



ECOWAS Regional Centre for  
Renewable Energy and Energy Efficiency

Centre Régional pour les Energies Renouvelables  
et l'efficacité Energétique de la CEDEAO

Centro Regional para Energias Renováveis e  
Eficiência Energética da CEDEAO



## ECREEE Regional Workshop

# Integration of Renewable Energy Sources in the Energy Planning of the ECOWAS Region

Location: ITC Premises-Pozo Izquierdo, Gran Canaria - Canary Islands, Spain

Date: 15<sup>th</sup> to 17<sup>th</sup> June 2011

### 1. Summary

Within the framework of the Capacity Building Program of ECREEE, the ECOWAS Regional Centre for Renewable Energy and Energy Efficiency (ECREEE) in partnership with the Canary Island Institute of Technology (ITC) will organize a **Seminar on Renewable Energy Planning and development for Executives and Decision Makers** in the Canary Islands, Spain from 15<sup>th</sup> to the 17<sup>th</sup> of June 2011

The seminar will

1. Show the Canary Islands Experience on electrical grid planning and strategies for maximizing the penetration of Renewable Energies in small and weak electrical grids, and the challenges they face. It includes visits to RES installations and control centres
2. Analyze ECOWAS countries readiness for the integration of RES in their national electrical grids

The Seminar will bring together Decision Makers from the Energy Ministries and Chief Executives of the Electricity Utilities' of ECOWAS member states and Spanish specialized institutions on renewable energy and energy planning.

Seminar languages: presentations and discussions will be in **English, Spanish and French** (simultaneous translation will be provided).



## 2. Introduction

### a. Renewable Energy in electrical grids and ECOWAS

#### *Low Rates of Energy Access*

The ECOWAS region is characterized by a very low overall access rate to modern energy services, thereby inhibiting prospects of developing economic activities, providing basic social services and fighting poverty. The region has some of the lowest modern energy consumption rates in the world with average electricity consumption of 88kWh/capita compared to the continental and global averages of 563 and 2596kWh/capita respectively. Household access to electricity across the region is about 20% but wide differences exist between the access rates in urban areas that average 40% while rates in rural areas range between 6% and 8%. There are significant electricity and overall energy pricing inequalities within countries i.e. between rural and urban areas and between countries. Access to modern fuels for motive power and electricity in rural areas is particularly low since there are no decentralized energy systems in place. At household level, access to LPG or kerosene averages a mere 5%. In seeking to address the region's energy challenges, ECOWAS is spearheading a number of regional approaches including the establishment of ECREEE.

#### *Clear-Cut Policy Framework*

Most ECOWAS Member States do not have a clear-cut policy on renewable energy. As a result, renewable development follows an ad hoc path, with little recourse to national energy plans, which are rarely available or out of date and inadequate. In situations where the policies exist, they are not backed by legislation. In addition, standards and codes are absent or not adequately developed. Coherent, consistent and conducive policy and regulatory frameworks are central to the successful dissemination of renewable energy in the region, yet such frameworks are generally absent.

#### *Budgetary Support*

Limited support for renewable energy is further demonstrated by low budgetary allocations in most countries. Emphasis is placed on the petroleum and power sectors, which supply a small portion of the population, at the expense of renewable which can assist in reaching a wider proportion of the population.

#### *Capacity at Human and Institutional Levels*

There is lack of or limited capacities in almost all aspects of RES to enhance the ability of relevant personnel and institutions within the member states to effectively and efficiently carry out the programmes and projects. Without the necessary capacities, it would be impossible to implement investment programmes and projects. Any attempt to recruit the services of experts from outside the region may be expensive and unsustainable.

#### *Data/Information*

The Region is among groupings of countries where information and data on resources, experts and institutions are lacking. Information is vital for strategic planning and implementation across the entire socio-economic spectrum. There is urgent need to address this critical issue, if the Centre and the region would make any headway in its mandate.

#### *Major Investments*

Notwithstanding the abundant RES resources within the ECOWAS region, it is generally acknowledged that without major investments in sustainable energy frameworks and infrastructure in West Africa, the regional



energy access, energy security and climate objectives cannot be achieved simultaneously in the forthcoming decades. Major investments are required to enhance the development of the renewable energy and energy efficiency markets in the ECOWAS region.

b. About ECREEE

**The ECOWAS Regional Centre for Renewable Energy and Energy Efficiency (ECREEE) was established in November 2009 in Praia, Cape Verde** by the ECOWAS Commission with support of the Governments of Austria, Cape Verde and Spain, and the technical assistance of the United Nations Industrial Development Organization (UNIDO).

The **Vision of ECREEE** is to contribute to the sustainable economic, social and environmental development of West Africa by improving access to modern, reliable and affordable energy services, energy security and reduction of energy related GHG emissions and climate change impacts on the energy systems. The specific objective of ECREEE is to create favourable framework conditions and an enabling environment for renewable energy and energy efficiency markets by supporting activities directed to mitigate existing barriers.

The **Mission Statement of ECREEE** is to lead and coordinate the implementation of the ECOWAS/UEMOA regional plan of action for increasing access to energy services by promoting the adoption of renewable energy and energy efficient technologies and services in ECOWAS member states thereby supporting the region's economic and social development in an environmentally benign manner. Specifically, ECREEE is mandated to:

- Lead and coordinate the implementation of the ECOWAS/UEMOA regional plan of action and White Paper on Energy Access for increasing access to energy services by promoting the use of renewable energy resources;
- Improve energy security by promoting energy efficient technologies in ECOWAS member states;
- Contribute to achievement of the MDGs in West Africa by making available to at least half of the people in the region, access to modern energy services using renewable energy and energy efficient technologies;
- Enable the ECOWAS region to take advantage of the available Clean Development Mechanisms;

**ECREEE aims at the establishment of regional renewable energy and energy efficiency markets by supporting various activities to mitigate existing barriers on different levels and sectors.** The ECREEE activities include policy development and quality assurance, capacity building, the design and usage of tailored financing mechanisms and appraisal tools, awareness raising and the implementation of demonstration projects with potential for regional scaling-up. In this regard ECREEE cooperates with the private sector and other national, regional or international institutions (e.g. WAPP, ERERA, IRENA, UNIDO). Most of the activities of the Secretariat are implemented in collaboration with ECREEE National Focal Institutions (NFIs).



### c. About ITC

The Canary Islands Institute of Technology (ITC) is attached to the Regional Ministry of Employment, Industry and Trade, and supports the Canary Islands Government in the elaboration of the Regional Energy Plans and in the execution of the Regional R&D policies in the field of renewable energies.

Its main goal is to promote the industrial development of the region, fostering Research, Development and Innovation in emerging technological fields, in close collaboration with regional SME's, the Regional Government, island and local public bodies, the two regional universities, and other R&D centres and public and private companies.

ITC activities are organised in the following 3 divisions (staff: more than 200 people):

- The Central Management Division
- The Research and Technological Development Division (R&D Division)
- The Innovation Division

ITC R&D DIVISION carries out applied research activities in technological fields where the Canary Archipelago offers competitive advantages with respect to other regions in Europe, and also fosters innovation in the Archipelago's businesses. Currently, ITC is active in **renewable energy, water technologies, biotechnology, environmental technologies, biomedical engineering, mechanical and software engineering**. ITC also advises and supports different public bodies which belong to the Regional or the Local Administrations, and executes international cooperation projects in less developed countries (particularly related to energy and water supply to remote areas).

ITC supports the execution of the energy and renewable energy policy of Canary Islands Government and manages the different programs for the promotion of renewable energies and energy efficiency in the archipelago. The Institute has contributed among other, to the elaboration of the energy planning of the Canary Islands (PECAN); the elaboration of the tender process for allocation of wind power authorizations in the archipelago, and the definition of regulations affecting regional development of RES. It develops and transfers technology in the renewable energy and water technology sector, especially to neighbouring West African countries.

The facilities of the R&D Division, where the workshop will take place, are located in the southeast of Gran Canaria, next to the coast, occupying a 109.000 m<sup>2</sup> plot on a site with excellent renewable energy conditions (solar and wind). ITC main fields of research in renewable energies are:

- Electricity production from renewable energy sources
- Fresh Water production (water desalination) using renewable energy systems
- Development of small to medium sized wind energy systems (incl. wind-diesel)
- Testing of solar thermal collectors and systems
- Penetration of renewable energy systems in weak electrical grids
- Production of hydrogen by renewable energy systems
- Wind and solar prediction tools

ITC facilities in Pozo Izquierdo are valued by leading European Research Centres working in the fields of energy, water and environment. The strategic geographical location puts the Canary Islands in an excellent position as a showcase for developing countries in the demonstration of European technologies contributing to



sustainable growth. For more than 10 years, ITC has been successfully transferring its experience in renewable energy and water to neighbouring West African countries.

### 3. Objective of the Regional Seminar

The objectives of the seminar are:

1. To show the Canary Islands Experience in electrical grid planning and penetration of Renewable Energies in weak electrical grids. To understand RE power generation, the existing barriers to be overcome and the challenges they face. (The seminar includes visits to RES installations and control centres).
2. To analyze ECOWAS countries readiness for the integration of RES in national electrical grids

The seminar will also contribute to:

- a. Help understand the different available RES technologies for grid-connected power generation plants
- b. Address relevant issues to be considered in the elaboration of energy plans
- c. Share experience on the operational challenges of running RES systems
- d. Analyse how RES and conventional energy production is currently managed by the grid operator
- e. Know current R&D activities currently being carried out on RES integration in the Canary Islands, through a visit to R&D ongoing projects at ITC's premises

### 4. Participants

Participants will be drawn from:

- Ministries of Energy of ECOWAS member states,
- Utilities of ECOWAS member states
- Spanish electrical sector organizations
- Specialized institutions on the RES sector
- ECREEE experts

### 5. Supporters

This seminar is funded mainly by the Spanish Agency for International Development Cooperation (AECID) through its programmatic support to ECREEE.





## 6. Program

<b>Integration of Renewable Energy Sources in the Energy Planning of the ECOWAS Region</b>	
<b>Time</b>	<b>Tuesday, 14<sup>th</sup> June 2011</b>
22:55	<b>Departure from Dakar with IBERIA flight</b>
02:55	<b>Arrival to Gran Canaria and accommodation</b>
<b>Wednesday, 15<sup>th</sup> of June 2011</b>	
11:30	<b>Pick up from the hotel and registration</b>
12:30 – 13:00	<p><b>Opening of the Seminar and presentation of the program</b></p> <p><b>Juan Ruiz Alzola / Pablo Martín Carbajal</b> – Canary Islands Regional Government</p> <p><b>Mahama Kappiah</b> - ECOWAS Regional Centre for Renewable Energy and Energy Efficiency (ECREEE),</p> <p><b>Luis Padilla</b> - Casa Africa (Ministry of Foreign Affairs and Cooperation / Canary Islands Regional Government)</p> <p><b>Gonzalo Piernavieja</b> – Canary Islands Institute of Technology (ITC)</p>
13:00 – 14:30	<p><b>Session I: Contextualizing the situation. <i>Canary Islands vs. ECOWAS Energy Situation</i></b></p> <p><b>I.1. Energy Planning in isolated areas and weak electrical grids:</b> Canary Islands current legislative energy framework and proposals for new regulations to foster RES development. Canary Islands Gov.</p> <p><b>I.2. Feed-in tariffs and other schemes to promote grid-connected RES.</b> Ms. <b>Diana López</b> (IDAE)</p> <p><b>I.3. Canary Islands Electrical systems:</b> RES integration limits. Mr. <b>Santiago Marín</b> - Red Eléctrica de España (REE, Spanish grid operator)</p> <p><b>I.4. Renewable Energies in West Africa. The role of ECREEE</b> Mr. <b>Mahama Kappiah</b> - ECREEE</p> <p style="text-align: center;">Feedback &amp; Discussions</p>
14:30 - 15:30	<b>Lunch</b>
15:30 - 17:00	<b>Visit to ITC facilities</b>
17:00 - 18:30	<p><b>Session II: Contextualizing the situation. <i>Renewable Energy Technologies</i></b></p> <p><b>II.1. Wind Energy.</b> Gamesa activities in wind power hybrid systems. Mr. <b>Álvaro González &amp; Ignacio Prieto</b> (GAMESA)</p> <p><b>II.2. Solar Energy.</b> Medium and large scale solar energy production, the case of photovoltaic (PV) and concentrated solar power (CSP). Mr. <b>Enrique Soria</b> (CIEMAT)</p> <p><b>II.3. Hydropower.</b> Pumped Storage plant Chira-Soria in Gran Canaria island: a pioneering way to store renewable energy. Mr. <b>Ramón Rodríguez</b> (ENDESA)</p> <p><b>II.4. Biomass.</b> Sustainable energy production systems using biomass. Mr. <b>Mercedes Ballesteros</b> (CIEMAT)</p> <p style="text-align: center;">Feedback &amp; Discussions</p>



Time	Thursday, 16 <sup>th</sup> of June 2011
8:15	<b>Pick up from the hotel &amp; transport to ITC</b>
9:00 – 10:30	<p><b>Session III: Opportunities and Challenges to RES penetration in electrical grids.</b></p> <p>III.1. <b>High penetration RES power systems analysis.</b> Canary Islands example. Mr. <b>Jesús de León</b> (ITC)</p> <p>III.2. <b>RES management in weak electrical grids.</b> Mr. <b>Alfredo Rodriguez</b> (REE)</p> <p>III.3. <b>Micro-grids for rural electrification with high RES penetration.</b> Mr. <b>Daniel Henríquez</b> (ITC)</p> <p>III.4. <b>The case of Islands.</b> El Hierro: First 100% RES island. (GORONA DEL VIENTO)</p> <p style="text-align: center;">Feedback &amp; Discussions</p>
10:30 – 10:50	<b>Coffee break</b>
10:50 – 12:30	<p><b>Session IV: RES for rural electrification. Beyond the Solar Home Systems (SHS)</b></p> <p>IV.1. <b>Sustainable management of energy and water supply projects.</b> Canary Island experience in Africa. Mr. <b>Vicente Subiela</b> (ITC)</p> <p>IV.2. <b>Rural electrification and solar cooling systems.</b> Case studies of Canary Islands cooperation activity. Mr. <b>Fernando Caballero</b> (RICAM)</p> <p>IV.3. <b>Management models for rural electrification in Mali.</b> Mr. <b>Agalassou ALASSANE</b> (AMADER)</p> <p>IV.4. <b>Management models of small hydro power plants.</b> Mr. <b>David Vilar</b> (ECREEE)</p> <p style="text-align: center;">Feedback &amp; Discussions</p>
12:30 - 13:00	<b>Visit to the 30.000 m<sup>3</sup>/d seawater desalination plant in Pozo Izquierdo</b>
13:00 - 14:00	<b>Lunch</b>
14:00 - 14:50	<p><b>Session V: First approach to RES planning in ECOWAS Countries</b></p> <p><b>V.1. Introduction and conceptual issues</b></p>
14:50 - 16:30	<p><b>Session V: First approach to RES planning in ECOWAS Countries</b></p> <p><b>V.2. Work Groups (by language)</b></p>
16:30 – 17:00	<b>Coffee Break</b>
17:30 - 19:00	<p><b>Continuation of Session V</b></p> <p><b>V.2. Work Groups (by language)</b></p> <p><b>V.3. Presentation of RES Planning from Work groups</b></p>
19:00 – 19:30	<b>Conclusion and official closing of the seminar</b>
21:30	<b>Dinner for guests</b> (casual dress)



Time	Friday, 17 <sup>th</sup> of June 2011
9:00	<b>Pick up from the hotel</b>
9:15 – 14:00	<b>Visits:</b> 9:15 – 10:15 REE Regional RES Control Centre 10:15 – 10:45 Short walk through Las Palmas de Gran Canaria historic town centre 10:45 – 12:00 3.2MW photovoltaic power plant 12:00 – 14:00 2.5MW wind – desalination system (with power control management) for agriculture purposes
14:00 – 15:00	<b>Reception in CASA AFRICA with attendance of High Representatives of the Canary Islands Regional Government</b>
15:00 - 18:00	<b>Free time</b>
18:00 – 18:15	<b>Pick up from the hotel to the airport</b>
20:15	<b>Depart from Gran Canaria with IBERIA flight</b>
21:40	<b>Arrival to Dakar</b>