

# Expression of Interest to Participate in SREP

**Country:**

**Ghana**

**Government Agency Submitting Expression of Interest:**

**Ministry of Energy & Petroleum**

## **I. DESCRIPTION OF THE COUNTRY AND ENERGY SECTOR CONTEXT**

Please provide a summary of the country and energy sector context, including resource potential for deploying renewable energy, status of energy access (population with access to electricity), renewable energy policies, targets, and implementation measures.

### **Country Description**

Ghana is located in West Africa bordering the Gulf of Guinea to the south, Togo to the east, Cote d'Ivoire to the west and Burkina Faso to the north. The geographic coordinates are 8 00N and 2 00W. The country has a total land area of 238,533 km<sup>2</sup> with a population density of 103 per km<sup>2</sup>.



**Figure 1 Map of Ghana**

Total country population was 25 million in 2012. The political situation is stable and the country continues to consolidate democratic governance, characterized with open society, vibrant media and strong public dialogue.

### **The Energy Sector Overview & Challenges**

#### **The Sector Policy and Framework**

The Ministry of Energy and Petroleum (MoEP) oversees the energy sector, and is responsible for energy policy formulation and implementation. Power Sector Reforms (PSR) began in 1994 to

accelerate expansion of infrastructure in line with the country's socio-economic development agenda. Since then, the PSR has enhanced transparency in the regulation of the sector and opened it up to private sector participation by dismantling the vertically integrated utility structure and availing the generation and distribution aspects of the industry to market competition. The implementation of the reform process has resulted in the current unbundled structure with separate operational functions in respect of power generation for the Volta River Authority (VRA), transmission for the Ghana Grid Company (GRIDCo) and distribution for the Electricity Company of Ghana (ECG) in the Southern zone of Ghana, and Northern Electricity Distribution Company (NEDCo) in the Northern zone. The sector has, since 1997, been regulated by the Energy Commission (EC) which is the technical regulator responsible for licensing and advising the Ministry of Energy on policy issues; and the Public Utilities Regulatory Commission (PURC) which is the independent economic regulator responsible for approving and setting tariffs in the power sector. The National Petroleum Authority and Petroleum Commission regulate the petroleum downstream and upstream sectors respectively.

The main institutions in the sector and their respective roles are presented below:

- *The Ministry of Energy & Petroleum*  
In line with provisions in the Renewable Energy Act 832, the Renewable Energy Directorate under the Ministry oversees the implementation of renewable energy initiatives, execute renewable energy projects initiated by the State, or in which the State has an interest and finally, manages the assets in the renewable energy sector on behalf of the State until such a time when the Renewable Energy Authority is established. For the purposes of this application and implementation, the Renewable Energy Directorate shall remain the focal point for the SREP.
- *The Energy Commission (EC)*  
The EC provides technical regulations for the power subsector (licensing and issuance of permits).
- *Public Utility Regulatory Commission (PURC)*  
The PURC is responsible for setting and approving rates chargeable for the purchase of electricity from conventional and renewable energy sources. The PURC is also mandated to determine and approve rates chargeable for the mini-grids
- *Electricity Generation*  
Electricity generation is done by state-owned companies and Independent Power Producers (IPPs). The Volta River Authority (VRA) and Bui Power Authority (BPA) are the main state generation companies managing and operating hydro and thermal power portfolios. A number of IPPs have been licensed to build, own and operate power plants. .
- *Distribution Utilities*  
The distribution utilities are Electricity Company of Ghana responsible for distribution services within the southern zone and the Northern Electricity Distribution Company (NEDCo) responsible for distribution services in the northern belt.

## **Energy Generation and Access Situations**

Generation capacity is 2800MW, and the target is 5000MW installed capacity by 2016 with renewable energy contributing 10% to the generation mix by 2020.

Grid extension is carried out in accordance with the National Electrification Scheme (NES). Access to electricity is 72% nationwide in 2010, even though it is less than 50% in the three northern regions of the country. Universal access to electricity by 2020 is now advanced to 2016. In terms of service reliability, the average forced outages per customer per year currently stand at 40 hours / customer / year (h/c/y) in urban areas and 66 h/c/y in rural areas.

## **The Challenge of Achieving Universal Access**

Majority of the remaining 28% of the country's population (about 7 million) lives in deprived rural communities including those along the Volta Lake and the Islands created by the Akosombo Dam. These communities are the most difficult and uneconomical to electrify through national grid. The challenges posed by the electrification of these communities are now seen as a significant hurdle in the country's goal of achieving universal access by 2016. Preliminary results of ongoing World Bank funded GIS assessments of the Lake Volta region alone shows that there are over 200 inhabited islands and 2000 lakeside communities which are not likely to be connected to the National Electricity Grid.

Renewable energy-based electrification solutions are strongly being pursued as the way forward for these communities. Many development partners, including the African Development Bank, State Secretariat for Economic Affairs (SECO) of Switzerland and the World Bank are supporting the Ghana Energy Development and Access Project (GEDAP) for which one component is meant to promote a mix of renewable energy based models including 4 pilot mini-grids to serve nearly 100,000 people in some of these deprived communities. The Ministry of energy is leveraging resources and lessons from the ongoing initiatives to develop the necessary frameworks, scale-up and accelerate rural electrification using renewable energy.

## **The Country's Renewable Energy Potential**

The proven renewable energy resources are biomass, solar, wind energy, waste-to-energy and hydro. The MOEP is committed to the sustainable development and utilization of these resources to address energy access issues, contribute to the fight against climate change, sanitation problems, and create sustainable green jobs for Ghanaians.

*Hydropower* is still the most important renewable energy source accounting for about 60%-70% of electricity generation capacity, if large hydro is counted. Plants below 100MW are considered modern renewable energy by ACT 832 and there are 17 potential sites in the country. There are also about 22 exploitable mini-hydro sites with total potential between 5.6MW – 24.5MW.

*Solar* energy plays a significant role; from electrification to agro-processing. The Solar irradiation levels range from 4.5-6.0kWh/m<sup>2</sup>/day with the highest irradiation levels occurring in the northern half of the country. Over 38,000 solar home systems and lanterns have been

installed in more than 120 communities throughout the country for off-grid applications and 25 grid-tied installations with total installed capacity of ca. 4MW.

*Wind* energy potential exists. Average annual wind speeds along the coast and some islands range from 4-6m/s at 50m hub height. This potential can support utility scale wind power and hybrid micro/mini-grid development.

*Biomass* resource includes agricultural to forest wastes/products. A recent World Bank funded study on Agro - Processing and Sawmill Wastes Assessment for Electricity Generation 2014 revealed that there are well over 30 major/clustered agro, wood processing sites in Ghana generating nearly 10,000 ton/year of agro and wood processing wastes alone.

### **Renewable Energy Targets and Development Status**

The table below provides a summary of renewable energy targets for the Ministry of Energy.

<b>Potential RE Projects</b>	<b>Target</b>	<b>Investment Requirement US\$ (million)</b>	<b>Accelerated time line</b>	<b>Development Status</b>
Development of utility type wind farms	50-150MW	100-350	2011-2020	<ul style="list-style-type: none"> <li>• Wind data collected for 8 onshore locations and 3 on selected islands.</li> <li>• 3 developers (VRA, NEK of Switzerland, &amp; Eleqtra/InfraCo) are actively pursuing the development of up 200MW wind part by 2019.</li> </ul>
Development of grid-connected solar parks	50-100MW	100-200	2012-2020	<ul style="list-style-type: none"> <li>• 4MW installed and 12MW to reach financial close by Q3 2014 for the VRA.</li> <li>• Over 25 IPPs granted provisional licenses to commence utility-scale solar feasibilities.</li> </ul>
Medium – small Hydro	150-300MW	200-650	2018-2020	<ul style="list-style-type: none"> <li>• 90MW Juale &amp; 48MW Pwalugu Hydro prefeasibilities ongoing by VRA 90MW Hemang Hydro-feasibility complete by CWE.</li> <li>• Feasibility and design completed for 60kW Tsatsadu SHP and 1 unit 30kW turbine procured under UNIDO Support</li> </ul>
Modern Biomass /waste to energy	90MW	90-150	2012-2020	<ul style="list-style-type: none"> <li>• Biomass resource assessment near completion</li> <li>• Pilot 2-4 combustion and cogeneration planned</li> </ul>
Development of mini-grid	20-50 units	38.5	2012-2018	<ul style="list-style-type: none"> <li>• Development of 4 pilot mini-grid schemes commenced funded by World Bank.</li> <li>• Development of regulatory frameworks for mini-grid commenced.</li> </ul>
Solar lantern Promotion	2 million units	15-200	2012-2018	<ul style="list-style-type: none"> <li>• 20,000 units of solar lanterns distributed</li> <li>• Private sector and local manufacture envisaged</li> </ul>

Off-grid RE project	30,000 units	10-25	2012-2020	<ul style="list-style-type: none"> <li>• Nearly 18,000 SHS installed</li> <li>• Public and private sector led</li> </ul>
Sustainable energy for cooking	2,000,000 units	10-50	2012-2020	<ul style="list-style-type: none"> <li>• SE4ALL Country Action plan in place with timelines</li> <li>• Private sector led</li> </ul>

## II. RATIONALE FOR SELECTED SECTORS FOR SREP FINANCING

Please identify barriers for the deployment of renewable energy, potential sector, sub-subsectors, and technologies for possible SREP financing as well as the rationale for prioritizing them for SREP interventions.

### **The Main Barriers**

The main barriers facing the scaling-up of renewable energy based electrification to a wider population in Ghana are;

- Lack of financing,
- Payment of low electricity tariffs,
- Difficulties in enforcing approved regulatory and legal frameworks,
- Weak local capacity to operate, maintain and manage such facilities and inadequate funding for projects..

#### *Efforts to address the lack of financing*

- Engagement of local banks to develop renewable energy financing portfolios,
- Development of the renewable energy fund and proposed levies to support renewable energy initiatives.
- Exploring external funding opportunities such as World Bank, Climate Funds, EU Energy Facilities, etc.

#### *Efforts to address non-cost reflective tariffs*

- Upward adjustment of electricity tariffs to the tune of about 78%
- Review and implementation of the automatic adjustment tariff system
- Support for electricity distribution companies to reduce technical and commercial losses

#### *Efforts to enforce regulations*

- Support for the Energy Commission and PURC to fully implement its core mandates,
- Development of relevant policy tools such tariff setting program, licensing procedures and guidelines, etc. in line with the Renewable Energy Act, 2011, and resourcing key agencies to implement them.

Efforts to address weak human capacity

- Bilateral arrangements with development partners such as Chinese, Japanese, Indian governments, European Union, to build short and long term capacities in renewable energy
- Support for technical, vocational and tertiary institutions in Ghana to develop and run curricula in renewable energy. Business Develop Support (BDS) for the private sector to play vital role in the provision of renewable energy solutions in the market.

While the MOEP is already very active in addressing the barriers to renewable energy development, much more efforts are required to meet the at least 10% target of renewable energy by 2020 and universal access. In that context, MoEP intends to use the SREP Financing to leverage other funding facilities, especially those under the Ghana Energy Development and Access Project (GEDAP), to undertake the following prioritized renewable energy initiatives.

- Further electrification of 46 additional communities in the immediate vicinity of Lake Volta using micro/mini-grid renewable energy systems. Based upon the pilot exercise currently under evaluation, these 46 villages will cost in the range of US\$35 to \$38.5m to electrify and will provide connections to between 15,500 and 25,500 households or roughly 93,000 to 155,000 people and add close to 16MW of installed renewable energy capacity. In addition, roughly 350 public facilities (100 clinics, 200 schools and 50 security posts) will be electrified through this initiative.
- Construction of the 60kW Tsatsadu micro hydro project.
- Support for facilitation of waste-biomass cogeneration and other promising activities identified under the current GEDAP program.
- Develop human and institutional capacities for decentralized renewable electrification.
- Development relevant policy tools and business model (Community IPP Model where the grid/distribution infrastructure would be owned and managed by the Government and IPP will generate mini power and sale to customers).
- Develop the framework and strategies for the creation of Renewable Energy Authority to manage the industry to ensure post project sustainability as provided in the renewable energy Act 2011 (Act832).

Given the technical assistance needs of getting this work underway, the MoEP is requesting US\$ 50m from the SREP fund.

### **III. ENABLING POLICY AND REGULATORY ENVIRONMENT**

Please provide an overview of the existing policies, legal framework, market and regulatory structure for renewable energy development and the potential impacts of public and private sector interventions in addressing the barriers. Discuss the existing regulatory environment for attracting private investments in renewable energy technologies and governance within the energy sector, including commercial performance of relevant institutions, pricing and tariff practices, competitive procurement of goods and services, the transparency and accountability of these practices and the degree to which they are subject to public oversight.

#### **The National Energy Policy (Renewable Energy Sub-sector Policy)**

The goal of the renewable energy subsector is to increase renewable energy in the total national energy mix to 10% by 2020, ensure its efficient production and use.

The policy focus therefore is to promote the development and management of renewable energy resources with the view to increasing energy access, combat climate change and contribute to the attainment of:

- Ghana Shared Growth Development Agenda.
- ECOWAS White Paper for Energy Access
- UN Millennium Development Goal
- Sustainable Energy For All Initiative

### **The Renewable Energy Act 2011 (Act 832)**

In December 2011, the Renewable Energy Act 2011 (Act 832) was created to provide fiscal incentives, regulatory framework for the promotion and attainment of at least 10% of renewable energy in the generation mix by 2020. The key provisions of the Act 832 are the following.

- **Feed-in-tariff scheme** under which electricity generated from renewable energy sources would be offered a guaranteed price.
- **Renewable Energy Purchase obligation** under which power distribution utilities and bulk electricity consumers are obliged to purchase a certain percentage of their energy required from electricity generated from renewable energy sources
- **Off-grid Electrification** – promote Mini-grid and stand-alone RE systems for remote off-grid rural electrification.
- **Licensing regime** for commercial renewable energy service providers among others to ensure transparency of operation in the renewable energy industry.
- **Connection** to transmission and distribution systems which obliges the operators of the transmission and distribution systems to connect a generator of electricity from renewable energy source within the coverage area where a generator of electricity from renewable energy sources so request
- **Net-metering** which provides incentives and allows for the integration of renewable energy into the distribution network through own-consumption and export of the excess into the networks.

### **The Implementation Measures**

#### ***Gazette Renewable Energy Feed-in-Tariffs (RE-FIT)***

- The RE-FIT was approved and gazetted on 28th August, 2013 as shown in the table below. It is applicable for the purchase of electricity from renewable resources by utilities and has been effective since 1st September, 2013.
- The approved rates are fixed and applicable for a period of ten (10) years, and subsequently, the rates are subject to review every two (2) years.

<b>Renewable energy technology</b>	<b>FIT Effective 1st September 2013 (GHp/kWh)</b>
Wind	32.1085
Solar	40.2100
Hydro $\leq$ 10MW	26.5574
Hydro ( $\geq$ 10MW and $\leq$ 100MW)	22.7436
W2E (Landfill Gas)	31.4696
W2E (Sewage Gas)	31.4696
Biomass	31.4696

GH¢/US\$ Exchange Rate: GH¢1.9968 to US\$1.0000 as of 27<sup>th</sup> August, 2013 (average selling rate from the Association of Bankers).

#### ***Mini-grid policy***

The Ministry of Energy & Petroleum is working with the PURC and the Energy Commission to develop the regulatory framework to deal with the challenges of mini (and micro) grids. This framework is expected to be reviewed and released for public consultations by the end of June, 2014. The World Bank, through the African Electrification Initiative (AEI) and the African Development Bank, will be providing expert technical review to the draft regulations. This would pave the way for the development of the relevant policy tools and the business model for mini-grids.

### **Competitive Procurement in the Energy Sector**

In an effort to stem the tides of procurement corruption, Ghana's Public Procurement Act, 2003 (Act 663) which is fashioned after the UNCITRAL Model Law of Public Procurement guarantees transparency and accountability in the use of public funds. Procurement of goods and services within the energy sector of Ghana is conducted in line with this Act (Act 663). Public procurement constitutes over 50% of Government budgets besides the cost of government wage bill and accounts for the largest share of government expenditure.

Considering the stakes involved in public procurement, the Act 663 established the Public Procurement Authority (PPA) which is an independent regulator to supervise procurement activities as they occur at the procurement entity levels. The Ministry of Energy and Petroleum ensure that the procurement of goods and services are done in line with this Act and per the following sets of rules.

- the strict adherence to competition (as a default) in the conduct of public procurement;
- the involvement of representatives of tenderers during tender openings;
- the disclosure of evaluation criteria prior to the start of tendering processes;
- the publication of tender and disposal notices and contract awards;
- rules for procurement planning, procurement records keeping, and
- grounds for rejection of tenders, proposals and quotations;

These therefore reduce the tendency for capriciousness and the worst forms of subjectivity in the procurement process.

#### **IV. INSTITUTIONAL AND TECHNICAL CAPACITY**

Please provide an analysis of the institutional and technical capacity for implementation, including the government's ability to effectively absorb additional funds. Please also provide a preliminary assessment of potential implementation risks.

The Renewable Energy Directorate of the Ministry is responsible for the implementation of renewable energy programmes and projects and would most probably be the SREP focal point.

The staff strength is thirteen (13) as described in the table below.

#	Name of Staff	Qualification	Position/Duties
1	Wisdom Ahiataku-Togobo	MSc Renewable Energy	Director
2	Seth Mahu	MSc. Renewable Energy	Deputy Director, Renewable Electricity
3	Ebenezer Ashiyie	MSc Renewable Energy Mgt	Snr. Engineer
4	Gifty Tettey	MBA	Deputy Director, Bioenergy



5	Robert Sogbadji	PhD, Alternative Energy	Head, Alternative Energy Planning
6	Dennis Turkson	MSc Energy Management	Snr. M&E Officer
7	Apkene Dzadzra	BSc Geology	GIS Specialist
8	Albertina Bemile	MSc Engineering	Hydro Planning Engineer
9	Charles Glover	BSc Physics	Solar Energy Planning Officer
10	Isaac Barimah Amposah	BSc Mathematics	Wind Energy Analyst
11	Jimmy Agbey	BSc Physics	GIS Planning Officer
12	Bright Agbesinyale	BSc Electrical Engineer	Systems Maintenance Engineer
13	Doris Doudu	BSc Natural Resources	Snr. Bioenergy Analyst

The Renewable Energy Directorate has over the years implemented complex multi-donor funded projects including the Spanish, Japanese, Chinese government funded solar and capacity development projects. Currently, the Directorate is implementing the renewable energy component of the US\$210 million multi-donor funded GEDAP I&II project. The Renewable Energy component includes;

- Capacity development for the Energy Commission, the PURC, Power Generators and Distributors (about 13 individuals were trained, and various tools procured for these commissions),
- the ARB Apex Bank Solar Project (About 16,000 solar systems and lanterns were sold),
- Wind Resource Assessment (8 wind sites (3 islands and 5 mainland) are being assessed)
- Mini-grid development (4 pilot projects are undergoing procurement),
- Support for the drafting of the Renewable Energy Law and Feed-in-Tariff and,
- Business Development Support Fund for renewable energy companies (12 private companies were supported).

In fact, under the Spanish Government grand facility, a total of 1286 solar systems were installed in off-grid public institutions; the Japanese facility supported installation of 22 communities solar energy service centers, 8 technical institutes, and 715kWp solar park for Noguchi Institute of the University of Ghana.

The Renewable Energy Directorate works closely with other agencies such as the Ministry of Finance, The Technology Energy Centre of the KNUST, the Energy Commission, and the private sector in the dispensation of renewable energy initiatives.

Based on the assessment of the proposed interventions, the following potential implementation risks are envisaged.

- Access to a robust and reliable water transport service for the transportation of materials and equipment.
- Bad weather conditions
- Resistance from stakeholders to accept and own the project model
- Long transaction time for projects implementation.
- Unbridged financing gaps that could make project very expensive and unattractive
- The willingness of customers to pay for the electricity services

The Ministry of Energy & Petroleum would take the necessary measures to ameliorate these and other intrinsic implementation risks.

## **V. PROGRAMS OF MDBS AND DEVELOPMENT PARTNERS**

Please describe briefly the ongoing and planned programs of the relevant multilateral development banks (MDBs) and other development partners relevant to energy access and renewable energy and how the proposed interventions for SREP would link to and build upon these programs.

The Ministry of Energy & Petroleum would take advantage of the ongoing and planned renewable energy initiatives and leverage with the SREP support to achieve higher and impactful targets. The following are the ongoing and planned renewable energy-based electrification initiatives.

1. GEDAP I & II Renewable Energy- has three main components: (a) sector and institutional development; (b) distribution improvement; and (c) electricity access and renewable energy. The renewable energy component is described in section IV above with a total budget of about US\$19m.
2. Spanish Government €5m Grant for Off-grid Public Institutions Project-which provided about 1800 public facilities with solar systems.
3. Japanese Government US\$ 4m Grant Facility for capacity building for the dissemination of solar energy in Ghana
4. Chinese Government US\$2.5m Grant facility for the implementation of the Pilot Urban Solar Streetlight Project
5. GEDAP III Renewable Energy Component-MDBs yet to finalize their commitments. The African Development Bank has recently approved approximately USD 75 million for the Electricity Distribution System Reinforcement and Extension Project, which is part of the GEDAP III program and includes a renewable energy component for off-grid connection to some Volta River islands.
6. German Government €1.8m Grant Facility for the implementation of the Renewable Energy Act 2011 (Act 832)
7. German Government Credit Facility for 12MW Solar Park for the VRA.