

Policy Report Note

Rwanda

This note summarizes a recent report prepared by *Lighting Africa* to identify key policy barriers to the adoption of modern lighting products and services in Rwanda, and offers recommendations for their mitigation. The note is based on a comprehensive policy report prepared for Rwanda that consulted a range of stakeholders—across the supply chain—to obtain an independent, objective assessment of the prevailing policy environment for low-cost lighting and electrification services in the country. Rwanda is one of eight countries studied.

Energy Sector Overview

In Rwanda, roughly 85 percent of the primary energy balance of the country is made up of biomass, 11 percent from imported petroleum fuels, and 4 percent from electricity. Households consume roughly 80 percent of the final energy balance and most of this is in the form of biomass. Conditions encountered by rural households are very poor and many households still rely on agricultural residues and firewood for lighting. Of the rural population roughly 0.6 percent has access to electricity, with somewhat higher rates in the South and the East. Some 13 percent of the respondents have no lighting at home, 81 percent use traditional lighting, and only 5 percent have access to modern lighting. Much of the electricity generated from grid-connected systems comes from hydro power plants ranging from 3-30 MW. Micro hydro power has a good chance of providing low-cost electricity in the near future which will be needed for the accelerated development of the country that the Government envisions. All new generation capacity in Rwanda is expected to be based on renewable energy—hydro, photovoltaic, or methane, and it appears that a large potential is present.

The country faces a triple challenge to meet the growing wood energy demand, to continue to feed its growing population from the same limited land surface, and to provide modern energy access to the population as a whole. This paper will focus on electricity access only, and will divide this into two parts: electricity from the grid as supplied by RECO, and electricity by other means. Since the overwhelming majority of the Rwandan population will not have RECO electricity by the year 2020, it makes sense to explore alternatives. This includes looking at options that provide limited access to electricity, to satisfy the immediate needs for modern energy. Most of the rural population currently uses wood, candles, or kerosene for lighting. Promoting the use of a battery-based LED or CFL lamp would provide a host of benefits over the use of a kerosene lamp.

Key government agencies active in the energy market are summarized in the Table 1.

Rwanda at a Glance

- Population: 11.7 million people
- GDP Per Capita: 530 USD (2010)
- GDP Growth Rate: 7 percent
- Politically stable
- While GDP growth has remained high, per capita income is among the lowest in the world
- Key Sectors: Agriculture and Service Industry
- Endowed with natural resources
- Member of Common Market for Eastern and Southern Africa (COMESA)



Table 1. Key Government Agencies in Rwanda’s Energy Sector



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- **Ministry of Natural Resources (MINIRENA).** MINIRENA defines standards, issues permits, and sets regulations on resource use.
- **Rwanda Electricity Corporation (RECO).** RECO is the national electricity utility engaged in the generation, transmission, distribution and sale of electricity in Rwanda.
- **Rwanda Water and Sanitation Corporation (RWASCO).** RWASCO (formerly Electrogaz) is a public water and power utility engaged in the generation, transmission, distribution and sale of electricity in Rwanda. RWASCO is also the operator of urban water supply and sewerage infrastructure.
- **Rwanda Utilities Regulatory Agency (RURA).** RURA has control over licensing and regulations for all utilities in Rwanda.
- **Rwanda Environment Management Authority (REMA).** REMA authorizes water abstractions, setting water quality and discharge standards as well as environmental impact assessments.

Rwandan electrification initiatives can be broadly divided into two groups:

- **Grid-Based Extension-** Operated by RECO, predominantly supplying urban zones. Under the Government's vision plans are underway to extend the existing grid network, although still within city limits.
- **Off-Grid-** Few rural projects are taking place, however government plans that are intended to connect rural households and businesses are in place. The few district offices that will have a connection in 2012 will receive or already have a solar or micro-hydro electricity plant available. In addition, there are several programs to electrify schools, hospitals, and health centers through solar or micro-hydro plants. It looks that all public institutions further away than 5 km from the grid are slated for decentralized renewable energy solutions.

Challenges

Despite the all-out resolve of the Government and the international willingness to support the energy sector, major challenges still lie ahead on the way to increased access for rural populations. The topography of Rwandan landscape makes power extension expensive. Despite subsidies by the Government, the low capacity of the population to pay for connection and consumption is still a major setback for low-income households¹.

Lighting Africa

The Lighting Africa programme in Rwanda seeks to support the Government in creating an enabling environment to phase out traditional lighting sources and complement current grid extensions and off-grid rural electrification efforts with innovative off-grid lighting solutions. Recent advantages in lighting technology, including Compact Florescent Light (CFL) bulbs and Light Emitting Diodes (LEDs), promise clean, portable, durable, lower cost, and higher quality lighting. Lighting Africa aims to mobilise the private sector with a view to providing affordable, renewable and clean lighting to rural, urban and peri-urban customers without electricity access – predominantly low-income households and micro businesses.

¹ *Increased access to electricity for the rural population*, article by the Belgian Development Agency.
<http://www.btcctb.org/en/casestudy/increased-access-electricity-rural-population>

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Lighting Options in Rwanda

So far, there are no “official” projects to promote modern off-grid lighting in Rwanda².

There are two **solar companies in Rwanda**. Both are small companies currently promoting the sales of low-cost electricity products including small PV lanterns, phone battery chargers, lanterns without PV module, and solar home systems.

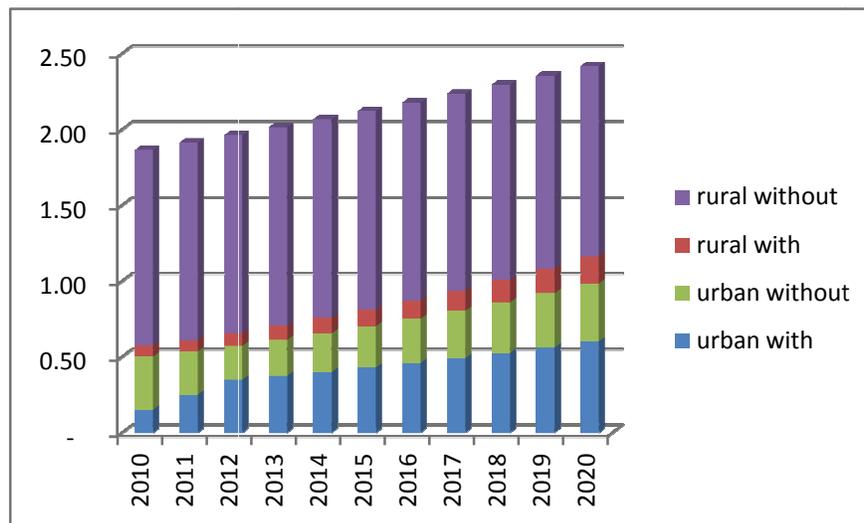
The fast moving goods market. There are a number of public and private organizations that might be interested in rolling out a modern lighting program with a view to reach the maximum number of households in rural and peri-urban areas.

Newly established companies are rare. The only notable one is Pisat Solar, supported by an American NGO, which recently started promoting its K-light solar lantern that is relatively costly.

Where is the Off-Grid Market Going?

The Government recently embarked on an extensive and ambitious electrification effort - “the Roll-out” - with an intention to cover 25 percent of the population by 2012 and 35-50 percent by 2020, up from about 6 percent now. This is a vast task by any measure and has a reasonable good chance of success; the \$300 million program is funded from the Budget and through a combination of donors supporting the program. The number of clients is expected to increase from 137,000 today to over 300,000 by 2012 (reaching a 16 percent overall connection rate). With the implementation of this plan the number of non-connected households decreases from about 1.9 million to 1.7 million³. See Figure 1 below, which shows the number of connected and not connected urban and rural households between 2010 and 2020; the rate of connections for urban households is maintained at 61 percent (which is the case in 2010).

Figure 1: Population and Projected Connections



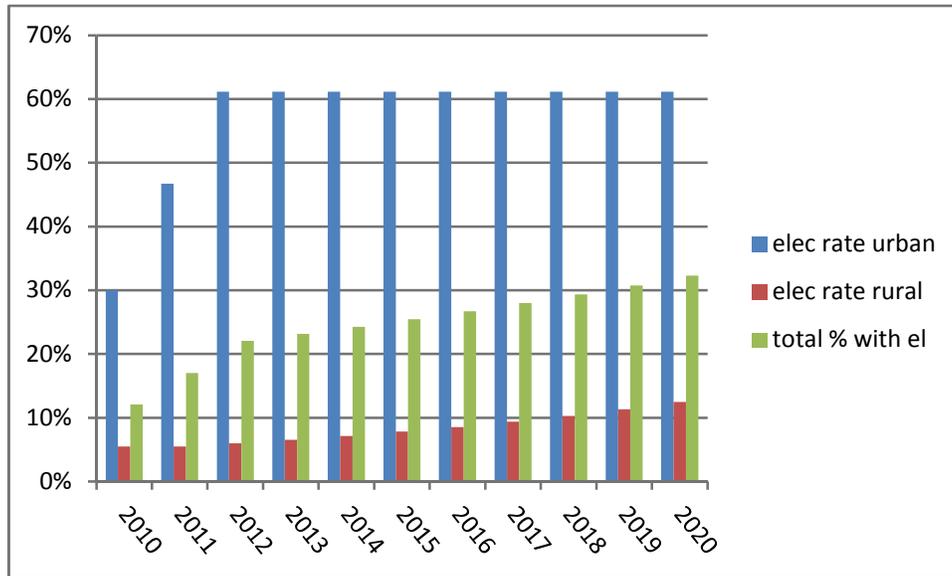
² Official in the sense that they are managed by the Government or a specific Donor.

³ It would be beneficial to mention what is the no. of people per household (5?) as the number is a bit confusing when we are talking about more than 10 million people without access to electricity.

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Figure 2 below shows projected access rates to electricity, following the Roll-out program with very high growth in the early years and then aggressive growth afterwards. This is then used to develop estimates for modern off-grid lighting markets. Again, the two are not competing but complementing one another: households with a grid connection do not have much reason to buy a modern off-grid lighting product. On the other hand, households without grid connection might be interested in obtaining a low cost lighting product.

Figure 2: Modelled Growth of Electricity Access in Rwanda by 2020



Using these models, it is also useful to analyze which groups among the rural and urban populations would be interested in lighting products - and whether they would be willing and able to pay for the products. Figure 3 below shows how the urban and rural populations might be broken up as groups of potential target markets. This analysis is necessary because, as later policy sections will suggest, assisting lower income groups to access lighting products requires different policy interventions than middle and high income groups.

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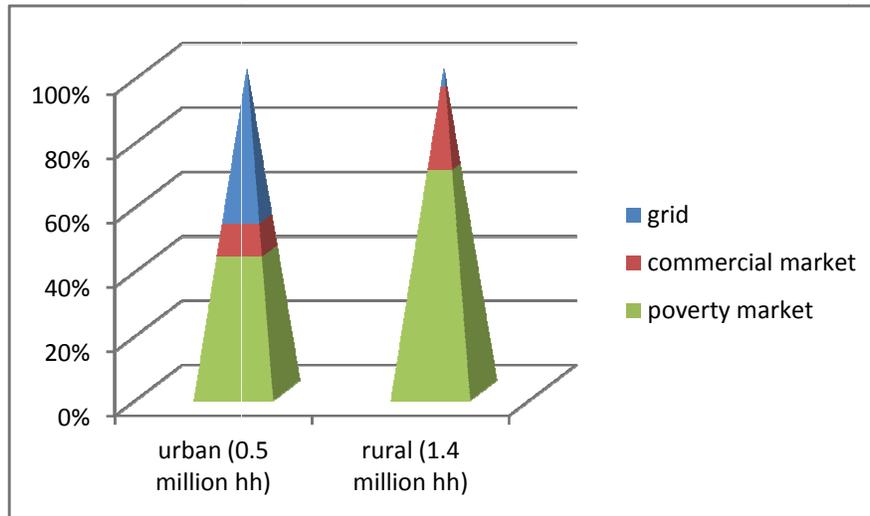


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Figure 3: Market Size for Low Cost Lighting Equipment



In the above analysis, there are 6 primary markets:

- Urban and rural grid-connected. This market might buy lighting products as a back-up for the grid, but it is a fully commercial market and interested in a lighting product which is mostly “temporary”. The rural grid connected market is negligible due to the low rural access rate.
- Urban and rural off-grid commercial. This is a commercial market for lighting products which has already begun to develop, and which will develop with or without Lighting Africa assistance. There are certainly opportunities, particularly in rural areas.
- Urban and rural “poverty” markets. This off-grid market is constrained by income --- as well as geographic isolation --- and would not prioritize lighting products because of up-front costs. It would need some type of policy intervention to open up the market. This is by far the largest part of the potential market.

Policy and Institutional Environment for Modern Off-Grid Lighting

Fiscal Measures

There are three main fiscal charges on equipment: import duties, at a level of 30 percent of Cost, Insurance, Freight (CIF) value, a 5 percent withholding tax, and 18 percent Value Added Tax (VAT). The result is a total increase in price of about 60 percent of the CIF value⁴, which makes access difficult for poor consumers. Renewable energy and some types of energy efficient equipment are exonerated from import duties or a reduced import duty tariff applies. Most of the equipment is related to PV, solar water heating, or biogas systems, and mainly in the form of a complete system.

Kerosene and Fuels. There are no longer direct subsidies on petroleum fuels; on the contrary, petroleum fuels are taxed (duty, VAT), and as a result the prices for kerosene, diesel, and petrol are comparable to those in most European countries. Kerosene had been subsidized for a long time, as the main lighting alternative for rural areas, but this was abolished. However, an energy charge is levied on most petroleum fuels except illumination kerosene, which results in a 22% lower retail price compared to diesel.

⁴ For a CIF value of 100, the total after taxes becomes 159: $CIF * (1 + 30 \text{ percent} + 5 \text{ percent}) * (1 + 18 \text{ percent})$

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PV and Lighting Products. Although PV panels are exempt, batteries are not unless they come in conjunction with a PV system. Off-grid lanterns are exonerated only if imported together with a PV module. The reason behind this is not known although it appears to be an enforcement issue; the dual purpose of the exonerated is to promote renewable energy equipment and energy efficient equipment. In this view, an off-grid lantern that can be used as an emergency lamp in grid connected areas should not benefit from the exonerated, but the same lantern would make sense in rural areas. CFLs are exonerated as well, but it is unknown if this holds for 220 V AC lamps only or also for 12 V DC lamps. The list was approved prior to the arrival of LED lamps, but it is expected that LED lamps fall within the category for low-consumption light bulbs. Importers have not reported that had to pay import duties on such lamps.

VAT charges apply to all merchandise, except some rural electrification activities realized by RECO; RECO's investments for grid expansion and generation capacity are not exonerated from both VAT and import duties, although diesel fuel for the Aggreko thermal power stations is exempt both from import duties and VAT. At least these subsidies are transparent and RECO needs to request Minecofin to pay the subsidy to Rwandainvest on behalf of RECO, but this is somewhat of a cumbersome process. There could be some important gain for immediately increasing access if VAT rules are relaxed on modern off-grid lighting and battery charging equipment similarly to what was applied to Information and Communication Technology (ICT) equipment. The market for lighting equipment is negligible at the moment so lifting the VAT has no fiscal impact. Even when the entire market is theoretically supplied within one year, the VAT would be about \$15-25 million, which is not much compared to VAT on petroleum imports.

Laws Governing Private Business Development. Vision 2020 portrays the Government's medium term goals. Being land-locked, Rwanda has a keen interest in reducing its dependence on foreign energy imports and it placed a high emphasis on renewable and/or locally produced forms of energy. The use of biomass will be brought back to 50% of the energy balance by 2020, from 86% now. This is expected to be done through the use of modern fuels such as LPG and kerosene, and the increased use of electricity⁵.

The country has strong private sector laws and a drive for privatizing public services and promoting private sector involvement. Benefits are provided to foreign investors, in terms of tax holidays, import tariff reductions, etc. The country developed a strong regulatory environment, which on the one hand seems overly bureaucratic, but on the other hand creates clarity and transparency. Environmental Impact Assessments need to be submitted to the Rwanda Development Board although the actual assessment and evaluation work is carried out by the Environment Management Agency (REMA). Another result of the regulatory environment is that the Rwanda Revenue Authority is well aware of all commercial activities and monitors this closely. The Rwanda Utilities Regulatory Agency (RURA) has been established to oversee the operations of private and public utilities. RURA operates in the absence of the Electricity Act, which would establish the rules under which to operate. The Electricity Act has been under preparation – for the past few years.

Private players complain about the taxation regime: import duties on certain equipment and VAT on everything. They maintain that business could accelerate significantly if these taxation rules were relaxed, and cite the example of computers. Newly established businesses obtain temporary import benefits and may enjoy income tax breaks, depending on their type and level of business. It would be worth considering income tax breaks for renewable energy and modern off-grid lighting options for use in off-grid mode.

Financing Mechanisms. Banks have provided funds through loans or leasing contracts to private entrepreneurs for the realization of micro-hydro projects; venture capital providers are looking at the same now. The Banque Populaire, together with Netherlands Development Finance Company (FMO), provides financing for household biogas digesters.

⁵ The price difference between biomass fuels and fossil fuels or electricity is large and it may be questionable whether this objective is realistic.



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The Development Bank of Rwanda (Banque rwandaise de développement (BRD) had a financing mechanism in place for household PV systems; it is unknown how many beneficiaries exist.

Private Sector Effectiveness. Private-sector firms are present in Rwanda, although many have no regular or very few employees and would be too small to qualify as Small and Medium Enterprise (SME). Their interest often lies with donor financed programs, which form a large part of the actual market for lighting and PV equipment, and which is easier to tap into than developing business through true market development. The technical capacity of many of the private firms is low. However, as was demonstrated through the development of micro-hydro plants under a PPP program realized by GTZ, local firms are willing to learn and can gain expertise in a relatively short period of time.

The electricity and water companies, RECO and RWASCO (formerly combined into ELECTROGAZ) are publicly owned companies operating under private commercial law. They are the largest companies in Rwanda and exhibit good technical capacity and are quite capable in their work. For a few years a large German firm managed ELECTROGAZ under a management contract, but handed over the responsibility back to ELECTROGAZ itself. Some private firms have started to operate in the small-lighting and battery charging segment of the economy, but it is too early to say how they will perform. There are 6-8 private firms carrying PV solar home systems, mainly as a side-business. Although these firms are catering to the lucrative public sector market (hospitals, schools), they will sell on occasion to individuals as well. The largest two firms sell less than 15 kW per year. The current market hovers around 60 kW per year; total installed capacity (public + private) is about 1 MW⁶. Their focus is on larger systems such as 100 W and up, not on micro lights.

Conclusions and Recommendations

Key Barriers

- *Insufficient recognition of off-grid lighting products as a complementary and interim option for rural access to modern energy.* Modern off-grid lighting solutions are not explicitly mentioned in the government development policy documents.
- *High cost of doing business in Rwanda.* The existing business environment is difficult for private enterprises due to factors such as land-locked position, costly customs procedures for imported goods, and the high taxation of off-grid lighting products compared to electricity and kerosene, which are not taxed.
- *Low priority for off-grid lighting products among consumers.* Lighting is not valued as other mass products. The desire for modern lighting does not exist, as low lighting standards still prevail in their surroundings. The lighting standard promoted by the government and donors has always been grid electricity or costly PV systems, which has been a disincentive for consumers to consider modern off-grid lighting devices as an option to improve their lifestyle.
- *Low-quality products in the market.* The market is dominated by low-cost, low-quality products. There is an absence of quality standards and means to distinguish good quality products from low-quality products. Low-quality of the products can spoil the market.
- *Low purchase power of a large portion of off-grid lighting users.* In Rwanda, the main market is located in rural areas where households have very low purchasing power. Households are unable to pay the initial cost in cash.
- *Financial inability of companies to make capital investments in stock and lack of access to financing.* Most companies lack the financial ability to make investments in stock as they are small enterprises that don't have sufficient assets. Borrowing money in commercial banks requires huge collateral, which many small enterprises do not have.

Key Recommendations

⁶ The Solar Energy Market in Rwanda, GTZ, 2009

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Encourage Political Participation. Modern off-grid lighting devices are superior to kerosene and other traditional sources of lighting. This needs to be recognized clearly in the Government policy documents and integrated in the country development and poverty reduction strategies as well as in the rural electrification Roll-out program. The political buy-in is a prerequisite for other policy measures to urge the rapid development of the high-quality modern lighting market as this will influence policy orientation and build confidence among all players (government agencies, private sector, NGOs, donors, consumers).

Enhance Awareness and Education. Raising awareness and education of key stakeholders is fundamental. Products are new in the market and the benefits have not been properly measured by most market players. Consumers need to be stimulated to purchase the lighting products. Businesses need to be encouraged to sell lighting products and all levels of the political spectrum (local to national) need to be educated about the role of modern lighting solutions.

Address Product Quality Issues. It is critical to promote good quality products as poor quality products could create dissatisfaction among consumers and spoil the market. Internationally accepted standards, as those to be developed by Lighting Africa, could create confidence in the market and avoid a costly development process for national standards. Moreover, a quality label/stamp should enable consumers to distinguish good quality products from poor quality products. Incentives should be given only to products certified under these standards and labels/quality stamps.

Make High-Quality Products Available in the Market and Affordable to Consumers. Two measures are to be combined. The first one consists of (temporary) VAT exemptions on imports of high-quality modern off-grid lighting products. The objective is to encourage private players to invest in the modern lighting market by removing fiscal charges on eligible good quality products. This will make high-quality modern lighting devices more affordable. This has the advantage of developing the commercial segment of the market first, which can further lower prices for other market segments. The second measure should offer support to lighting businesses, such as a micro-credit for the purchase of stock, bulk procurement facility, guarantees for large-scale imports, and financial support for setting up rural distribution systems.

Subsidize the Bottom of the Pyramid. Subsidies for poor rural and peri-urban families will be required in a later stage to reach people who live under the poverty line. Subsidizing these households is also a question of social equity as electricity and kerosene are currently available below-costs. Moreover, there is a possibility for the government to save money on kerosene subsidies and reallocate this money to scale up modern off-grid lighting use in rural areas.

About Lighting Africa

Lighting Africa, a joint World Bank and IFC program, seeks to accelerate the development of markets for modern off-grid lighting products in Sub-Saharan Africa where an estimated 10 to 30 percent of household incomes are spent on hazardous and low quality fuel-based lighting products. The goal is to mobilize and provide support to the private sector to supply quality, affordable, clean, and safe lighting to 2.5 million people by facilitating the sale of 500,000 off-grid lighting units by 2012 (target achieved and exceeded with 4 million people reached), while at the same time creating a sustainable

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commercial platform that will realize the vision of providing 250 million people with modern off-grid lighting products by 2030.

About the Public-Private Infrastructure Advisory Facility (PPIAF)

PPIAF is a multi-donor trust fund that provides technical assistance to governments in developing countries in support of the enabling environment conducive to private investment, including the necessary policies, laws, regulations, institutions, and government capacity. It also supports governments to develop specific infrastructure projects with private sector participation. PPIAF is a major donor of the Lighting Africa program, supporting off-grid lighting policy studies and international off-grid lighting conferences.

About the Africa Renewable Energy Access program (AFREA)

AFREA was established in 2009 to help meet energy needs and widen access to energy services in Sub-Saharan African countries in an environmentally responsible way. AFREA funds support the implementation of the World Bank's Africa Energy Unit (AFTEG) strategy and its clients, through analytical and advisory activities, while also providing recipient-executed technical assistance and investment grants that help speed up the deployment of renewable energy systems regionally. AFREA is a donor of the Lighting Africa program.

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