

## **Investigating Barriers in Renewable Energy Investment in Sub Saharan Africa**

Mohamed Diyad Elmi

**Abstract:** Sub-Saharan Africa's record on electricity generation is dismal, many of the household in rural Sub-Saharan Africa are not connected to electricity. Chronic power shortages are constant threat to many. Comparing electricity generation in Sub-Saharan Africa to that of Korea shows that Korea has the equivalent power to that of Sub-Saharan Africa. This research will investigate the main barriers in renewable energy investment in Sub-Saharan Africa by considering selected countries within Sub-Saharan. The independent power producers and Feed-in tariffs are the two main factors assessed and analyzed so as to solve the constant problems of electricity barriers. The issue of IPPs is a major concern when it comes to electricity generation as most of Sub-Saharan population lack clean electricity. 80% of rural in Sub-Saharan Africa are without electricity, this is instigated by lack of enough IPPs and poor tariff structure. The current status of IPPs performance in terms of improvement in Sub-Saharan Africa is still low and this resulted poor technical and commercial utility performance. For instance a country like Kenya, the issue of blackout still exist even after the country increased its demand. Recently, the Ugandan government started ways to introduce energy portfolio to improve its energy sector. Few Sub-Saharan adopt Feed-in tariffs, in Kenya FiT is mainly applied in small renewable energy projects of up to 10 MW installed capacity connected to the grid. For wind, the standardized FIT in 0.11US\$/kWh for installed capacity of between 0.5-10 MW. When the capacity of wind energy installed is 0.5 MW the standardized FIT is 0.105US\$/kWh. For hydro 0.0825US\$/kWh. Biomass has 0.10 USD/kWh, solar (grid) accounts for 0.12USD/kWh. The speedy expansion of renewable energy in sub-Saharan Africa depends on reducing the current reliance on fossil fuel, reducing monopoly on state-owned utility, use of proper application of feed-in tariffs, the introduction of independent power producers through independent regulatory authorities.

### **Introduction**

It has been predictable that 2.4 billion people heavily rely on Biomass (charcoal, wood, agricultural residues and dung) for cooking. The International Energy Agency (IEA), (IEA, 2015), testified that these figures will be unchanged unless new strategies and systems are adopted to expand access to modern energy services. People in sub-Saharan Africa specifically in rural areas, have to rely heavily on traditional fuels for cooking, which have severe negative impacts to human health and the environment. Over 1.6 million women and children die every year because of respiratory diseases caused by indoor air pollution from cooking fuels. In sub-Saharan, poor people spend a higher share of their income on energy services. For instance in northeastern part of Kenya 70% uses kerosene which is a fossil fuel for lighting at night. This branded constant threats on developing in the region. Costs per energy unit are also higher since most countries in sub-Saharan lack proper electricity infrastructure. Candles and batteries prove to be the most used in the rural parts of sub-Saharan Africa. Several developing countries like Kenya have abundant renewable energy resources including solar energy, wind, geothermal, hydroelectric and biomass but are not effectively utilized. Modern energy services are crucial to human well-being and to a country's economic development; and yet globally 1.2 billion people are without access to electricity and more than 2.7 billion people are without clean cooking facilities. More than 95% of these people are either in sub-Saharan African or developing Asia, and around 80% are in rural areas (IEA, 2015)

### Methodology

Various instruments, methods and materials were used in assessing and analyzing the energy portfolio and barriers in renewable energy development in sub-Saharan Africa. Selected countries were used to represent the entire sub-Saharan Africa.

### Results and Discussion

The discussion of the results obtained using the methodologies are discussed independently under the following sub-sections.

1. Independent power producers
2. Feed-in tariffs

#### Independent power producers

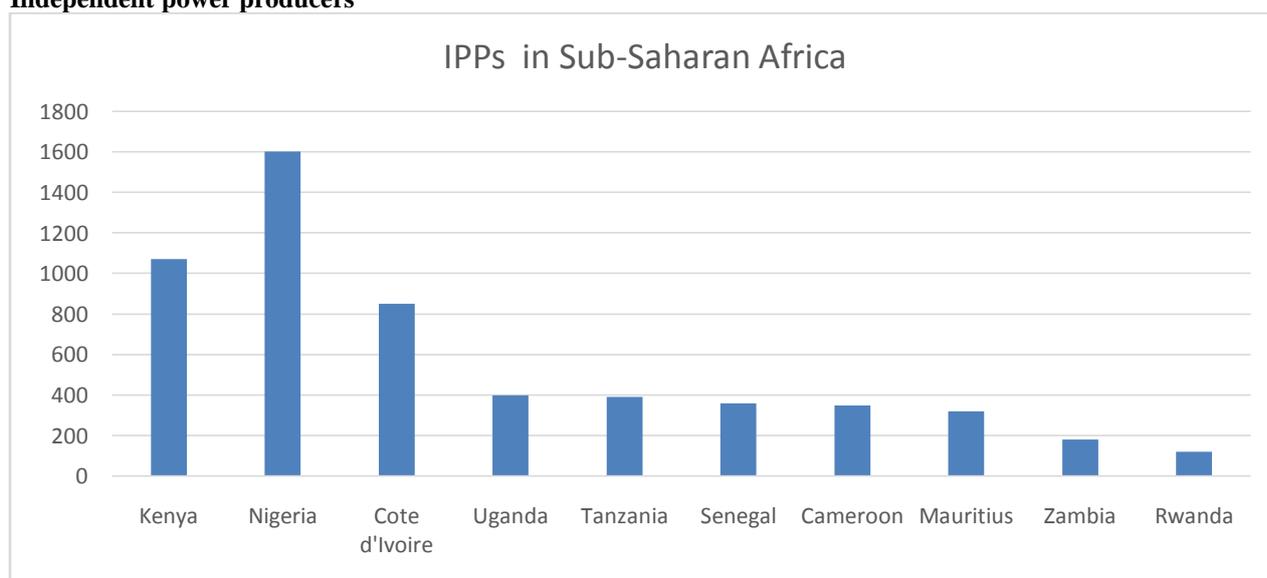


Fig. 1. Countries with the most potential independent power projects in Sub-Saharan Africa, South Africa excluded.

IPPs initiated in 1994 in Cote d' Ivoire, then Kenya (1996). IPPs then spread to 20 countries with projects increasing under competitive bidding system that harnessed most of the projects but the growth of IPPs was not fast due to various factors. For instance in Kenya the IPPs account for 20% of the country's energy mix. IPPs still represent a minority of total generation capacity as state –owned utilities plays the major contributors in the energy mix in Sub-Saharan Africa. In figure 1, out of 48 countries in Sub-Saharan Africa 10 of them plays as the most potentials with IPPs, the rest 38 countries are still under development. Mauritius and South Africa have investment grade credit ratings. South Africa's IPPs are ignored in this research. The issue of IPPs is a major concern when it comes to electricity generation as most of Sub-Saharan populations are not accessed to clean electricity. 80% of rural in Sub-Saharan Africa without electricity, this is instigated by lack of enough IPPs that can help leverage energy scarcity. The current status of IPPs performance in terms of improvement in Sub-Saharan Africa is still low and this resulted poor technical and commercial utility performance. For instance a country like Kenya, the issue of blackout still exist even after the country increased its demand. Recently, the Ugandan government started ways to introduce energy portfolio to improve its energy sector. Again the government of Kenya laid master plan to connect its grid system to that of Ethiopia so as to reduce the constant power blackouts caused by unstable performance of the utility. In Sub-Saharan Africa could increase the number of IPPs to meet the need demand it could have reduced the 80% rural populations that are without electricity access.

IPPs being investment transactions regulated by the underlying contracts, Sub-Saharan African the energy regulators are government own organization thus favors the state-owned utilities. Therefore to achieve

efficient and effective utility in Sub-Saharan Africa, independent regulatory authorities should be enforced which will bring transparency, fairness and accountability

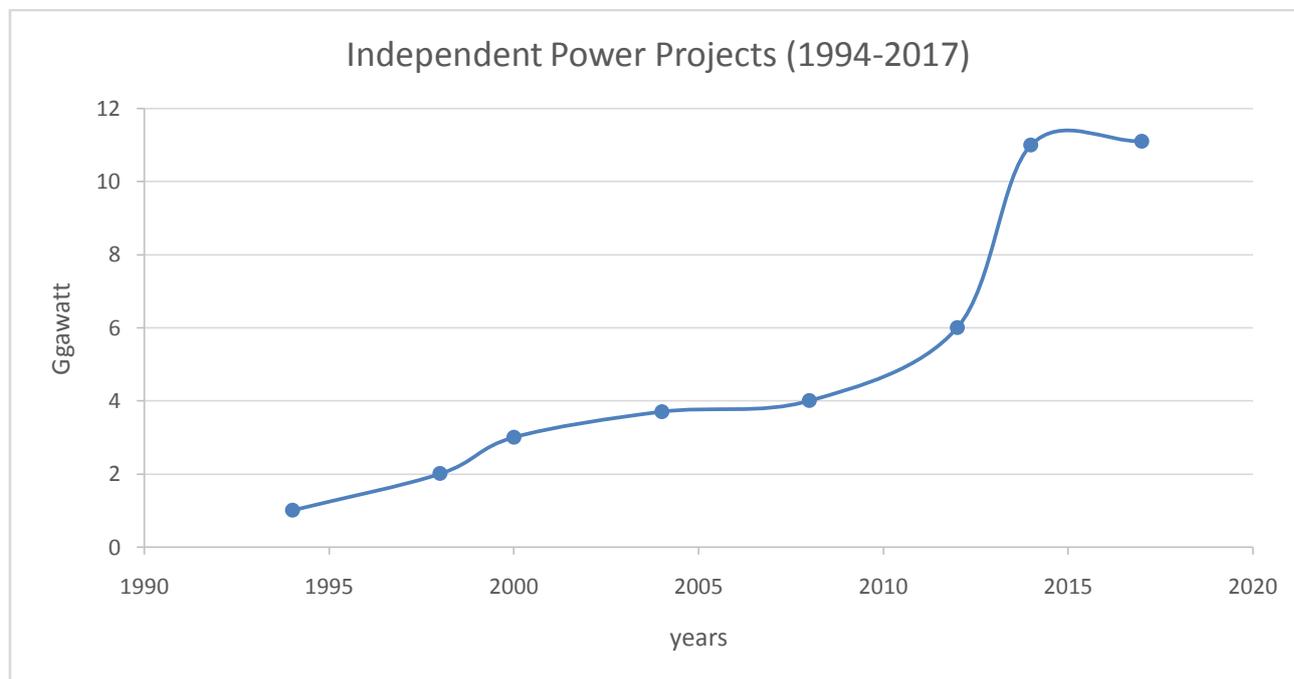


Fig. 2. Independent Power Producers pattern from 1994-2017

Figure 2 shows the pattern in which independent power project undergone. Starting from 1994 when investors first lay IPPs infrastructure in Cote d'Ivoire, followed by Kenya 1996 then Mauritius of 1997. Followed by Tanzania, Ghana and Senegal till 1999. Since the initiation of IPPs, 17 countries have adopted the system resulting over 58 projects within Sub-Saharan Africa. The total installed capacity is 11.02GW. The curve will continue to increase since some of the Sub-Saharan Africa have shown great interest in power sector reforms. For instance Uganda expects to add over 9 projects which adds up to 20 projects from Uganda alone. Among the countries that reached their financial close are Kenya and Uganda. The leading state-owned energy producer (Kenya Electricity Generating Company) has reduced its energy market share from 80% to 70% and started a new policy to work with IPPs so as to reduce electricity shortage within the country but the system might take longer since the implementation process is not fast enough.

### Feed-in tariffs

The features of Feed-In Tariffs (FIT) schemes in a number of Sub-Saharan Africa are described and analyzed. Countries with working FIT schemes including Kenya, Uganda are used as reference.

### Feed-in tariffs in Kenya

In Kenya FIT is mainly applied in small renewable energy projects of up to 10 MW installed capacity connected to the grid. For wind, the standardized FIT in dollar per kWh is given as 0.11 for installed capacity of between 0.5-10 MW. When the capacity of wind energy installed is 0.5 MW the standardized FIT in USD/kWh is 0.105. For hydro the FIT is 0.0825 (when installed capacity is 10 MW). Biomass has 0.10 FIT in USD/kWh, solar (grid) accounts for 0.12 FIT in USD/kWh while solar. The FIT applicable at the time a power purchase agreement (PPA) is signed is the fixed value which will apply over the 20 year life of the PPA (ERC, 2015)

### Feed-in tariffs in Uganda

Uganda was among the first Sub-Saharan Africa to adopt feed-in tariff. The tariff was initiated in 2007 under Uganda renewable energy policy. In particular, the policy goal is to increase the use of modern new renewable energy from the current 4% to 61% of the total energy consumption by the year 2017.

### **Conclusion**

In sub-Saharan, poor people spend higher share of their income on energy services. For instance in northeastern part of Kenya 70% uses kerosene for lighting at night. This branded constant threats on development in the region. Costs per energy unit are also higher since most countries in sub-Saharan lack proper electricity infrastructure. Candles and batteries prove to be the most used in the rural parts of sub-Saharan Africa. Several developing countries like Kenya have abundant renewable energy resources including solar energy, wind, geothermal, hydroelectric and biomass but are not effectively utilized. Modern energy services are crucial to human well-being and to a country's economic development; and yet globally 1.2 billion people are without access to electricity and more than 2.7 billion people are without clean cooking facilities. More than 95% of these people are either in sub-Saharan African or developing Asia, and around 80% are in rural areas (IEA, 2015). Few Sub-Saharan adopt Feed-in tariffs, in Kenya FIT is mainly applied in small renewable energy projects of up to 10 MW installed capacity connected to the grid. For wind, the standardized FIT in dollar per kWh is given as 0.11 for installed capacity of between 0.5-10 MW. The FIT applicable at the time a power purchase agreement (PPA) is signed is the fixed value which will apply over the 20 year life of the PPA. The speedy expansion of renewable energy in sub-Saharan Africa depends on reducing the current reliance on fossil fuel, reducing monopoly on state-owned utility, use of proper application of feed-in tariffs, the introduction of independent power producers through independent regulatory authorities.

### **Reference**

- [1]. Fischer R, Lopez J, Suh S. (2011). Barriers and Drivers to Renewable Energy Investment in Sub-Saharan Africa. *Journal of Environmental Investing*. 2 (1), 33-40.
- [2]. Antone E (2016). *Independent Power Projects in Sub-Saharan Africa* Eberhard, Gratwick, Morella, and Antmann *Independent Power Projects in Sub-Saharan Africa*. Washington: congress library. 200-255.
- [3]. Antone E. (2008). IPPs in Sub-Saharan Africa: determinants of success. *Cape Town Graduate School of Business*. 1 (2), 22-36.
- [4]. Energy Regulatory Commission (2015). Kenyan, government.
- [5]. International Energy Agency (2015).