



**THE REPUBLIC OF RWANDA**



**ENERGY, WATER AND  
SANITATION LTD**

**EXPRESSION OF INTEREST FOR SCALING UP RENEWABLE  
ENERGY PROGRAM (SREP) FINANCING FOR ENERGY PROJECTS IN  
RWANDA**

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# 1 ENERGY SECTOR OVERVIEW

## 1.1 ELECTRICITY SYSTEM

The present electricity supply in Rwanda is derived principally from thermal and hydropower sources. The table below summarizes the 2014 available capacity in Rwanda.

Source of supply	Capacity /MW	Contribution/ %
Thermal	47.8	43.03
Hydro	59.43	53.50
Methane to Power	3.6	3.24
Solar Power	0.25	0.23
<b>Total</b>	<b>111.08</b>	<b>100</b>

Table 1.1

Electricity access in Rwanda is still low. It is estimated that currently 18% of the population has access to electricity supplies. In addition to lack of access to electricity, the high retail tariff for electricity is an impediment to growth of demand for electricity in the country. The current retail tariff (excluding VAT) is shown below;

- Industries : 96Rwf/kWh : **Off peak hours** (23 h00 - 07h00)  
126Rwf/ kWh: **Mid peak hours** (07 h00 - 17h00)  
168Rwf/ kWh: **On peak hours** (17 h00 - 23h00)
- Residential consumption : 134 Rwf/Kwh

## 1.2 ENERGY RESOURCES

Rwanda has variety of potential energy resources from biomass, hydro, solar, petroleum, methane gas, wind and geothermal.

The analysis of supply and demand of energy in Rwanda indicates that today approximately 85% of primary energy still comes from biomass, in the form of wood that is used directly as a fuel (57%) or is converted into charcoal (23%), together with smaller amounts of crop residues and peat (5%). Of the 14% of non-biomass primary energy, petroleum products account for 11% (used mainly in the transport sector) and electricity for approximately 4% .

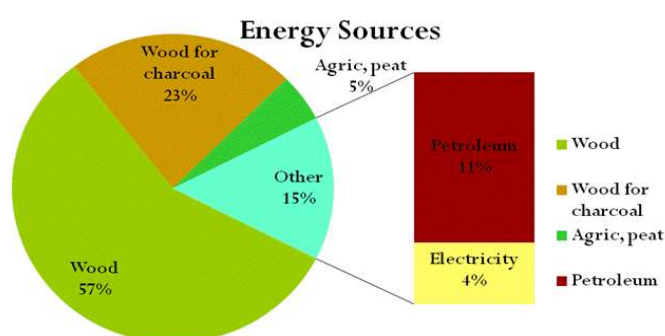


Figure 1.1

Due to increasing energy demand of the modern sector, the search is underway for other sources of energy. In addition to the option of expanding the capacity for hydro-electricity and solar energy, the government is supporting the development of methane gas of Lake Kivu and Geothermal exploration studies. There is also an estimated 155 million tonnes of peat reserve.

Rwanda’s potential for renewable energy, micro-hydro, geothermal and solar, is considered to be huge. Hydropower is the foremost energy resource in Rwanda utilized for power generation.

The Hydropower Atlas has identified 70 hydro sites in the country with a combined capacity of 15 MW. Future domestic generation developments for the main grid are expected to continue from both hydropower sources and thermal (heavy fuel oil and methane based production from Lake Kivu). Geothermal and wind power resources are also being investigated with initial geothermal estimates suggesting that further investigation of geothermal potential is warranted.

The following energy related policies are in effect in Rwanda.

### 1.3 ECONOMIC DEVELOPMENT AND POVERTY REDUCTION STRATEGY (EDPRS II)

The EDPRS II covers the period 2013-2018, and is the medium-term framework for achieving the country’s long term development aspirations as embodied in the Rwanda Vision 2020, and the intermediate targets of the 2015 Millennium Development Goals (MDGs). An Energy Sector Strategy has been developed to support sustained growth of the economy, and raise the standard of living for the Rwandan people by improving access to modern forms of energy at the household level.

### 1.4 NATIONAL ENERGY SECTOR STRATEGIC PLAN (2008-2020)

This is a detailed roadmap of investments which will allow meeting of the energy requirement.

Electricity Generation	The target is to have an installed capacity of <b>563 MW by 2018</b> . Government is prioritising developing the feasibility of different generation sources to reduce the perceived delivery risks and lay ground for more private sector participation
Access to Electricity	<b>100% of households get access to electricity</b> through grid and off-grid solutions by 2018. This will be done through; <b>Grid connections (48% of households):</b> The plan is to extend the network of electricity across the country for grid connections. <b>Off-grid installations (52% of households):</b> Households located in a significant distance away from the grid or those consuming insufficient electricity to make a grid connection financially viable will be advised to get access through off-grid solutions such as minigrids or solar PV solutions.
Tariff and Subsidies	<b>Subsidies:</b> Government plans to eliminate subsidies to the tariff by <b>2015</b> whilst maintaining a regionally competitive tariff.
Biomass	Government plans to decentralise implementation of Biomass programmes from central to local government level to streamline implementation. Specifically, government : <b>Target the delivery of domestic BioGas digesters.</b> Promote the use of bio digesters within households and government institutions. The target is to deliver 100,000 bio digesters by 2017 <b>Improved Cook-stoves (ICs).</b> Increase penetration of improved cook-stoves (50% to 80%) <b>More efficient charcoal production:</b> Support Improved wood harvesting and charcoal production techniques by scaling up the

	level of training given to local cooperatives. Government will also continue to support the market and research of biomass alternatives such as LPG and Peat briquettes
Petroleum	<p><b>Increase Security of supply:</b> 4 months' supply will be stored by government and private sector.</p> <p><b>Decreased import costs and Increased price stability:</b> Through promoting and facilitating bulk purchasing of petroleum with Rwanda's regional neighbours</p> <p><b>Maintain and increase quality:</b> Improve standards and testing to ensure consistently high quality.</p>

## 2 PREFERRED SECTORS FOR SREP FINANCING

### 2.1 BIOGAS

One of the long-term strategy of the EDPRS II is to reduce fuel wood consumption from 94% to 50% and one of the major contributing factor will be the installations of Biogas digesters in both residential homes as well as the institutions with large population of citizens like, schools, hospitals, prisons etc.

The Biogas Programme in Rwanda started operations in 2007 under the Ministry of Infrastructure with financial and technical support provided by SNV, GIZ, formally known as GTZ and the Dutch Ministry of Foreign Affairs (DGIS) as the main donor. The programme's objective was to develop a commercial and sustainable domestic biogas sector, contributing to substitute mainly firewood, increasing agricultural production while applying bio-slurry, improving living conditions by reducing the workload and improving health and sanitation for mostly women and children, employment generation and reduction of greenhouse gas (GHG) emissions.

There are two distinct programmes under the biogas program in Rwanda:

1. **Domestic Biogas program.** The National Domestic Biogas Programme (NDBP) started in 2007 targeted at generating useful Biogas from the waste produced by a mixture of animal dung and urine. The initial focus of the programme was on capacity development, training of technicians and entrepreneurs, awareness campaigns and promotion. As a result, by September 2012 over 2700 biogas digesters had been constructed, over 200 masons trained and approximately 40 companies were actively involved in the programme. The government is in the process of facilitating installation of at least 100,000 additional domestic Biogas digesters by 2017/18.
2. **Institutional Biogas program:** The Government in 2008 announced a policy to introduce biogas digesters in all boarding schools (estimated at around 600 schools), large health centres and institutions with canteens to reduce the consumption of firewood. Further, through this program, 11 out of the 14 prisons in Rwanda are currently using biogas for cooking. To-date, altogether, around 70 large biogas digesters have been constructed in several institutions in Rwanda. The biogas systems installed in the schools and prisons have reduced firewood consumption by close to 60% and 40% respectively, along with significantly improved hygienic conditions and revenue savings.

With enough funding and support from SREP, Government of Rwanda will be able to achieve the EDPRS II targets of reliance on the fire wood and charcoal which will be mostly replaced by Biogas digesters at both levels of domestic and institution.

## 2.2 MICRO HYDROPOWER PLANTS

Rwanda is blessed with a favourable topography comprising numerous hills and streams which present large opportunities for the development of hydropower. There has been a growing realization that electrification through mini/micro hydropower plants (MHPP) can play an important role in increasing the generation capacity in Rwanda as well as promoting the socio-economic development of remote rural areas. To date, the majority of the mini/micro hydropower projects in Rwanda have been promoted through public schemes, which are financed by the Government of Rwanda (GoR) or by international development partners and operated by the public utility, Energy Water and Sanitation Authority Limited (EWSA Ltd).

Hydro power, where correctly sited, can deliver an economic supply of base-load power. Government of Rwanda plan to develop around 70 MW of domestic Hydro projects between now and 2018. The individual nature of each Hydro site necessitates a feasibility study be carried out in advance of development or contracting with the private sector. Its overall potential is estimated to be somewhere between 400 and 500 MW but the current installed hydro capacity is approximately 60 MW. As a result of extremely low operational costs however, hydro is still one of the cheapest forms of generation in the long run.

In pursuant of the National objective to increase the installed capacity from the current 110 MW to 563 MW by 2017, the GoR, through the Ministry of Infrastructure and Energy Water and Sanitation Limited (EWSA Ltd) is committed to utilize every means and resources to develop projects that will make this mile stone achievable. This ambition has become even bolder in that around 32 MW is expected to be achieved in the next 6 Months to come, from on-going hydropower projects.

In order to achieve this target, (EWSA Ltd) has selected around 69 potential micro and Pico hydro sites totalling approximately 15 MW of estimated total capacity (in the capacity of 500 kW and less). Feasibility studies for these sites are currently underway on a number of sites. These studies are expected to be completed in Mid-2014. Upon their completion some will undertake a competitive bidding process to identify a private sector partner while others will be developed through public funding.

Nyabarongo (28 MW), Giciye (4 MW), and Rukarara V (5 MW) are all under implementation. For Giciye and Rukarara V, being developed by Private developers, they have already signed a PPA with EWSA.

As part of Private Sector participation and encouragement in the energy sector activities, the Government of Rwanda through EWSA Ltd is planning to deliver some of its operational mini-hydropower plants to private operators. Currently only one plant (Rukarara I (9 MW)) have been placed under private management. The generated income from these plants will be used for development of the other mini/micro-hydropower plants.

Barriers associated with hydropower development and operation in Rwanda is mainly the low participation of private sector in the development and operation of the plants. To overcome this, the Government have decided to develop and then transfer them to the private sector for operation, this incentive is expected to boost their participation as the involved risks will be minimised. Another issue is topography at the River banks which is responsible for soil erosion and landslides causing extensive siltation and sedimentation of the water bodies. The silt and sediments flow downstream and reach the turbine as slits and sediments with the potential to damage the mechanical parts of the turbines. Since this was identified, there has been a countrywide campaign to protect all the river banks by planting trees and grasses, and seasonal

cleaning of rivers where possible. However, additional measures and structures such as construction of terraces are in some instances required and encouraged in localized areas that have been identified through feasibility studies for hydropower production.

A grant from SREP is essential to complement public financing in order to construct a number of micro-hydropower plants (some from a pool of the above mentioned 69 sites) and then transfer them to private operators in a form of as a way of reducing risks, support and encouragement to private sector participation in the electricity generation. The transfer agreement is in a form of renting where the private investors pay the rental fees to Government in instalments at a specified period of time. The generated income from these transfers will be used for the development of new sites.

### **2.3 SOLAR ENERGY**

It is possible for people to access electricity without the need to connect to the Electricity grid network. In such instances electricity is provided through off-grid solutions ranging from solar lanterns for lighting and charging phones to power from small hydro installations. These solutions will not provide the voltage or the stability provided through a grid connection but are often far more economical for low usage consumers due to reduced capital costs. Government plans to ensure that 52% of households have electricity from either of the two off-grid (hydro and solar) systems by 2017/2018. The Government also plans to extend coverage to the other 48% of the households, to the grid network by 2017/2018.

Rwanda has a good solar energy potential, where the daily insolation is ranging from 4 to 5 kWh/m<sup>2</sup>. This energy potential is used as a source of electricity to rural institutions located at far distances (greater than 5km) from the national interconnected grid through reliable off-grid systems.

Currently only 20% of the schools in Rwanda have access to electricity and these schools are located within a radius of less than 5Km from national interconnected grid. More than 2000 schools have no access to electricity and are located at distances greater than 5Km from the national interconnected grid.

To ease the integration of ICT in education, the Government of Rwanda through the Ministry of Education, has initiated an ICT program in Education “one laptop per child” in primary schools but the main challenge to date, is the lack of access to electricity.

Following the experience from the previous projects (like the on-going project of supplying and installing solar PV equipment in 300 rural schools located at distances greater than 5km from the national interconnected grid), solar energy can be used as a source of electricity required by “One Laptop per Child” program, in rural primary schools. It is in this regard, that the Government of Rwanda would like to electrify more schools with Solar PV systems as a part of a the current country wide campaign of achieving 100% electricity access by 2017/18 as outlined in the “Energy Sector Strategic Plan Roadmap 2013-2018”

To achieve this, each primary school will be equipped with a PV array of at least 2.5 kWp that will provide sufficient electrical energy for IT equipment and lighting. Solar PV installation includes; PV modules, Charge regulators, Solar batteries, Inverters, lightning arresters, Differential circuit breakers, Junction boxes, Compact Fluorescent Lights (CFL) and other accessories such as cables, plugs, switches, supports etc.

SREP funding will be able to complement the other Government of Rwanda internal financing mechanisms and efforts to make sure this target of solar coverage to all schools is achieved in line with the national energy strategy.



### **3 POLICY AND REGULATORY ENVIRONMENT**

Since 2006, Government of Rwanda has been consistently improving doing business by easing barriers to whoever wants to invest in Rwanda. Continuous radical reforms which have made it easier for businesses to get credit, pay tax and deal with construction have boosted Rwanda's ratings again in the World Bank's 'Doing Business Report'. In 2014's index, with reforms implemented in 8 indicators measured by Doing business - starting a business, dealing with construction permits, registering property, getting credit, protecting investors, paying taxes, trading across borders and resolving insolvency – Rwanda is this year's top reformer in Africa and second globally to Ukraine.

These achievements are mainly due to continuous policy reforms and upgrading through regular reviews and updates. In Rwanda policies and regulatory frameworks in each sector are monitored and improved regularly to make them increasingly relevant to existing and emerging conditions.

There a number of policy documents which complement each other for making the investment in the energy sector participation easier. They include

- Vision 20120
- National Energy Policy and Strategy (2008-2012) – currently under review
- Economic Development and Poverty Reduction Strategy II (2013--2018)
- National Energy Strategy (2008-2020)
- Energy Sector strategic Plan Roadmap 2013-17
- Green Growth and Climate Resilient Strategy (2011)

#### **3.1 ROLE OF GOVERNMENT**

##### **MININFRA**

The Ministry of Infrastructure (MININFRA) is responsible for national energy infrastructure, and is the primary government ministry in the energy sector. Rural energy is part of this mandate. The MINIFRA views its role in the off-grid energy sector to include training, strategy, development of technical specifications for energy equipment, recommendation of strategies for the development of the private sector.

##### **MINIRENA**

The Ministry of Natural Resources (MINIRENA) is responsible for the management of the forest and water resources of the country, as well as environmental protection and management. The afforestation and wood consumption targets set out in the EDPRS II fall under the remit of the MINIRENA.

#### **3.2 PARTNERS**

The overall energy planning process is driven by the government, yet with strong participation by international donors organisations (NGOs, World Bank, AfDB, DFID), which are key to environmental and poverty issues. Institutionalising planning is the core responsibility of the Ministry of Infrastructure. Under the guidance of the MINIRENA and Rwanda Environment Management Authority (REMA) implementation of national environmental policies and formulating the legislation is taken into consideration.

### **3.3 ENERGY REGULATOR**

The Rwanda Utilities Regulatory Agency (RURA) regulates both the electricity and gas sectors. RURA set the tariff and has recently published the National Renewable Energy Feed in Tariff (on part of hydropower plants up to 10 MW). The Regulatory Agency operates independently and has legal powers, and autonomous management. Tariff-setting for electricity is the responsibility of RURA in consultation with EWSA.

### **3.4 REGULATORY FRAMEWORK**

So far, Rwanda has no a framework for the regulation of renewable energy. The development of a regulatory framework for renewable energy is integral to the current National Energy Policy. In addition, the need for capacity-building, the establishment of standards and codes of practice, and suitable guidelines for the use of renewable energy in the country is identified.

### **3.5 REGULATORY BARRIERS**

Whilst regulations are established in law, the current crisis facing the Rwandan energy market is hampering implementation and development. The regulatory framework for sustainable energy in particular is still being developed and it is expected to be finalised towards the end of 2014. Programs put in place under the EDPRS II will serve to promote the need for improved regulatory frameworks.

### **3.6 PROCUREMENT OF GOODS AND SERVICES**

All the good and services are procure according to the Government's public procurement legal and regulatory framework, which has the objectives of reducing costs and improve efficiency by promoting fair competition and streamlining procedures, to ensure accountability by increasing transparency in the process and reduce corruption. The Rwandan procurement legal and regulatory framework is designed to address specific country problems and constraints while at the other hand being consistent with the international public procurement standards.

## **4 INSTITUTIONAL AND TECHNICAL CAPACITY**

### **4.1 ORGANISATION, RESTRUCTURING AND RESPONSIBILITIES**

The electricity sector has gone through some significant changes over the last 15 years. In order to revitalize the energy sector, Rwanda enacted a law in 1999 that ushered in a transition and reconfiguration of the sole supplier, The ELECTROGAZ which had exercised monopoly over such services at the national level. After extensive deliberations, it was placed under a management contract with Lahmayer International in 2003 which ended in 2006 when the management of the company reverted to the Government. In 2008 ELECTROGAZ was split into the Rwanda Energy Corporation (RECO) and the Rwanda Water and Sewerage Corporation (RWASCO) that were in 2011 integrated within the Energy and Water and Sanitation Authority (EWSA) which became EWSA Ltd in 2014. EWSA Ltd is responsible for generation, bulk transmission and distribution and retailing functions on a commercial basis.

The private sector is currently a significant energy user and thereby an important partner for implementing the energy efficiency and conservation agenda. The private sector is also expected to play a much stronger role on the supply side by investing in future energy projects with increasing investments in renewable energy. An improvement in the capacity of local contractors is taking place with the help of EWSA Ltd and in the context of the Electricity Access Rollout Program (EARP). EWSA has been making greater use of local contractors in new connections while carrying out a systematic effort to build the capacity of these contractors.



The environmental aspects of the energy sector are placed under REMA, which functions under the guidance of MINIRENA, and is responsible for the co-ordination and implementation of legislation and policies relating to the environmental impacts of energy production and consumption. Towards this goal, REMA has been instrumental in facilitating the growth of the renewable energy sector. Recently, a strategy the Green Growth and Climate Resilient Strategy, GGCRS) a cross sectorial nation strategy that promotes green economy agenda for Rwanda was approved by Cabinet in 2011. The strategy embeds a sustainable financing mechanism, the Fund for Environment and Climate Change (FONERWA) that incentivizes renewable energy initiatives as well as providing opportunities for climate proofing the overall energy investments

The international donor organizations support the implementation of the government strategy by providing technical and financial resources. A common energy Sector-Wide Approach (SWAp) is considered to be the basis of the partnership between the government and the development partners in order to ensure proper coordination, efficiency and effectiveness in the use of resources in the Rwandan energy sector.

The Government exercises a reliable leadership in donor coordination and has agreed with the development partners on a Division of Labor (DoL). The DoL agreement was finalized in July 2010 and limits each partner's activities to three sectors. The DoL identifies as the main partners in the energy sector the following multilateral and bilateral donors: World Bank, AfDB, Arab Bank for Economic Development in Africa (BADEA), UNIDO , Cooperative Technique Belgium (CTB), Netherlands, France, Japanese International Cooperation Agency (JICA), Société Tunisienne de l'Electricité et du Gaz (STEG International).

In terms of the sector structure, the electricity market is expected to remain dominated by EWSA in the short to medium term. EWSA will have an important role in generation, transmission and distribution. At the same time Independent Power Producers (IPPs) are encouraged to invest in the generation sector while self-contained off-grid schemes can be owned and operated by EWSA or by private developers. EWSA is licensed as the single buyer of electricity. It can enter into agreements with private developers of generation projects for the purchase of electricity. It is envisaged that in the long-term the power sector will be unbundled into separate generation, transmission and distribution companies.

The overall proposition to separate the responsibility and accountability of generation, transmission and distribution segments of the power sector are in line with the international experience. However, the process and expectations from the restructuring should be adapted to country circumstances.

## **4.2 IMPLEMENTATION RISKS**

- One of the risks is the participation of the private sector which has a limited role in contributing to economic growth. If the trends are not improved there is a likelihood of not fully achieving the EDPRS II which considers large portion contribution from the private sector.
- Poor physical infrastructure is a major constraint to economic growth, human capital development and increasing exports of goods and services. Economic transformation to create employment and generate exports is one of the flagship programs of the EDPRS II. Within this flagship program, a key priority is to expand access, improve quality and reduce the cost of infrastructure services, especially transport, power and communications. However, this can only be possible with enhanced resources (technical and financial) as well as overall management requirements.

- Skill gaps at both institutional and technical level have become a severe bottleneck to rapid economic growth. This span across all economic activities both in the private sector and across the government agencies. The government has put in place mechanisms towards strengthening the capacity to manage public resources with noticeable improvements in public financial management in the central and local government agencies

## **5 MULTILATERAL DEVELOPMENT BANKS AND OTHER DEVELOPMENT PARTNERS PROGRAMS**

Both foreign and local organizations actively engaged in the energy sector.

International donors consider Rwanda as a model partner that uses external development assistance effectively. Several development partners including 12 bilaterals, 3 multilaterals and some 16 UN agencies are active in Rwanda. The government has tried to bring the donors funds within a unified framework and to establish some predictability and accountability of available resources. Presently, some donors - the African Development Bank (AfDB), the World Bank (IDA), the European Union (EU), Germany, the Netherlands, and the United Kingdom provide general budget and/or sector support. Budget support is provided in accordance with the provisions of a 2008 Memorandum of Understanding (MoU) between the government and seven development partners. This MoU established the principle of joint monitoring of policy actions and expected outcomes through the Common Performance Assessment Framework (CPAF). Since the signing of the MoU all budget support donors rely on the CPAF to design and monitor their budget support programs. The budgetary support is in both loan and grants forms and has remained at around 6% of GDP during the 2009-2012 period. The budget support donors try to provide to the extent possible annual commitments in time for the national budget formulation process and monthly disbursement plans.

In addition, the government agreed with development partners in July 2010 on a Division of Labor (DoL). This DoL maps donors to various sectors while limiting each donor to participate only in three sectors. The donors active in the energy sector are: World Bank, AfDB, Arab Bank for Economic Development in Africa (BADEA), UNIDO, Cooperative Technique Belge (CTB), Netherlands, France, Japanese International Cooperation Agency (JICA), Société Tunisienne de l'Electricité et du Gaz (STEG International).

The role of development partners in the energy sector will be important in: (a) partnership with the government to support public sector projects including transmission, distribution and some generation investments; an (b) partnership with and assistance to the private sector in undertaking large power generation projects. The public sector electricity investments are estimated at \$2.8 billion during the period 2013-2018 and financed by the private sector, government and the development partners. The contribution from each development partner should be reviewed and confirmed in a systematic and most importantly coordinated manner.

We believe the development partners' direct funding (grants and loans) to the private sector would be important; development partners can play an instrumental role in mitigation of technical and political risks.

The experience of EARP can be used as a guide for the implementation of the projects under SREP funding. This is due to the fact that, the EARP is financed on large part by development partners and has been successfully reaching its objectives.