National Training Workshop

Use of HOMER Software as a tool for RE Project Design

Date: 24 – 25 June, 2014

Location: Kumasi, Ghana

Organized by:

The Energy Center, College of Engineering

Kwame Nkrumah University of Science and Technology, Kumasi Ghana

Supported by:

ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)

I. Introduction and Context

A. The Energy Center, KNUST

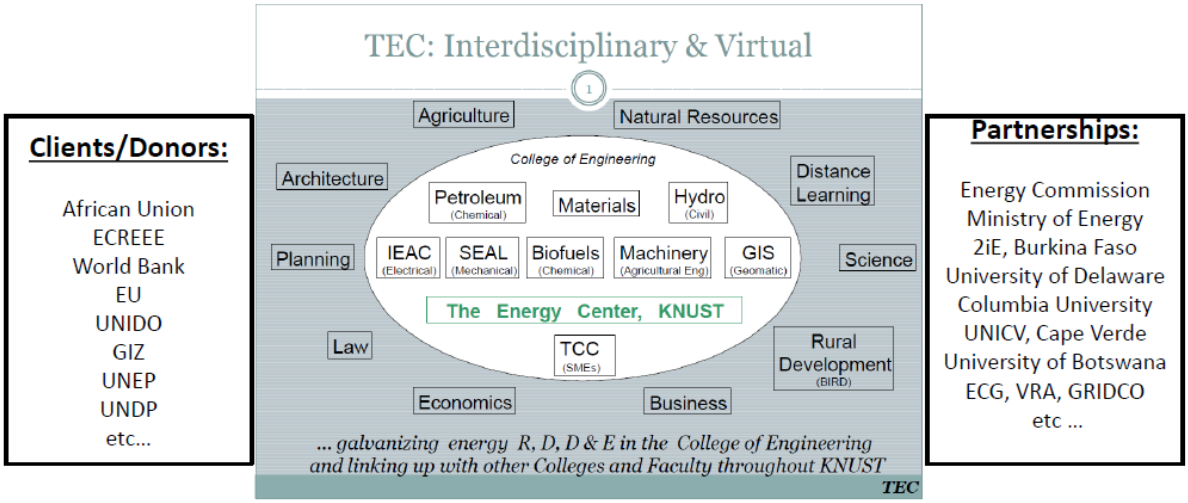
Kwame Nkrumah University of Science and Technology (KNUST) is Ghana's foremost institution of Science and Technology, established in Ghana in 1952 with a mission to provide an environment for teaching, research and entrepreneurship training in Science and Technology for the industrial and socio-economic development of Ghana, Africa and other nations. KNUST also offers service to community, and is opened to all the people of Ghana and positioned to attract scholars, industrialists and entrepreneurs from Africa and other international communities.

The University has a student capacity of nearly 50,000 comprising undergraduate and postgraduate students from all over the world, especially, from the African continent, offering programmes ranging from Science, Engineering, Art, Business, Law, and Technology. The main university campus is about seven square miles in area.

Although KNUST has been actively involved in energy research in Ghana and across Africa since the 1970s through the 80s and 90s, with particular emphasis on renewable energy, it established The Energy Center (TEC) in 2006 (as part of the restructuring of the university system) to better coordinate its activities in energy technology and policy research. TEC is one of two centers of research at the College of Engineering, KNUST.

The center promotes energy research, development, and demonstration (R, D&D) activities in the university by providing strategic direction and using a multidisciplinary approach which draws on expertise and research findings from the various departments of the College of Engineering and the University at large, thus enabling TEC to actively work on both energy technology and policy issues.

The Center has since its inception worked with several partners within Ghana and across the African continent and beyond, attracting funding of more than $7.1 million from the African Union (AU), the European Union (EU), World Bank, GIZ, ECOWAS, IRENA, ECREEE etc, for its research and other activities. In pursuit of its vision of becoming a globally recognized center of excellence, TEC continues to actively engage partners within Ghana, the ECOWAS and Africa region in particular, and with world-class centers of competence around the world as shown in the diagram below.



B. ECREEE

As a policy response to the rising energy security concerns, continued lack of access to energy services in rural areas and the need for climate change mitigation the ECOWAS Energy Ministers established the first regional renewable energy and energy efficiency promotion agency in Sub Sahara Africa. The Secretariat of the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) was inaugurated on 6th July 2010 with support of the ECOWAS Commission, the Governments of Austria, Spain and technical assistance of the United Nations Industrial Development Organization (UNIDO).

The ECREEE Secretariat is based in Praia, Cabo Verde, and operates with a small multi-national team of full time staff. ECREEE works through a network of National Focal Institutions (NFIs) which interlinks the Secretariat with all ECOWAS Member States. The overall objective of ECREEE is to contribute to the sustainable development of West Africa by improving access to modern, reliable and affordable energy services and energy security, and a reduction of negative energy related externalities (e.g. local pollution, greenhouse gas (GHG) emissions) through the dissemination of RE&EE technologies and services. ECREEE aims at the creation of favorable framework conditions for renewable energy and energy efficiency markets. The Centre supports activities, programs and projects directed to mitigate existing technical, legal, institutional, economic, financial, policy and capacity related barriers. The ECREEE activities include fund mobilization, policy support, knowledge management and awareness raising, capacity development and business and investment promotion.

C. About HOMER

HOMER stands for **H**ybrid **O**ptimization **M**odel for **E**lectric **R**enewables. The HOMER energy modeling software is a powerful tool for designing and analyzing hybrid power systems, which contain a

mix of conventional generators, combined heat and power, wind turbines, solar photovoltaic, batteries, fuel cells, hydropower, biomass and other inputs. It is currently used all over the world by tens of thousands of people.

For either grid-tied or off-grid environments, HOMER helps determine how variable resources such as wind and solar can be optimally integrated into hybrid systems. Engineers and non-professionals alike use HOMER to run simulations of different energy systems, compare the results and get a realistic projection of their capital and operating expenses. HOMER determines the economic feasibility of a hybrid energy system optimizes the system design and allows users to really understand how hybrid renewable systems work.

As distributed generation and renewable power projects continue to be the fastest growing segment of the energy industry, HOMER can serve utilities, telecoms, systems integrators and many other types of project developers – to mitigate the financial risk of their hybrid power projects.

HOMER Energy provides software, services and an on-line community to the diverse group of people who are using HOMER to design hybrid systems. More information can be found at http://homerenergy.com/index.html

II. ABOUT THE TRAINING WORKSHOP

A. Introduction

The Energy Center (TEC), KNUST and The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) are organizing a two-day Training Workshop on the use of HOMER as a tool for renewable energy (RE) project design from 24 – 25 June 2014 in Kumasi, Ghana.

The training workshop will use theoretical concepts, simulations and practical exercises to prepare participants on the use of HOMER. Having already trained over 300 persons from 17 African countries in RE Technology and Energy Policy, this training is part of TEC's objective of contributing to the development of requisite expertise for the energy sector in Ghana and other African countries. This training is also part of ECREEE's objectives in building capacities in ECOWAS Member States in RE project design and appraisal, and to create an ECOWAS network of certified users in different RE project tools. This training is a follow-up to a train-the-trainer session that was organized by ECREEE in June 2013 in Praia, Cabo Verde.

B. Objective(S)

The primary objective of this training workshop is to equip its participants with the requisite proficiency in the use of HOMER as a tool for conducting analysis on hybrid renewable energy systems with the view to obtaining optimal solution.

C. Expected Results and Outcome

The workshop expects to train up 20 persons in the use of HOMER to analyze the technical and financial options for hybrid power systems in Ghana.

III. PARTICIPATION AND REGISTRATION

A. Target Participants

Participants are expected to come from across the country, from government agencies, academia, energy sector businesses and organizations, etc.

Opportunity will also be given to graduate students who are studying energy related programmes.

B. Requirements

Participants are expected to:

- Possess an understanding of the basics of Hybrid, Stand-alone and Grid-connected systems using different types of energy resources;
- BE familiar with at least one simulation/dimensioning tool in RE;
- Understand vocabulary and terminologies used in cost and economic analysis of power systems.

C. Logistics

Participants will be provided with meals, course materials and certificates upon successful completion. No participation fee is charged, as ECREEE and The Energy Center (TEC) have provided sponsorship for this training. Transportation and accommodation costs shall be borne by selected participants. TEC is

happy to assist participants to find accommodation in nearby hotels, guesthouses and hostels. The participant is required to bring his/her own laptop.

D. Application

Candidates are required to submit their applications on http://www.ecreee.org/homer-online-questionnaire before 16 June. Further information on the training, including reading material, is available on http://www.ecreee.org/event/national-training-workshop-use-homer-software-kumasi-ghana.

E. ENQUIRIES AND CORRESPONDENCE

All enquiries and correspondence prior to the workshop should be addressed to:

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C. INDICATIVE TRAINING SCHEDULE

	DAY 1: INTRODUCTION TO HOMER
Time	Activity
08:00 – 09:00	Registration
09:00 – 10:00	Opening session: • Presentations by The Energy Center • ECREEE/UNIDO • Introduction of participants
10:00 – 11:00	Overview of the training course: critical concepts, approach and specific needs from the users
11:00 – 11:30	Tea / coffee break
11:30 – 12:30	General introduction: Overview of design and simulation tools
12:30 – 13:15	PROS & CONS about Homer simulation tool
13:15 – 14:30	Lunch Break
14:30 – 15:30	What you can do (and what you cannot do) with HOMER: Examples, outputs, results and data processing
15:30 – 17:00	HANDS on HOMER: practical session with the user interface
	DAY 2: SYSTEM DIMENSIONING
09:00 - 10:30	Introduction to Exercise 1
10:30 – 11:00	Correction of Exercise 1
11:00 – 11:30	Tea / coffee break
11:30 – 12:45	Introduction to hybrid systems
12:45 – 14:00	HANDS on HOMER: Simulating and dimensioning and Stand-alone Hybrid System *THE INPUTS* • Energy Demand: the load profile INPUT • Energy Resource INPUT • Technical equipment and costs INPUT • Restrictions INPUT
14:00 – 15:30	Lunch Break
15:30 – 17:00	*THE OUTPUTS* • Outcome of the simulation: List of possible systems • Interpretation of the economical results • Analysing the simulated performance of the system • Exporting data for further uses
17:00 – 18:00	Wrap up, evaluation of the training course