generation and have estimated the yearly growth in demand for electricity to be at 7 – 9% which confirms that the increased investment in the renewable energy projects are required to respond to the growth in demand.

Here in Uganda, in 2006, Dr. Albert Rugumayo in his paper, *The Electricity Supply Situation in Uganda and Future Direction*, reported that Uganda was facing an acute power supply shortage which had affected all the sectors of the economy. Even after the commissioning of the Bujagali hydro electric power station in 2012, load shedding has continued.

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