



THE REPUBLIC OF UGANDA

MINISTRY OF ENERGY AND MINERAL DEVELOPMENT

**SCALING UP RENEWABLE ENERGY IN LOW INCOME COUNTRIES PROGRAM
(SREP)**

EXPRESSION OF INTEREST TO PARTICIPATE IN SREP

**SUBMITTED BY REPUBLIC OF UGANDA REPRESENTED BY THE MINISTRY
OF ENERGY AND MINERAL DEVELOPMENT**

I. DESCRIPTION OF THE COUNTRY AND ENERGY SECTOR CONTEXT

Uganda is a low income developing country located in East Africa with an area of 241,550km² and a population estimated at 36million in 2014. The country's economy is predominantly agricultural with the country Gross National Income (GNI) per capita at US\$549 in 2011. In the last 20 years, the economy has been growing fast creating high demand for modern forms of energy. Real Gross Domestic Product (GDP) grew by 6.7% in FY 2010/2011. Uganda has surpassed the 2015 MDG of halving the 56% poverty rate recorded in 1993 to 24.5% by 2010. Uganda's vision 2040 sets out an electricity access target of 80% by 2040. Uganda's National Development Plan (NDP) covering the period 2011-2015 highlights the urgent need to increase access and usage of electricity through investments in least cost generation, promotion of renewable energy, energy efficiency, and the development of associated transmission and distribution infrastructure.

ENERGY SECTOR CONTEXT

The energy balance comprising of biomass 88.9% (fuel wood 78.6%, charcoal 5.6% and agricultural residues 4.7%), petroleum products contribute 9.7%, and electricity contributes only 1.4% of the total national energy balance. Most of the fuel wood is used for cooking utilizing the highly inefficient three stone cook stoves especially in the rural areas where most of the population lives. Access to electricity stands at 14% nationally and in rural areas it is at 7%. Per capita electricity consumption remains one of the lowest in the World at less than 100kWhrs per person.

Uganda had always used hydropower as the main source of electricity until 2005 when thermal power plants had to be introduced to the national grid to address an acute shortage of power which had come about due to poor planning arising from a history of internal conflict. Installed power capacity currently stands at 850MW including 100MW of thermal power. Uganda is endowed with abundant forms of renewable energy (biomass, hydropower, geothermal, wind,

solar) but exploitation of this clean energy for socio economic development remains a challenge. The East African rift valley in which geothermal power has been exploited in Kenya has its western arm running through a big part of Uganda and there are clear surface indications of availability of geothermal energy.

In 1999, Uganda realized the need to attract private capital to its energy sector and reformed the power sector allowing for private sector participation. As a result of these reforms, Independent Power Producers (IPPs) are currently participating in electricity generation and have built one large hydro power plant (the 250MW Bujagali hydropower plant), 5 mini hydro power plants with a total installed capacity of 56MW, two cogeneration plants from sugar production plants, and plans to build a total of 150MW from renewable energy resources mainly focused on mini hydropower plants are now quite advanced with construction expected to start this year. Uganda has a renewable energy policy in place with renewable energy feed in tariffs published and in use with an independent power sector regulator. Hydropower development for grid connected systems is picking up with plans to build 600MW Karuma hydropower plant and the 183MW Isimba hydropower plant in advanced stages. However, geothermal power development remains a challenge and the need to address scale up of house hold and community based renewable energy for cooking and other household requirements is urgent. Uganda was selected as one the fast movers under the United Nations supported Sustainable Energy for ALL (SE4ALL) where increased use of renewable energy is one of the targets. SREP financing would contribute towards achieving these global objectives.

Uganda has established the Rural Electrification Fund (REF) which is managed by the Rural Electrification Board (REB) with the now ten year old Rural Electrification Agency (REA) as the implementing arm of the Government rural electrification agenda. Uganda has also established the Uganda Energy Credit Capitalization Company (UECCC) to promote financing for renewable energy development utilizing existing financial institutions and the Ministry of Energy and Mineral Development has a fully fledged renewable energy division whose mandate is to promote renewable energy development. Implementation of SREP interventions would utilize these existing structures.

II. RATIONALE FOR SELECTED SECTORS FOR SREP FINANCING

Uganda experienced poor governance and internal conflict through the 1970s and the 1980s allowing hardly any progress in renewable energy development. Following return to stability and the reforms in the 1990s, there is visible progress in renewable energy deployment mainly utilizing private enterprise. Renewable energy deployment requires technology and capital. However for entrepreneurs to invest in renewable energy, they need information of the available forms of renewable energy (where is it, in what quantities and for what market) and a suitable investment climate with a clear risk allocation. Major barriers for renewable energy deployment in Uganda are various and vary with the form of renewable energy and include the following:

- (i) For geothermal energy the main barrier has been borehole drilling risks and lack of public funding to quantify the geothermal resource information to allow packaging of bankable projects for private sector investment. Geothermal investors fear the risk of drilling boreholes which could turn out dry. To address this risk, funds have to be found to drill the boreholes and once steam is established, private investors are attracted to develop the sites. Geological,

geophysical and geochemical investigations have been carried on several sites in Uganda with the support of International Development Association of Iceland (ICEIDA) and other development partners with clear indication of geothermal recourse availability but the next step of drilling boreholes to demonstrate availability of steam for power generation has not been done due to lack of funding. Detailed investigations have been carried out at Katwe-Kikorongo Kibiro and at Buranga Geothermal sites. Preliminary investigations have been carried out at other sites like Panyimur and Kanangorok.

(ii) For household energy utilization the main barriers have included lack of adequate mobilization to allow change in attitudes (use of energy efficient stoves and use biogas resources), information with supportive data to support household and community renewable energy areas as viable investment destinations, lack of knowledge by local communities on benefits and advantages of utilizing better energy methods, high upfront costs for project developers and for end user consumers, and technical capacity to develop and sustainably utilize these renewable energy resources at household level.

In terms of prioritization of renewable energy interventions in Uganda under SREP, geothermal development for grid connected power supply is high priority. In neighboring Kenya, geothermal resources have been deployed with excellent results. In Uganda surface exploration has been done and the next step is required to drill boreholes to demonstrate availability of steam for power generation. The impact of geothermal would be big given that it would be connected to the grid and replace fossil fuel thermal power plants and prevent establishment of new thermal power plants. Availability of geothermal power would contribute to national socio economic development and create jobs for the population utilizing clean energy. Uganda relies heavily on hydropower whose available capacity is heavily affected by climate variability. Geothermal power is less impacted by climate change and would provide the necessary stabilization in the grid energy mix. For one geothermal area, at least three boreholes are required at an estimated cost of $3 \times \text{US\$6m} = \text{US\$18m}$. Fortunately, these geothermal sites are close to the recently established oil fields where drilling rigs are now available. Use of these rigs could reduce on the cost of geothermal drilling.

The second potential area is scaling up of household renewable energy addressing cooking requirements at household and at institutional level (schools and health facilities), renewable energy for lighting, and renewable energy to support communication and core productivity. In Uganda, close to 95% of all schools are still using the three stone fire places and most head teachers are not aware about improved stoves and their cost effectiveness. The school is a learning environment where practical renewable energy use should be demonstrated to groom a new generation which fully appreciates renewable energy use. At a National level the biomass consumption for cooking in institutions takes up over 2 million tonnes of wood per annum. Through adoption of improved cook stoves this consumption can be reduced to 50% or lower. Upfront funding is a main barrier. There is a need to develop a number of innovative funding mechanisms to address renewable energy requirements at household level including community and institutional level such as grants, challenge funds and use of carbon credits as collateral. After attaining a dissemination of certain critical mass in terms of number of units and assemblers / manufacturers, the renewable energy industry can become self-sustaining

and subsidies can be gradually withdrawn without any adverse effects on continued dissemination of the stoves. In Uganda, the mobile phone has taken communication to the most remote areas of the country. Other Information, Communication Technologies (ICT) are following allowing the farmers to explore better opportunities to improve their livelihoods through search for better markets, farming technologies, and obtaining global linkages. This ICT revolution requires modern energy to power it. Renewable energies like solar systems, biogas and biomass systems, off grid pico hydros and micro hydros, as well as small scale community based wind systems would support the rural communities improve their lives. The main challenge is financing for technology vendors and users. Utilizing the Uganda Energy Credit Capitalization Company and the microfinance structures which are already established in Uganda innovative financing structures coupled with a targeted public information system would be put in place to cause scale up of these renewable forms of energy.

III. ENABLING POLICY AND REGULATORY ENVIRONMENT

The Energy Policy for Uganda dates back to 2002 and aims “to meet the energy needs of the Uganda’s population for social and economic development, in an environmentally sustainable manner”. With this policy the Government aims to increase and improve modern energy supply and it shows a commitment of the Government to develop and use Renewable Energy resources and Energy Efficient technologies.

The applicable law is the Electricity Act (1999) whose purpose was to enhance efficiency through Privatization and liberalization of the sector and provides for an independent regulator, the Electricity Regulatory Authority (ERA). Other applicable laws include the National Environmental Management Authority (NEMA) Act, the National Forest Authority (NFA) Act and the Constitution of Uganda.

The Renewable Energy Policy (REP) for Uganda was published in 2007 and recognizes that a number of renewable energy technologies have become commercially viable and, need to be brought into the national energy supply mix. The policy lists four major challenges the Government had faced in meeting the energy needs of its people:

- i. The unprecedented electricity deficit of about 165MW on the national grid due to the fall in Lake Victoria water levels as a result of prolonged drought. This necessitated the installation of 150MW of thermal (diesel) generation to bridge the gap.
- ii. The escalating oil prices on the international market
- iii. To make electricity accessible to the rural population through grid extension as well as small scale renewable energy generation using micro and pico hydros, PV systems, wind power and biomass.
- iv. The Government’s obligations on greenhouse gas emissions to contribute to the global fight against climate change. In particular, Government wants to provide the necessary framework for private sector investors in renewable energy projects to benefit from the available facilities for emissions trading.

The Renewable Energy Policy set a target to increase the use of modern Renewable Energy from 4% to 61% of the total energy consumption by 2017. It recognized the barriers to Renewable Energy development including high upfront costs, inadequate legal and institutional frameworks, limited technical and institutional capacity, limited awareness and irrational utilization of biomass resources among others.

The key feature of the Renewable Energy Policy was the publication of Standard Power Purchase Agreements and a Feed in Tariff for grid connected renewable energy systems with the aim of reducing the transaction time and to raise the levels of predictability of the investment environment for RE projects that were then below 20MW. The Feed in Tariffs are reviewed periodically to reflect the costs changes over time.

Feed in Tariff (Up to 20 MW) Uganda

Technology	Eligible Capacity	Tariff US\$/kWh	Total Capacity Allocation MW	Payment Period (Years)
Hydro	9 - 20MW	0.073	180MW	20
Hydro	1 - 8MW	0.082 – 0.092	90MW	20
Hydro	0.5 – 1MW	0.109	5MW	20
Bagasse		0.081	100MW	20
Biomass		0.103	50MW	20
Biogas		0.115	50MW	20
Landfill Gas		0.089	50MW	20
Geothermal		0.077	75MW	20
Solar PV		0.362	7.5MW	20
Wind		0.124	150MW	20

Following the opening up of Uganda's power sector, private investors have been attracted. The whole generation segment is currently operated by the private sector with Government having privatized its generation plants through 20 year concessions, the distribution segment is also privatized through long term (20 year) concessions leaving transmission at voltages above 33kV as the only Public participant in the power sector. The Government owned Uganda Electricity Transmission Company Ltd (UETCL) is the system operator and single bulk purchaser of electricity in Uganda's single buyer model. The electricity Regulatory Authority (ERA) is the independent regulator and reviews all power tariffs quarterly.

All license applications and tariff reviews are subject to public reviews and any person dissatisfied with any sector decisions can lodge complaint with the Electricity Disputes Tribunal which has the powers of a high court. The Ministry of Energy and Mineral Development is in charge of policy and the Minister may give policy direction to ERA by way of a published policy direction. Procurement of goods and services follows the Public Procurement and Disposal of Public Assets (PPDA) Act and any person dissatisfied with the procurement process may lodge complaint first to the Accounting Officer of the involved entity and if not satisfied at that level may lodge complaint with the Public Procurement and Disposal of Public Assets Authority. Further complaint can be lodged with the Inspector General of Government before resorting to courts of law.

The Ugandan climate is conducive for Public Private Partnerships (PPP) with Government providing the enabling environment especially addressing investment risks to allow safe inflow of foreign direct investment and outflow of profits in any currency which can be obtained from the many forex bureaus. Under SREP, the aim is to address investment barriers to allow private investors to participate in the scaling up of renewable energy.

IV. INSTITUTIONAL AND TECHNICAL CAPACITY

The implementing agencies under SREP would be Ministry of Energy and Mineral Development providing policy guidance and implementation of some renewable energy interventions. The Rural Electrification Agency (REA) will support the rural electrification related interventions while the Uganda Energy Credit Capitalization Company (UECCC) will address financing issues. All these institutions have implemented World Bank and other donor funded projects and have adequate institutional and technical capacity to implement projects funded under SREP. Potential Implementation risks could relate to lengthy procurement procedures with consequent delays. To address this risk, dedicated personnel may be required.

V. PROGRAMS OF MDBS AND DEVELOPMENT PARTNERS

There are some ongoing interventions which involve renewable energy.

A. ENERGY FOR RURAL TRANSFORMATION (ERT)

Under the World Bank supported Energy for Rural Transformation (ERT) program, several grid extensions have been built and solar systems put in schools, health facilities and water pumping systems during the concluded first phase and ongoing second phase of ERT (ERT I and ERT II). There was no intervention to address the proposed SREP actions. Under the proposed ERT III, there is a proposal to procure subsurface investigation equipment for geothermal investigations worth US\$700,000 and does not cover the pre-investment risks.

B. THE GLOBAL ENERGY TRANSFER FEED – IN TARIFF – (GET – FiT) PROGRAM

Government of Uganda with the support of KfW of Germany has established the Global Energy Transfer Feed – in – Tariff (GET FiT) scheme to support the development of the small renewable energy projects in Uganda. The scheme provides for an output based top – up payment to the project developers to allow a reasonable return on investment, while minimizing the need to increase REFiT and the electricity retail tariff. Under the GET FiT program, this top –up payment is termed “premium” by private sponsors when they begin commercial operation.

The GET FiT program has raised funds from different bilateral sources (Norway, Germany, United Kingdom and the European Union) and has established a Secretariat. This GET FiT Secretariat can be considered as the Project Implementation Unit (PIU) of the GET FiT Program, governed by a Steering Committee that includes members from the GET FiT Fund donors and GoU.

The total funding requirement for the GET FiT program is estimated to be about EUR 71.8million considering the initial approved REFiT. The GET FiT premiums for the different REFiT technologies are as in the Table below.

GET FiT Premium Payment Levels

Hydro (20<= $\leq$ 9MW)	0.02
Hydro (8<= $\leq$ 1MW)	0.02
Hydro (1MW<= $\leq$ 500kW)	Not included
Bagasse	0.01
Biomass	0.01
Biogas	No subsidy
Landfill gas	Not included
Geothermal	Not included
Solar PV	No subsidy required
wind	Not included

The GET FiT premium payment is designed as a quasi output based incentive for the project developers. It is further designed to increase the cash flow of the project developer during their initial operating years, thus increasing the internal rate of return of the projects significantly. The total GET FiT premium payment amount for a specific project developer is determined by estimating the total energy (GWh) the power would generate during its contracted period (20years). In order to conservatively estimate energy generation of a plant, only 60% of the installed capacity would be considered along with the projected average annual plant factor. Half of the GET FiT premium will be paid to the project developer after UETCL confirms that the project developer has reached Commercial Operation. The premium payment would be adjusted during this period for any deviation between the power plant's projected plant factor and actual operation. The GET FiT program to benefit from a World Bank funded Partial Risk Guarantee which is currently under design.

C. PROMOTION OF RENEWABLE ENERGY AND ENERGY EFFICIENCY PROGRAM (PREEP).

Since 2005, GIZ of Germany has supported MEMD through the Promotion of Renewable Energy and Energy Efficiency Program (PREEP). One of the areas of intervention is in the cooking energy both at household as well as larger user level. The program carried out efficiency tests and found that the improved charcoal stove has a potential to save

about 40% of the fuel compared to the traditional metal stove. Under this programme about 1,000 institutional stoves have been disseminated. The program has also worked with local bread bakeries that mostly use firewood for their ovens. These ovens are inefficient and about 2 kg of firewood are required for every kg of bread produced. The program could reduce this to 1.25 kg by installing more efficient ovens. Other areas included institutional stoves for schools, prisons and hospitals which use firewood for the preparation of the meals.

At the regional level the East African Community (EAC), Strategy on Scaling-up Access to Modern Energy Services (referred to as “the Strategy”) was adopted by the EAC Council of Ministers in November 2006. One of the targets is to provide access to modern cooking practices for 50% of the population that currently uses traditional cooking fuel. The political will to implement this program exists within the East African region partner states.

D. BIOGAS INITIATIVES:

- i) The most recent initiative involving Government was in 2002, where the Ministry of Energy and Minerals Development undertook a project on construction of 20 demonstration biogas digesters through technical assistance by the Chinese Government. The outputs were

- 20 demonstration digesters

- 17 technicians were trained

- ii) Uganda National Domestic Biogas Programme (UNDBP)

The current Uganda National Domestic Biogas Programme has 5,000 domestic digesters disseminated, 250 biogas technicians trained but does not deal with larger systems.

- iii) Modern Biomass for Rural Development

Under the Government supported Modern Biomass for Rural Development a component targeting production of biogas for electricity generation is in place. Assessment of feed stock availability has been carried out on some farms. A pipeline project supported by the Israel Government and the International Renewable Energy Agency (IRENA) to generate 200KW of electricity and serve as training for technicians is in the offing.

E. OTHER PROJECTS

Other ongoing projects relate to transmission, infrastructure and grid based rural electrification. These are supported by the World Bank (IDA), Norway, Germany, Japan, African Development Bank and the European Union. Sustainable Energy for ALL (SE4ALL) is also under preparation with the European Union taking the lead.

