TRAINING FOR OLADE`S MEMBER COUNTRIES
COURSE CAPEV 08 2012

Title: **DESIGN AND IMPLEMENTATION OF COMBINED HYBRID SYSTEMS (ADVANCES IN TECHNOLOGY AND REGULATION)**	**Aimed at**: Agencies and government bodies in the energy sector, energy companies from private and public sector of a Member Country or Participant Country of OLADE.
Instructor: **Dr. César Angeles Camacho.** **Technical Support**: : Nelson Benavides Lourdes Pillajo cap@olade.org	**Language**: English **Period of time**: from August 30th to September 24th **Days**: August 30, September 3, 6,10, 13, 17, 20, 24
Coordinator: Gabriel Hernández gabriel.hernandez@olade.org	**Schedule**: from 9:00 a.m. to 11:30 a.m. (Quito, Ecuador local time). We recommend being aware of your local country time in relation to Quito's time. If you wish to verify Ecuador local time please check: http://www.horlogeparlante.com/spanish/america_del_sur.php
Registration (due date): August 23th	**Modality**: Virtual training

Note: Each session will be convened from OLADE and it is recommended to enter the link before the session in order to do the necessary tests and consultations. On the day of the session we recommend to access the link 30 minutes in advance.

Technical Requirements:
- Pentium III computer or higher (or equivalent).
- Windows XP or Higher, MACOSX 10.2 o Linux
- 256 KB RAM (recommended 512 KB) or higher
- Internet Explorer 6.0 or higher, Netscape 7.0, or Mozilla Firefox.
- Full Duplex sound card
- Microphone and speakers
- Internet access of at least 128 Kbps (mainly 256 Kbps or higher)

VIRTUAL TRAINING COURSE:

TARIFF AND INCENTIVES FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY

1. PRESENTATION

The need for greater levels of energy efficiency (EE) in our society has never been more evident than today. Factors such as high energy prices faced by consumers, the growing concern for the environment, reduction of domestic resources and national energy security contribute to an increased awareness of the need for greater EE. Thus, there is an obvious and growing interest in several countries to increase EE efforts.

Regarding renewable energies, it is expected to rise its demand, explained both by their low awareness of environmental impacts as high prices for fossil fuels. It can be explained by their limited knowledge of environmental impacts, as by high fossil fuel prices. The biggest change expected is associated with potential technological developments in the future.

One way to diversify energy sources renewable energy is the hybridization of systems that can operate two or more systems to meet power demand set by user. Hybrid systems, along with energy storage systems attempt to solve the inherent intermittency of renewable sources of energy. The combination of two or more energy systems for energy efficiency and the economic feasibility of a dispatch are used to supply the demand. So far, many countries in the world have done several projects of hybrid systems in order to make better use of local renewable energy sources.

2. GENERAL OBJECTIVE

Learning about general issues related to the design, implementation and operation of hybrid systems that combine renewable energy systems as well as its incorporation with conventional systems.

2.1 SPECIFIC OBJECTIVES

To train the students on:

1. Renewable energy systems and identification of wind combined hybrid systems.

2. Storage Technologies for renewable energy systems.
3. The design and implementation of wind hybrid systems with hydrogen storage.
4. The design and implementation of wind - solar hybrid systems with diesel generator backup.
5. The design and implementation of wind - hydro hybrid systems, including micro, medium and large scale hydro energy.
6. The design and implementation of wind – thermal - PV hybrid systems.
7. The design and implementation of wind – biofuel - conventional hybrid systems.
8. The design and implementation of wind – concentrated solar - conventional hybrid systems.
9. The regulatory framework and technical considerations for their applicability.

3. PARTICIPANTS´ PROFILE

The course is primarily aimed at agencies and government agencies in the energy sector, energy companies, public and private sector of Member Country or Participating country of OLADE.

Other stakeholders such as engineers, economists and related professionals who are working in the Ministries of Energy, Secretaries of Energy, public or private energy companies of each Member or Participant country of OLADE may also participate.

4. DURATION AND SCHEDULE

The course has duration of 20 hours approximately (8 sessions of two hours and 30 minutes each). Besides, it will be held on Mondays, and Tuesdays, from August 30th to September 24th. (We recommend seeing the Agenda).

Note: the certificates will take into account the effective hours of the course, submission of examination and will include - where applicable - the estimated time spent on exercises or study.

5. REGISTRATION

Participants who register for the first time must go to the link: http://www.olade.org/amember/signup.php (Sign with corporate email).

Participants who have registered before and have a username and password must enter the link: http://www.olade.org/amember/member.php, and choose the course to which wish to register.

- **Note:** Participants that are registered with personal emails should go to "**Edit Profile**" and change it to a corporate email

If the participant is in the public sector, must take into account the established locations for your country and select the one nearest you in order to participate, to registered participants will be sent an email with instructions on the process for participation, unloading of materials and confirm their attendance.

To confirm participation, connection points, and the place to attend the course should contact the Supervisor CAPEV of their country. (Data can be found in http://www.olade.org/supervisores-capev.)

Government officials or staff members, who work for public companies in the energy sector and other organizations identified by the National Coordination of OLADE in the corresponding Member Country, will have free access to the course, and registration will be validated by the Supervisor CAPEV of their country.

The private sector professionals may register by paying a registration fee of: a) U.S. $ 150 per participant, if they are nationals from any OLADE's member countries, b) U.S. $ 220 per participant, if they are from countries not member of OLADE.

To make the payment and registration, private sector professionals should contact Ms. Monica Vivanco (monica.vivanco@ olade.org).

6. EVALUATION

After each session the student is given a questionnaire to be answered (if it deems the instructor), to evaluate their course attendance, this questionnaire is activated within the virtual classroom (http://www.olade.org/elearning/), to which students must enter their username and password with which they were registered in the registration.

The course will be evaluated by the participants.

7. CERTIFICATES

Those who have successfully completed training (attending a minimum of 6 sessions online and in other sessions recorded version) and comply with the request the instructor to evaluate students will be awarded a Certificate of Participation, which can be downloaded via the virtual classroom.

Note: the certificates will take into account the effective hours of the course, and if applicable include an estimate of time spent on exercises or study.

The teacher has the last word on tasks or quizzes

8. METHODOLOGY

Courses are delivered in the form WEBSEMINAR, i.e.virtual type, which involves real-time interaction with the instructor of the course and participants from different countries. The materials used for training can be

a) Previous reading of documents. The participants will have access to documentation related to the topic before the session in order to guide them in the course.
b) Lectures. During the first sessions it will take place a theoretical presentation of basic concepts and the tool, then the methodology will be explained and examples of calculations will be developed.
c) Exercises. It may require the conduct of practical exercises. The requirement or not be communicated by the teacher.

9. INTELLECTUAL PROPERTY

The entire distributed material (including recordings of meetings) as it relates to this course should be used exclusively for this course and only for registered participants. If any participant wishes to use the circulated material for disclosure to third parties he/she must request a written authorization to OLADE which will properly consult with the instructors.

10. INSTRUCTOR`s PROFILE

Dr. César Angeles Camacho is a Senior Lecturer and Researcher at the Institute of Engineering – UNAM. He teaches the application of power electronics in electrical power system to postgraduate students. Part of his job also includes supervising both Ph.D. and MSc. projects and thesis in both levels.

He has the follow studies:

- Post-graduate Studies, University of Glasgow, Scotland, UK. Research: Flexible AC Transmission Systems (FACTS) modelling and Simulation.
- Ph.D. Studies in Electrical Power Engineering, April 2005. University of Glasgow, Scotland, UK. Thesis: Phase Domain Modelling and Simulation of Large-scale Power Systems with VSC-based FACTS Equipment .
- M.Sc. in Electrical Engineering, 2000. Instituto Tecnológico de Morelia, Michoacán, México. Thesis: Steady-State Modelling of the Unified Power Flow Controller for Three-Phase. Analysis of Electric Power Systems.
- B.Sc. in Electrical Engineering, 1992. Instituto Tecnológico de Morelia, Michoacán, México. Degree obtained for M.Sc. Studies

11. PROGRAM

Session	Content	Date
01	1. Understanding renewable energy systems. a. Wind Energy. b. Photovoltaic Energy. c. Solar thermal energy. d. Biomass Energy. e. Hydropower. 2. Introduction to hybrid systems combined. a. Introduction. b. The need of hybrid systems. c. Different types of hybrid systems. d. Markets for hybrid systems.	August, 30th
02	3. Description of technologies for energy storage in renewable energy systems. a. Introduction. b. Application range of storage systems. c. Mechanical storage. d. Electrical storage. e. Electrochemical energy storage. f. Fuel cells. g. Batteries (lead acid, nickel metal hydride, lithium ion, sodium sulphide, etc.). h. Comparison of storage systems.	September, 3th
03	4. Wind - hydrogen storage hybrid systems. a. Introduction. b. Designing a system using wind electrolysis.	September, 6th

Session	Content	Date
	c. Design of hydrogen storage. d. Integration of fuel cell. e. Sizing. f. Optimization of wind-hydrogen system. g. Environmental impact of wind-hydrogen system.	
04	5. Wind-PV hybrid systems with diesel generator backup. a. Introduction. b. Design and configuration of a wind-PV system. c. Sizing. d. Optimization of wind-PV system. e. Environmental impact of wind-PV system.	September, 10th
05	6. Wind-hydro hybrid systems, including micro, medium and large scale hydro a. Introduction. b. Different types of wind-hydro systems. c. Design of wind-hydro systems. d. Benefits and limitations of wind-hydro systems. e. Different techniques and operating policies of wind-hydro systems. f. Environmental impacts of wind-hydro systems.	September, 13th
06	7. Wind – thermal hybrid systems (including Solar, steam by biofuel) a. Introduction. b. Medium concentration systems. c. High concentration systems. d. Cooling of solar cells and hot water provision. e. Technology Solar thermal-Wind hybrid systems. 8. Biofuel-conventional-wind hybrid systems. f. Introduction. g. Design and configuration of a biofuel-conventional-wind hybrid systems h. Sizing. i. optimization of biofuel-conventional hybrid systems. j. Environmental impact of biofuel-conventional hybrid systems	September, 17th

Session	Content	Date
07	9. Concentrated solar-conventional-wind power plants hybrid systems. a. introduction b. Solar concentrator systems c. Rankine cycle d. Brayton cycle e. combined Cycle f. Technology for concentrated solar-conventional wind power plants hybrid systems.	September, 20th
08	10. Renewable Energy Regulation in Mexico. a. The new Framework Law on Renewable Energy b. Remuneration and dispatch /interconnection rules c. Model contracts for Renewable Energy and Cogeneration Efficiency d. Efficient Cogeneration criteria and capacity credits	September, 24th

Drafted by:

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Date: 6 th June 2012