

Energy – The Opportunity in Rwanda

The mission of the Rwanda energy sector is to create conditions for the provision of safe, reliable, efficient, cost effective and environmentally appropriate energy services to households and to all economic sectors on a sustainable basis. The aim is to increase generation, improve transmission and distribution, diversify the energy sources to reduce costs and elaborate a very conducive legal and regulatory framework.



Key Facts:

- Electricity accounts for only about 4% of primary energy use in Rwanda
- Biomass contributes ≈85% and petroleum products account for the rest.
- The country currently has about 96 MW of installed capacity
- Approximately 13% of households are connected to the grid.
- Current electrification rate for Rwanda is 9% with 142,697 connections.
- The current share by source of power include;
 - Hydropower: 55%, of the installed generation capacity,
 - Thermal generation(esp. hired diesel and heavy oil fuel): 40%,
 - Methane gas: ≈ 4%.

Electricity Generation Targets

- Hydropower: ≈333 MW
- Geothermal: ≈310 MW
- Methane gas: ≈300 MW to grid

An Unrivalled Opportunity In Energy Investment

- ◆ As Rwanda's economy continues to surge forward, demand for energy to drive it continues to grow rapidly.
- ◆ With a current shortfall in electricity supply, power generation is set to grow to over 1000 Mw from its current capacity of 96 Mw – a projected growth of nearly 1000% by the year 2017
- ◆ The Government of Rwanda demonstrates commitment to partnering with investors in delivering this potential – by offering generous incentives and guarantees to its investors including those in the energy sector.
- ◆ This creates unrivalled opportunities for investment in electricity generation including alternative energy sources like Methane, Hydro and Geo-thermal.

A Coherent Electricity Development Strategy

The 5 year electricity strategy (2011 to 2017) aims to supply modern energy to all Rwandans and cover the existing energy deficit. The target from key energy sources (hydro, methane, geothermal and peat) by 2017 is to generate an additional 1,000 MW from both the indigenous energy resources and from shared energy resources with neighboring countries.

Power Market

Rwanda's Electricity Water and Sanitation Authority (EWSA) is the sole off-taker for all generated power. Rwanda is a member of the Eastern Africa Power Pool and plans to strengthen transmission interconnections with Burundi, DR Congo, Tanzania and Uganda. Further, EWSA provides a long-term Power Purchase Agreement (PPA) to project developers, which is backed by a possibility of a negotiated sovereign guarantee from the GOR. When the Eastern Africa Power Pool becomes operational, power can be exported through bilateral trade or to the power pool.

Power Generation Prospects

New power generation projects under construction include;

- Small hydropower projects adding ≈ 21.8 MW of capacity to the system by end 2012
- A medium sized domestic hydro-power plant adding 28 MW by 2014.
- Contour Global, has a concession to develop 100 MW of power from Lake Kivu Methane gas.
- Negotiations ongoing with a private investor for a PPP targeting 3.5 MW in 2012, later scaling up to 50 MW by end 2015.

Key facts in energy sector

- Current electrification rate for Rwanda is 14.5% with 252,000 connections.
- Electricity accounts for about 4.5% of primary energy use in Rwanda
- Biomass contributes ≈84.5% and petroleum products account for the rest.
- Hydropower: 55%, of the installed generation capacity,
- Thermal generation: 40%,
- Methane gas: ≈ 4%.
- The country currently has about 100 MW of installed capacity
- Total local electricity demand (TD): 76 MW.
 - o Local production: 71.5 MW
 - o Imported electricity: 15.5 MW
 - o Total produced & imported 87MW

Energy sector – An Investor-Friendly Framework

Legal Framework

Rwanda's electricity law of 2011 governs electric power production, transmission, distribution and trading both within and outside Rwanda. It allows for cost-based tariffs, ensures realistic ROI for license holders and provides performance-based pricing and benchmarking

Policy Framework

National Energy Policy developed by the Ministry of Infrastructure (MININFRA) was submitted to cabinet for approval.

Institutional Framework

The Ministry of Infrastructure and the Electricity Water and Sanitation Authority(EWSA) are the key energy sector bodies in Rwanda.

Power Tariffs

The Electricity Law empowers the regulatory authority (RURA) to set and approve electricity tariffs, in consultation with the Ministry. The current electricity tariff is FRW 112/kWh (+VAT) for small low voltage consumers and FRW 105/kWh (+VAT) for large commercial and industrial medium voltage consumers. Attractive feed-in tariffs for alternative generation technologies are being considered, especially for small hydro and other renewable energy sources.

Risk Mitigation Measures

These include Political Risk Insurance (PRI), Partial Risk Guarantees (PRG) & Partial Credit Guarantees (PCG).

Benefits/Incentives to Energy Investors

1. Government of Rwanda provides transmission access to all power projects at its cost
2. Provision of road access, water supply and all infrastructure needed to develop projects
3. Generous fiscal and non-fiscal incentives including tax exemptions for the energy sector

Specific Opportunities in Rwanda's Energy Sector

Hydro Power

Rwanda's major rivers have proven potential to support run-of-the-river hydropower plants in a total of 333 sites across Rwanda.

Micro/Mini/Small Hydropower Projects

Small hydropower projects totaling ≈21 MW are currently under construction and will be operational between 2011 and 2013.

Domestic Medium/Large Hydropower Projects

The largest domestic hydropower project is Nyabarongo I, with an installed capacity of 28 MW. The project is under construction and will be commissioned by 2014.

Regional Hydropower Projects

Some shared hydropower projects with neighboring countries include;

- Rusizi III (145 MW)- shared by Burundi, DRC and Rwanda with an estimated 48 MW Rwandan share
- Rusizi IV (287 MW) - With ≈96 MW, estimated as Rwanda's share.
- Rusumo Falls (90 MW) -Planned to be jointly developed by Tanzania, Burundi and Rwanda. Rwanda's share would be 30 MW.
- The Akanyaru project- Between Burundi and Rwanda with ≈ 4 MW potential.

Existing Potential

There is an estimated potential of ≈83 MW to be exploited with further sites with a potential of ≈ 22 MW. Feasibility studies to develop these projects are planned with the support of World Bank.

Key Investment Opportunities

- Mini & Small hydropower: 20 projects totaling 9 MW bid as 4 "bundles" with an expected investment of \$25-30 million. Planned completion date is 2014-15 and 3 bundled bids for 10 MW of projects bid every year from 2015-17
- Medium hydropower: 12-17 MW Nyaborongo II is being evaluated, with an expected investment amount of ≈ \$80Mn

Regional hydropower: Rusizi III (145 MW) supported by EU, AfDB, among others with an expected investment capital of \$450Mn and completion date in 2016. There is also a 90 MW Rusumo falls supported by WB and others.

Its expected investment amount is \$300Mn and planned completion date is 2017

Methane Gas

An estimated 100 to 150 million cubic meters of methane gas are generated annually in Lake Kivu. The lake is estimated to contain 300 billion cubic meters of carbon dioxide and 60 billion cubic meters of methane gas - shared equally between Rwanda and the DRC. For methane extraction, the resource zone is situated below 250 m, with total extractable ~ 40 km³ at STP.

Annual Gas generation capacity and power potential: ≈90 to 130 MWe (120 million to 150 million m³ per annum).

Potential: The quantity of methane available in Lake Kivu is believed to be sufficient to power 700 MW of electricity generation over a period of 55 years. Rwanda's proportion is 350 MW (50%)

Existing Methane-To-Power Projects:

- **Kibuye Power 1(KP1-50MW)** –Rwanda is in discussions to establish a Joint Venture (JV) with Israel Africa to enhance and scale-up the project to a capacity of 50 MW in phases. Once the JV is established, the project will provide investment opportunities.
- **Contour Global** – The largest private investment in methane gas is under construction by Contour Global Plc (100 MW). Phase I (25 MW), operational in July 2012, Phase II (75 MW) completed by 2014. Phase I will cost \$140m and has achieved financial closure, but Phase II offers investment opportunities.
- **Rwanda Energy Company-REC (50MW)** - A subsidiary of the Rwanda Investment Group (RIG), with a concession to develop a 50 MW methane-to-power project is seeking new partners and investors.

Investment Opportunities

Opportunities exist to invest in the methane gas projects located in Lake Kivu:

- KP1: In operation since 2007 and has generated 1.5 MW out of its rated capacity of 4.5 MW. The partnership with Israel Africa will bring new technology to revive the pilot project and build a 50 MW plant in phases. An off-shore platform to extract methane feeds an on-shore 4.5 MW power plant, connected to the grid.
Investment Opportunity- KP1/Israel Africa JV is under negotiation and on their completion, an investment opportunity exists to develop the 50 MW power concession.
- The Kivu-watt/Contour Global: (Under construction). A gas extraction platform is being built to extract methane from Lake Kivu, which will be transported by a 13 km submerged gas pipeline to an on-shore power plant. Phase I will serve as a pilot project and will influence the design of the remaining 75 MW planned for Phase II.
Investment Opportunity - Kivu-watt is currently finalizing project financing with a lending syndicate led by the Emerging Africa Infrastructure Fund, FMO, and AfDB. The 25 MW Phase I of the project is estimated to cost \$140m and will be commissioned by July 2012. The project is backed by sovereign guarantees from the GoR backstopped by Political Risk Insurance investment guarantee from MIGA. Phase II provides a very attractive opportunity to investors, with an investment potential of \$260m, for a total project cost of \$400m to develop the 100 MW concessions
- Rwanda Energy Company (REC): There has been insufficient investment capital and expertise in project development and maintenance
Investment Opportunity REC is now seeking investors and partners to restart and revive the project. Capital cost of developing the 50 MW plant is \$106M. REC offers a technology requiring less equipment and much lower captive power consumption, presenting an attractive opportunity to investors and other partners.

Other methane investment opportunities include;

- A 100 MW plant to be jointly developed by Rwanda and DRC with opportunities for investors.
- An opportunity to establish a methane gas-to-liquids and gas-to-fertilizer plant(s).

Geothermal Energy

Rwanda lies along the Western branch of the East Africa Rift Valley known as the "ring of fire" – an area with young volcanism, seismic and magmatic activity. This makes it a potentially active region for geothermal energy.

Prospects

Prospects for geothermal are found in the Western region (Gisenyi, Karisimbi and Kinigi) associated with volcanoes and Bugarama in the Southern region associated with the East African Rift valley (Geothermal Development Unit-GDU, MININFRA). The estimated potential for power generation from geothermal energy is more than 700 MW.

Existing Projects

The GDU has invited tenders for drilling services and materials and the exploratory drilling of three wells in Karisimbi. Contractors are being procured to develop infrastructure at the sites. EIA and SIA studies will follow given Karisimbi's close distance to a National Park and farms. Feasibility studies will assess the technical, financial and economic viability of developing geothermal resources. If test exploration wells are productive, drilling will continue, and once the well has heated up and is tested, a 10 MW wellhead generator will be installed as a pilot. The GOR has allocated a budget to undertake the detailed scientific studies and drilling exercise.

Investment Opportunities

- The for potential geothermal energy generation is over 700 MW. The GDU is conducting detailed surface studies and drill exploratory wells to confirm the viability of generating power from geothermal. Once geothermal resources in Rwanda are proven, the GOR will invite competitive bids from project developers to build geothermal power plants in the country.
- A contractor will prepare the test site, provide access roads and water supply and drill using diesel rigs. If test drilling is successful, the 10 MW pilot wellhead generator will be installed to provide adequate power for further development of the area.
Investment Opportunity If test wells are productive (estimated to cost \$30m and completion in 2013), GOR plans to develop 300 MW (4 x 75 MW) of power from geothermal energy by 2017. The estimated investment required is \$900Mn with completion planned between 2014 and 2017

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