Discussion Paper

Enabling Investment Climate for Energy Sources

Focus on Sustainable Energy in Eastern and Southern Africa

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Contents

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Executive Summary

Electricity is a fuel for economic development. However, several countries in Eastern and Southern Africa (ESA) are lagging far behind in meeting the minimum electricity requirements of its citizens. Although, the private sector can play a vital role in bridging the gap for much-needed infrastructure investments, it will require an investor friendly and enabling regulatory environment to motivate private players to enter this capital-intensive sector. Also, such expansion of infrastructure for providing electricity has to be balanced with the consideration towards achieving sustainable development in these countries.

In this paper CUTS looks into sustainable models of electricity infrastructure development pattern in a few selected countries of ESA. The purpose of this discussion paper is also to help develop the basis for CUTS intervention in facilitating a multi-stakeholder led process for reviewing country/regional approaches towards development of the electricity sector in ESA.

The first section provides an overview of the electricity sector in selected sub-Saharan African (SSA) countries. The second section examines the present policy, regulatory and institutional settings which affect the electricity sectors in the selected countries. Recent institutional and regulatory reforms of the electricity sector are highlighted to help analyse the investment climate in the energy sector in the third section of the discussion paper. The fourth section of the paper will then focus on outlining the need for sustainable energy development, while the fifth section will raise the argument for the need of investment in sustainable off-grid energy investments. The last section will concluded the way forward for renewable energy (RE) development in ESA and CUTS strategy for the advancement of sustainable and accessible energy for development.

Situation Analysis of the Electricity Sector

Currently, electricity demand in SSA is very low compared to other regions of the world, due to several other factors including accessibility. Net electricity consumption in SSA (excluding South Africa) equals to about 40 percent of that of South Asia and a mere 20 percent of the per capita consumption of Latin America with around 163kWh per capita.[1] Nevertheless, most SSA nations are facing constant challenges concerning the reliability and availability of electric power supply, which can be attributed to shortages in electricity generation leading to the need to import significant proportions of electricity, a lack of adequate infrastructure in the electricity transmission and significant transmission losses. Table 1 provides an overview of the yearly electricity generation, consumption as well as national electricity imports and exports in the ten target countries in ESA of this paper.

Table 1: Yearly Electricity Demand and Supply in Selected ESA Countries

Country (p.a. in billion kWh)	Production	Consumption	Imports	Exports
Botswana	0.042 (2009 est.)	3.118 (2011 est.)	2.89 (2009 est.)	0 (2010 est.)
Ethiopia	21.84 (2010 est.)	14.92 (2009 est.)	1.3 (2009 est.)	0.014 (2009 est.)
Kenya	6.573 (2009 est.)	5.516 (2009 est.)	0.038 (2009 est.)	0.03 (2009 est.)
Malawi	1.736 (2009 est.)	1.614 (2009 est.)	0 (2010 est.)	0 (2010 est.)
Mauritius	2.889 (2009 est.)	2.687 (2009 est.)	0 (2010 est.)	0 (2010 est.)
Namibia	1.643 (2012 est.)	3.635 (2012 est.)	2.519 (2012 est.)	0.091 (2012 est.)
Tanzania	4.489 (2009 est.)	3.589 (2009 est.)	0 (2008 est.)	0 (2010 est.)
Uganda	2.445 (2009 est.)	2.217 (2009 est.)	0.029 (2010 est.)	0.075 (2010)
Zambia	10.2 (2009 est.)	7.704 (2009 est.)	0.033 (2010 est.)	1.10 (2010)
Zimbabwe	7.615 (2009 est.)	12.54 (2009 est.)	5.497 (2009 est.)	0.053 (2009 est.)

Data Source: CIA World Fact Book [2]

As can be seen in table 1 in seven out of the ten target countries of this paper, electricity production exceeds electricity consumption. The only countries which face supply shortages in electrical power are the Southern African countries Botswana, Namibia and Zimbabwe. The nation with the highest electricity supply deficit is Zimbabwe with electricity consumption

1 Foster, V., Steinbuks, J. (2008), 'Paying the Price for Unreliable Power Supplies: In-House Generation of Electricity by Firms in Africa', Africa Infrastructure Diagnostic Working Paper 2

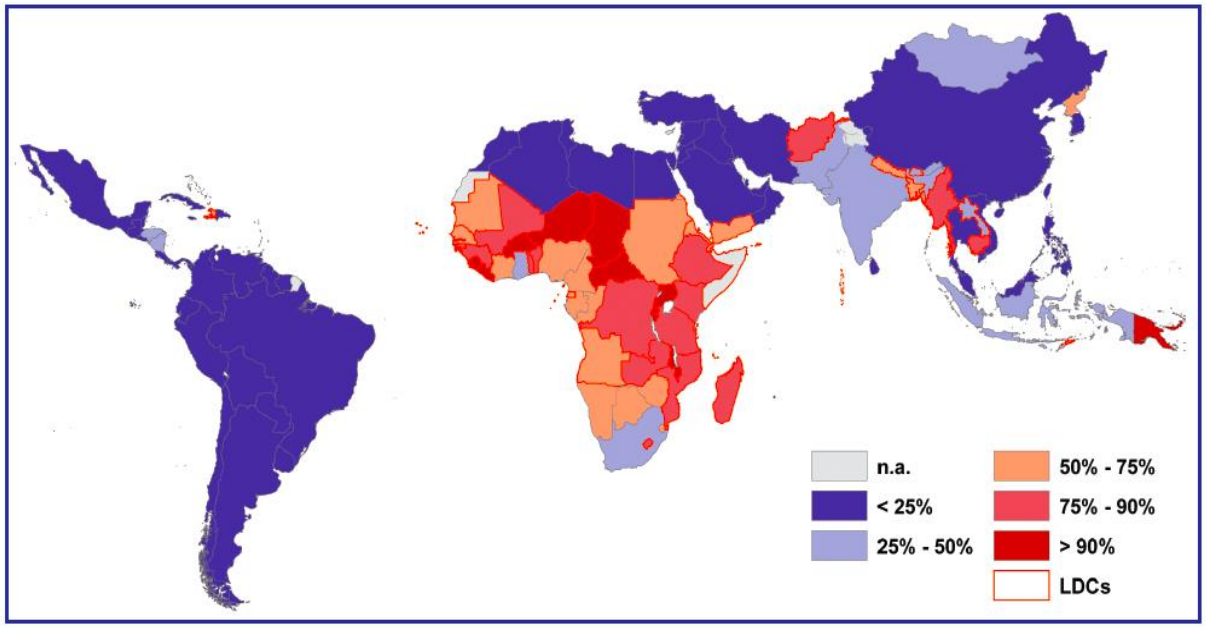
2 https://www.cia.gov/library/publications/the-world-factbook/

exceeding domestic supply by 4.925 billion kWh per year. The country with the highest surplus in electricity supply through domestic generation is Ethiopia with 6.92 billion kWh per year in supply surpluses. The general trend of higher electricity production than consumption in the majority of countries, however, does neither translate to reliable electricity supply in the region nor does it translate to affordable electricity prices.

Rate of Electrification

Generally speaking the rate of electrification in SSA is lower than developing countries as a whole. For example in Africa 560 million people lacked access to electricity in 2009, while in South Asian and the Pacific less than 200 million people lack access. Further, 74 percent of people in SSA lack access to electricity as compared to 28 percent of those living in developing countries.[3] As shown in Map 1, SSA is the only developing region in the world which has electrification rates of often significantly below 50 percent and even as low as less than 10 percent of the population being connected to electricity.

Map 1: Share of People without electricity access for developing countries, 2008



Source: UNDP & WHO (2009)[4]

More specifically to the countries assessed in this paper, the percentage of population with access to electricity greatly varies from nation to nation (see Figure 1). Overall, the Southern African nations of Botswana, Namibia and Zimbabwe have a significantly higher electricity access rate than their Eastern African counterparts. Nevertheless, none of the above mentioned nations exceed an electrification rate of 50 percent in 2010. However, Mauritius as a small island nation has by far the highest percentage of its population connected to power with 99.4 percent of the population having access to electricity. The nations with the lowest rates of electrification are

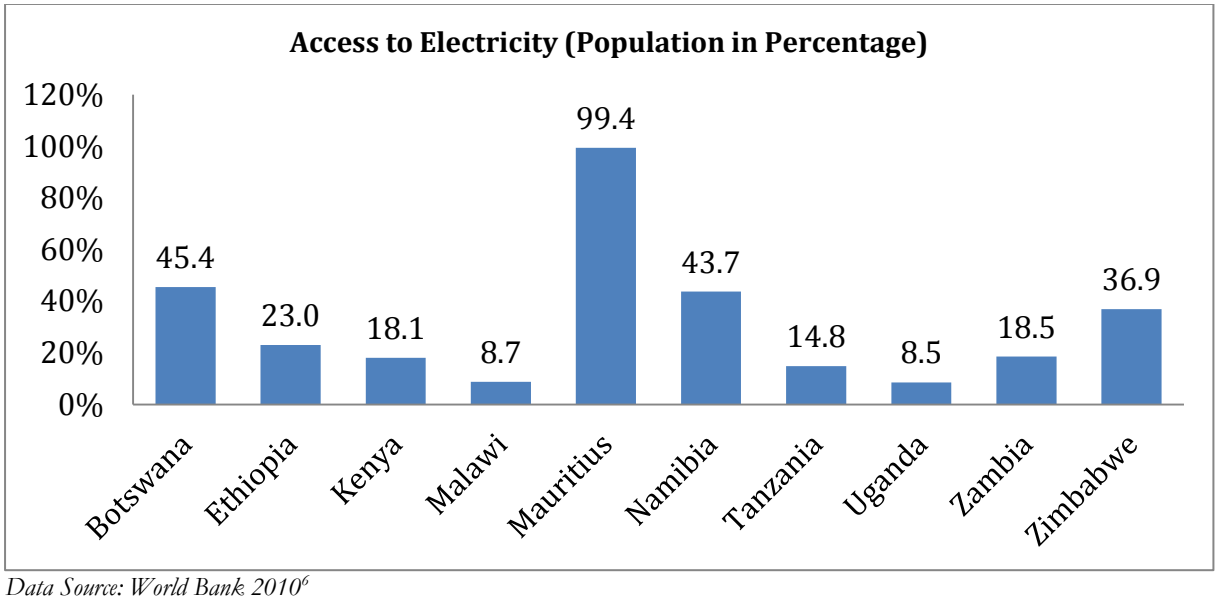
3 United Nations Development Programme & World Health Organisation (2009), 'The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and sub-Saharan Africa', USA

4 *Ibid*

Uganda (8.5 percent) and Malawi (8.7 percent), which are well below the electrification level of their neighbouring countries.

Notably, according to World Bank data[5], some countries in the two regions are experiencing a decline in the percentage of the population that has access to electricity, while others follow a positive trend in overall electrification rates. Based on the comparative data from 2009 and 2010, Uganda, Malawi, Zambia and Zimbabwe faced declining percentages of the population's access to electricity. Zimbabwe has shown the most significant decline from 41.5 percent (2009) to 36.9 percent (2010) of the population having access to electricity. On the other end of the spectrum, Namibia has managed to achieve the highest growth rate in electricity access from 34 percent in 2009 to 43.7 percent in 2010. Ethiopia, Kenya and Tanzania also experienced growing rates of electrification between 2009 and 2010, while Botswana and Mauritius remained on the same level during the above mentioned time period.

Figure 1: Percentage of Population with Electricity Access in ESA Countries (2010)



Data Source: World Bank 2010[6]

Rural Electrification

SSA has the lowest electrification rate in the world with 74 percent of people not having access to electricity. Electrification rates are particularly low in rural areas with most of the countries showing a rural electrification rate of below 10 percent with the exception of South Africa. Reasons that hinder rural electrification include high extension cost to the national electricity grid, limited generation capacities and dependence on imported fossil fuels.[7] Hence, there has been a push towards the introduction of in-situ electricity generation by many development organisations working in Africa, who have focussed on renewable sources of energy such as solar panels and biogas, which are independent of the extension of the national electricity grid infrastructure.

5 http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS
6 Supra Note 4.
7 GTZ (2010), Policy and Regulatory Framework Conditions for Small Hydro Power in sub-Saharan Africa: Discussion Paper

As shown in Table 2, the only country in ESA assessed in this paper is Mauritius with a rural electrification rate of 99 percent. All other countries are lagging far behind with Uganda (three percent), Malawi (two percent), and Zambia (two percent) experiencing the lowest rates of electrification in the two regions.

The Alliance for Rural Electrification has expressed concern, that "without strong political commitment and sustainable supporting frameworks, the electrification rate will never catch up with population growth and the un-electrified population in the poorest regions will keep increasing."[8] Without access to the main electricity grid, most rural areas rely on off-grid diesel powered electricity generators, which present a costly and environment detrimental solution based on fossil fuels.[9]

Table 2: Electricity Access in 2010 – Selected ESA Countries

Region (Eastern and Southern Africa)	Population without electricity millions	Electrification rate (Percent)	Urban electrification rate (Percent)	Rural electrification rate (Percent)
Botswana	1.1	45	68	10
Ethiopia	65	23	85	11
Kenya	34	18	65	5
Malawi	13	9	35	2
Mauritius	0.01	99	100	99
Namibia	1,2	44	78	23
Tanzania	38	15	46	4
Uganda	29	9	46	3
Zambia	11	19	48	2
Zimbabwe	8	37	79	11

Source: Adapted from IEA, World Energy Outlook 2012[10]

Here, clean energy off-grid electricity solutions may present themselves as a viable option to provide power to rural populations in ESA, who don't have access to the national electricity grid.

8 http://www.ruralelec.org/9.0.html

9 Ahlborg, H., Hammar, L., (2011), Drivers and barriers to rural electrification in Tanzania and Mozambique – grid extension, off-grid and renewable energy sources, World Renewable Energy Congress 2011, Sweden

10 http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CC0QFjAB&url=http%3A%2F%2Fwww.iea.org%2Fmedia%2Fweowebsite%2Fenergydevelopment%2F2012updates%2FWEO2012Electricitydatabase_WEB.xlsx&ei=xaJCUq7HM8re4QTotICwCA&usg=AFQjCNHs5Zl7Sp6C32fcsd4MFDJT1xPKEA&bvm=bv.53077864,d.bGE

Energy Sources

Currently, the four countries relying on fossil fuels for more than half of their domestic electricity generation are Botswana (100 percent), Mauritius (75.2 percent), Zimbabwe (66.1 percent) and Ethiopia (56.2 percent). The countries with the majority of electricity being produced using hydroelectric power plants are Zambia (99.6 percent), Malawi (94.3 percent), Namibia (66.7 percent), Tanzania (60.5 percent) and Uganda (59.5 percent).

Mauritius and Kenya are the two countries producing substantial shares of their domestic electricity utilising other forms of RE other than hydropower systems with 18.1 percent and 12.9 percent of total installed capacity in the two countries. Other countries utilising RE sources apart from hydro-energy to a much lesser extend are Uganda with 2.6 percent and Ethiopia with 2.1 percent.

Four ways in which access to electricity can contribute to economic growth and development

1. Access to power expands the number and variety of business and job opportunities available. Electricity means that businesses, such as hair salons, laundromats and welders, all of which rely on energy, can function. Energy also leads to the creation of new markets, businesses and job openings, which provide more opportunities for individuals to earn an income and lift themselves, their families and their communities out of poverty.

2. A lack of a consistent access to reliable power costs businesses and the economy as a whole. Even with access to energy, unreliable power makes operating a business even more challenging than usual. African manufacturing enterprises experience power outages 56 days a year on average. As a result, firms lose six percent of sales revenues in the informal sector. Where back-up generators are limited, losses can be as high as 20 percent. These losses have severe consequences for the health and growth of the wider economy, not to mention the dramatic impact in achieving other development objectives outlined by the Millennium Development Goals.

3. Power allows business owners and employees to increase working hours. This not only means that they can open their shop earlier and stay open later, but that business owners can complete other work related to owning and operating a business before and after daylight hours.

4. Electricity provides business owners with access to online information and resources. Power provides business owners with information that is critical to operating their business successfully, whether that information is about local or national markets, new economic policies or tax regulations. This allows small business owners in rural areas to engage with the wider business community and learn best practices from other individuals working in the same industry.

None of the ten ESA countries studied in this paper make use of nuclear fuels for electricity generation. In fact, the only country in SSA with nuclear power plants is South Africa with two nuclear facilities producing approximately five percent of its electricity.[11]

Table 3: Sources of Electricity Generation % of Installed Capacity

Country (% of total installed capacity)	Fossil Fuels	Nuclear	Hydroelectric	Renewable
Botswana	100 (2009 est.)	0 (2009 est.)	0 (2009 est.)	0 (2009 est.)
Ethiopia	56.2 (2009 est.)	0 (2009 est.)	41.7 (2009 est.)	2.1 (2009 est.)
Kenya	43.3 (2009 est.)	0 (2009 est.)	43.8 (2009 est.)	12.9 (2009 est.)
Malawi	5.7 (2009 est.)	0 (2009 est.)	94.3 (2009 est.)	0 (2009 est.)
Mauritius	75.2 (2009 est.)	0 (2009 est.)	6.7 (2009 est.)	18.1 (2009 est.)
Namibia	33.3 (2012 est.)	0 (2012 est.)	66.7 (2012 est.)	0 (2012 est.)
Tanzania	39.5 (2009 est.)	0 (2009 est.)	60.5 (2009 est.)	0 (2009 est.)
Uganda	37.8 (2009 est.)	0 (2009 est.)	59.5 (2009 est.)	2.6 (2009 est.)
Zambia	0.4 (2009 est.)	0 (2009 est.)	99.6 (2009 est.)	0 (2009 est.)
Zimbabwe	66.1 (2009 est.)	0 (2009 est.)	33.9 (2009 est.)	0 (2009 est.)

Data Source: CIA World Fact Book [12]

It is evident from these statistics that the most widely used source of RE in ESA to date is hydropower. Therefore, ESA is on par with the worldwide trend, which shows hydroelectricity as the most common form of RE in global electricity production. In 2008, 16.3 percent of the global electricity generation was produced by hydroelectricity plants.[13] Eight out of the ten countries analysed in this paper, with the exceptions of Botswana and Mauritius, are well above the global average in the proportion of electricity, which is generated through hydroelectric power plants.

The countries in ESA, that do utilise **other RE sources** apart from hydroelectricity use the geothermal power generation, biogas and biomass, solar energy as well as wind power generation to varying extends.

11 http://www.world-nuclear.org/info/Country-Profiles/Countries-O-S/South-Africa/#.Uh8HwBZOEWY
12 Supra Note 3
13 International Energy Agency (2010), 'Renewable Energy Essentials: Hydropower', OECD and IEA.

Geothermal power generation is currently utilised in Kenya and Ethiopia to limited extends. For example, Ethiopia has a potential 5,000MW from geothermal electricity generation, while it is currently only generating 7MW. The under reliance on geothermal energy is caused by the high cost and technological difficulty encountered when seeking to exploit the earth's heat for electricity generation.[14]

Wind power generation is utilised in Kenya, Ethiopia and Mauritius. However, in Mauritius mere 0.4 percent of local renewable electricity sources are constituted by wind energy.[15] In Kenya, one wind power plant is currently operational and has an installed capacity of 5.1 MW.[16] Ethiopia is in the process of commencing operations of its second wind farm with an additional 120MW generation capacity to add in the existing 51MW plant that stated operating in the country in 2012. The government estimates a potential wind power generation capacity of 1.3 million MW for Ethiopia.[17]

Solar energy generation is taking place in Kenya and Ethiopia, even though, in both countries, the installed solar systems are not producing power for the national grid, but rather serve as stand-alone such as home solar systems. In Kenya, investors have been unwilling to invest in grid-tied solar PV systems even though the government has introduced feed-in tariffs. However, 12 cents per kilowatt hour (KWh) for the currently established feed-in tariffs are regarded as too low to be viable for solar PV generation.[18]

In Ethiopia, the government has made efforts to provide power to the rural population through the planned instalment of a solar systems project, which will power 25,000 rural homes that are not connected to the national electricity grid. Currently, 13,200 systems have already been installed with funding provided by the World Bank.[19]

Biogas power generation and *Biomass energy generation* can be found in Mauritius, Ethiopia and Kenya on a small scale off-grid basis rather than a feed-in grid connected electricity generation method.

Policy, Institutional Settings and Regulatory Regimes

All ESA countries assessed in this paper have established an electricity board or comprehensive energy regulatory agency, with a mandate to regulate the electricity sub-sector and to provide policy guidelines to the relevant line ministries, which have the overall authority to issue sectoral policies. All 10 countries have undertaken significant structural and legal reforms of the electricity sub-sector since the 1990s of which the establishment of regulatory agencies was a major achievement. Efforts have been undertaken by all governments to unbundle the vertically integrated electricity sector with a natural monopoly situation, which has generally lead to low

14 http://allafrica.com/stories/201309231629.html
15 Mohee, R., Surroop, D., Jeetha, P. (2012)
16 The Energy Regulatory Commission Kenya: http://www.renewableenergy.go.ke/index.php/content/32
17 http://newbusinessethiopia.com/index.php/news/146-infrastructure/528-ethiopia-s-second-wind-farm-to-commence-power-generation
18 http://www.trust.org/item/20130923092115-lecgd/
19 http://www.ventures-africa.com/2013/09/ethiopia-powers-13200-homes-solar-energy/

quality of service in the sector as well as elevated prices and a lack of investment in infrastructure extension.

Table 4: Electricity Legislation & Regulatory Agency

Country	Legislation	Regulatory Agency
Botswana	N/A	There is no independent regulator
Ethiopia	Electricity Proclamation No. 86/1997, established an electricity regulatory agency (Ethiopian Electricity Agency)in June 1997	Ethiopian Electric Agency
Kenya	Came into effect in July 2007, was formerly the Electricity Regulatory Board established under the Electric Power Act of 1997	Energy Regulatory Commission
Malawi	Established in December 2007 replacing the National Electricity Council and Petroleum Control Commission	Malawi Energy Regulatory Authority
Mauritius	A parasternal body wholly owned by the Government and established in 1952. (The Utility Regulatory Authority Act was adopted in 2005 with the Regulatory Authority, as approved under the Act, expected to be established soon)	Central Electricity Board
Namibia	Created under the Electricity Act (2000)	Energy Control Board
Tanzania	An autonomous multi-sectoral regulatory authority, established under Cap 414 of the laws of Tanzania. EWURA commenced its operations on 1st of October 2005	Energy and Water Regulatory Authority
Uganda	Established following the enactment of the Electricity Act 1999	Electricity Regulatory Authority
Zambia	Created under the Energy Regulation Act of 1995, Chapter 436 of the Laws of Zambia, and become operational in 1997	Energy Regulation Board
Zimbabwe	Statutory body established under the Electricity Act, (Chapter 13:19) No. 4 of 2002, as amended by the Electricity Amendment Act No. 3 of 2003. It became operational in August 2003	Zimbabwe Electricity Regulatory Commission

To overcome these challenges, energy sector reforms have been implemented in varying degrees across ESA countries, comprising broadly:

i) entry of independent power producers (IPPs) into the electricity market;
ii) the unbundling of electricity generation, transmission and distribution functions; and
iii) the establishment of independent regulatory authorities of the electricity sector.

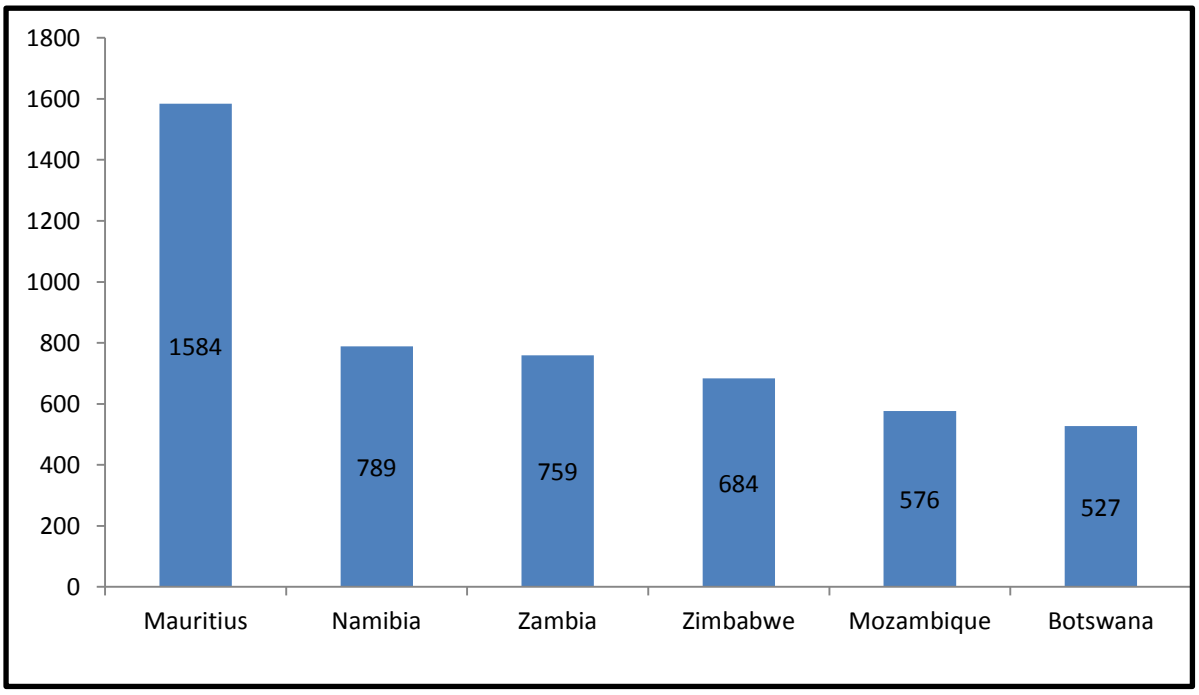
However, full reform model has not been implemented in any country. State owned utilities are transferred to private and public owned companies without restructuring. In some cases state owned utilities are unbundled into generation, transmission and distribution, but the ownership and management remains under state control with private participation occurring through IPP's.

Thus, energy sector reforms have not been able to meet the expected objective and unable to attract investment.

Investment Scenario in Energy Sector in ESA

Electricity access in SSA is the lowest in the world i.e. 26 percent, unlike investments flow into the region's electricity sector. The region witnessed 70 percent growth in electricity generation from 1998 to 2008, i.e. 6 percent average growth rate for the entire region. However, this growth and dynamism are very unevenly spread across the countries. Similarly, growth in electricity generation from RE between 1998 and 2008 is 72 percent, which means 66 percent new electricity generated in SSA after 1998 has come from renewable sources.

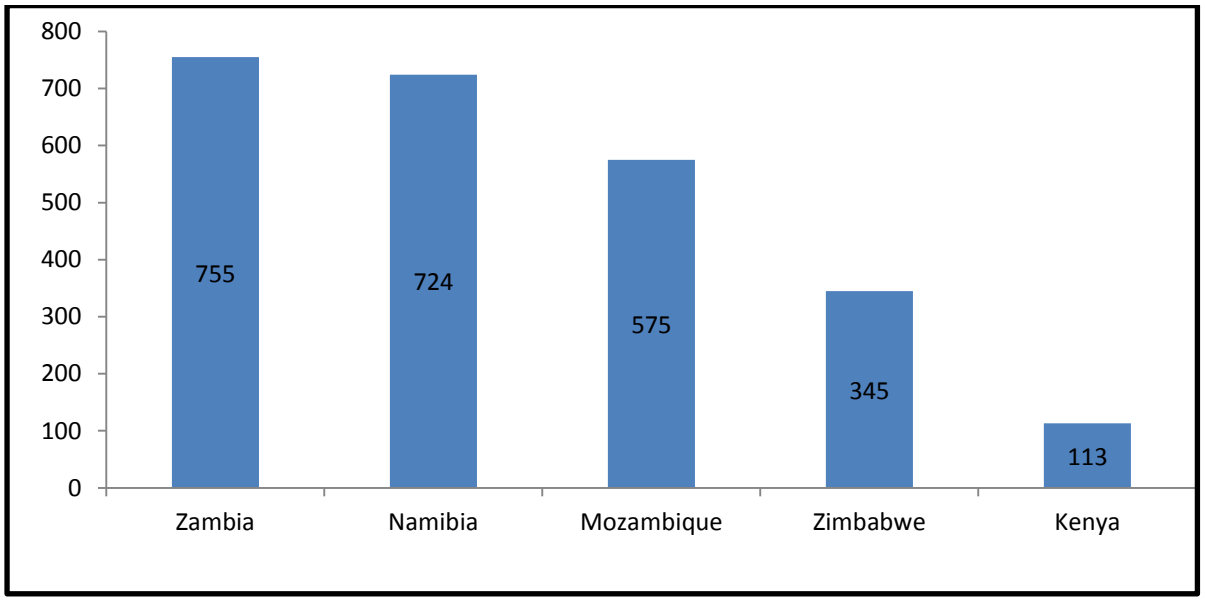
Figure 2: Selected ESA Countries Amongst Top Ten Countries in Average Generation Per Capita in kwp per year (1998-2008)



Of the selected countries from ESA, few countries which is amongst the top sub-Saharan countries in average generation per capita in kwh per year from 1998-2008 are Mauritius, Namibia, Zambia, Zimbabwe and Botswana. Whereas Ethiopia is in last ten with an average generation per capita of 34 kWh.

Similarly, in average generation of electricity from renewable sources per capita in kWh per year are Zambia, Namibia, Mozambique, Zimbabwe and Kenya, whereas, Botswana is in last 10 with no generation of electricity from renewable sources.

Figure 3: Selected ESA Countries Amongst Top Ten Countries in Average Generation of Electricity from renewable Energy Sources Per Capita in kwp per year (1998-2008)



The remarkable growth in RE in this region has essentially meant an increase in hydro-based electricity generation. **Therefore, other clean energy technologies like solar, wind etc., having large potential at less social and environmental cost as compared to hydropower (and probably a better suited option in African countries) seem to have been neglected.**

The only ESA country where electricity generation from non-hydro RE sources has played a significant role over the last decade is Kenya. In 2008 one fifth (21 percent) of the national electricity portfolio came from non-hydro renewable sources, while all RE taken together, including hydro, reached an impressive 62 percent, due to innovation and diversification in Kenya's Renewable Energy Industry. The role that renewable, non-hydro energy technologies have played in all other countries of the region has, at best, been marginal.

There are many factors ranging from high capital investment to underdeveloped RE technologies are responsible for this marginal performance. Moreover, subsidies on fossil fuels make RE generation more costly, particularly for large-scale generation, as compared to conventional sources. Thus, to achieve ambitious energy targets, it is essential to put in place regulatory frameworks and incentive structures, which can effectively mobilise private sector actors, including infrastructure developers, investors and financiers, to engage in the roll-out and operation of energy generation at an appropriate scale.

The role of the private sector in achieving any national energy strategy is not only to provide the financial means to enable investment. Often many of the key skills, expertise and resources required for the roll-out, built-up and operation of generating capacity from energies at scale will be found exclusively in the private sector. This is why governments, as part of their energy planning, need to develop effective strategies to mobilise private sector actors for technology deployment, infrastructure development, financing and operation.

However, private sector actors will only be interested in pursuing activities that are of immediate financial interest. Some options could be: (i) promoting public-private-partnerships on specific RE sources; and (ii) Inclusive businesses models etc.

Barriers to Investment in Renewable Energy Sector

It is, therefore, crucial to put in place mechanisms beneficial and strategic for the economy, society and country; and also financially attractive to the private sector. Few barriers which need to be addressed in order to achieve these goals are:

Cost of Generation

In ESA the average cost of electricity generation is exceptionally high, due to small size of electricity markets and economies of scale. Due to modest public budgets with only limited interest from private investors, cost minimisation and cost efficiency are high priorities for policymakers, developers and the local population. In the past hydro-based, gas- and coal-fired generation have often been the most cost-efficient options, therefore making them the preferred political choice. The cost of electricity generation is highly relevant as large parts of the population live at the subsistence level. Even if access to electricity is provided, it is uncertain that local population will able to afford it.

However, investment in RE sector will be driven by profitability and financial return; and in the absence of any long-term favourable policy electricity generation from renewable sources is more than the conventional sources. Nonetheless, costs for RE generation continue to steadily decrease and certain technologies are already competitive, or at 'grid parity', with conventional forms of electricity generation in many parts of the world.

Uncertainty of Returns on Investment

In order to stay viable, projects with high capital expenditures require easy access to capital. However, in almost all the ESA countries, capital markets are not as mature as in many other developed countries, making it difficult to get private financing.

Even when the challenge of access to finance is addressed, there is uncertainty about the returns that investors can expect. One of the reasons is higher risks associated with the novelty of clean energy technologies, which often contributes to higher return expectations of investors in developing countries.

Fossil Fuel Subsidy and Externalities

There are many types of fossil-fuel subsides: direct budgetary transfers, tax incentives, research and development spending, liability insurance, leases, land rights-of-way, waste disposal, and guarantees to mitigate project financing or fuel price risks. Regardless of their shape or form, these subsidies work to lower the price of energy generated from fossil fuels artificially, making them more competitive relative to RE alternatives. RE has also been an area where governments

have provided subsidies and incentive to popularise their uptake. However, the level of support (subsidies) received from government on fossil fuel is rather high as compared to that of RE. For instance, a study conducted in Senegal shows, that in three remote rural regions, only when environmental externalities are taken into account, the electricity from Photo Voltaic technologies (solar) costs less than energy from conventional sources (Thiam, 2010).

Political Risks

It is critical for all investors and financial institutions to ensure financial security before investing. Political stability and favourable policy plays a crucial role in financial decision making processes. Broader macroeconomic, political or legal concerns often hinders the implementation of otherwise promising and high-potential projects on the ground. This risk category encompasses risk of expropriation, breach of contract, war and civil disturbance also.

According to the survey conducted by The United Nations Environment Programme Finance Initiative (UNEP FI) in 2012, any private sector mobilisation strategy aimed at deploying RE technologies in developing countries at scale will require governments and policymakers to achieve three critical steps:[20]

1. Create a level playing field in terms of profitability, between innovative and promising renewable technologies and conventional fossil fuel based generation options.
2. Provide easy market access and grid access, to private sector actors on a competitive basis; without access, the required skills, technologies and financing will not move.
3. Mitigate political and regulatory investment risk which continues to be detrimental, particularly for RE technologies, even in situations where a level playing field and easy market access have been established.

Need for Sustainable Energy Development

Due to high initial investment costs off grid connected large-scale energy generation units, low-cost solutions that are not connected to the electricity grid, but provide broader accessibility of power especially for the large population in ESA should be the priority for future energy investments in the region.

Small-scale energy systems provide a low-cost, environmentally sustainable energy generation and transmission systems for rural communities to gain access to electricity services.[21] Generally, it is more cost effective to establish stand-alone electricity systems in remote areas than extending a power line to the electricity grid.[22]

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20 Financing Renewable Energy in Developing Countries, February 2012, The United Nations Environment Programme Finance Initiative

21 Byakola, T., Lemar,O., Kristjansdottier, T., Lineikro, J. (2009) 'Sustainable Energy Solutions in East Africa: status, experiences and recommendations from NGOs in Tanzania, Kenya and Uganda', Friends of the Earth, Norway.

22 http://energy.gov/energysaver/articles/grid-or-stand-alone-renewable-energy-systems

RE investments can be classified into large scale and small scale RE systems. While large scale projects are usually feeding into the existing national electricity grid, smaller scale systems are generally modular and decentralised in nature and thereby able to provide energy services to communities that are located in remote areas which usually do not have access to the conventional electricity systems and national grid lines.[23] Therefore, small-scale investments are highly suitable for the rural areas of ESA.

In recent years, a positive trend towards the interest in establishment of off-grid RE sources has developed, which may potentially ensure much greater, faster and more affordable rural electrification in remote areas in Africa than extending the often limited and morbid national electricity grid of the current service providers.

Off-grid small scale RE can represent an alternative path of rural electrification, which may act as a complementary option to the capital intensive large-scale electricity generation projects. Since infrastructural growth in the near future will be insufficient to electrify the majority of the rural population, off-grid, small scale electricity projects would foster a bottom-up approach to electrification, which will especially beneficial for potential rural electricity consumers, who are excluded from the national grid system, even if the generation capacity of the respective state was to be increased through large-scale installations. Governments would be required to guide investors and consumers to adopt this complementary strategy through favourable policy and regulatory guidelines. Of the countries assessed in the study, only Mauritius has acknowledged the missing link between rural electrification and decentralisation, by referring to energy issues in their decentralisation process.[24]

Off-grid RE sources include biomass based power projects (for example, waste to power projects); biomass gasifier for rural and industrial energy applications, water mills/mini hydro energy projects; small wind energy and hybrid systems as well as solar (rooftop) systems.[25]

Solar Power

Among the off-grid RE sources, solar home systems are by far the most common RE system among household consumers. Kenya has the second highest installed capacity following South Africa with 3,600 kWp in SSA. Unfortunately, due to high upfront costs for the installation of solar systems; poor households have benefitted less from solar PV systems than higher income groups.[26]

This challenge will have to be addressed through government policy which will aim at a more equitable access to off-grid RE sources, such as solar energy throughout ESA. The Government of Kenya, this year, has lowered the importation taxes levied on small solar systems in an effort to lower the initial costs of small-scale solar equipment especially for rural areas for domestic and industrial operations.

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23 UNIDO (2009) Scaling up renewable energy in Africa, 12th Ordinary Session of Heads of State and Governments of the African Union, Ethiopia

24 Supra Note 8

25 http://www.mnre.gov.in/schemes/offgrid/

26 Supra Note 24

Furthermore, the Rural Electrification Authority has entered into partnership with the International Finance Corporation for the 'Lighting Africa Initiative', which is providing relatively low cost small solar systems for lighting and irrigation pumps (on credit instalments) for rural households in a private public partnership.[27]

Mozambique Energy Ministry has invested more than US$15mn in solar power, whereas, in rural areas of Rwanda, mini-solar projects provide energy access to local schools and farmers, who would otherwise be without power. Strengthening legislation across ESA for managing solar energy off-grid could massively boost projects in this sector.

Hydro Power

Another high potential alternative off-grid energy source is small or micro hydropower systems with less than 10 MW generation capacities, which have significantly lower capital investment costs than larger scale projects while involving local private sector involvement and community participation. A number of African countries already make use of micro hydropower systems to generate electricity on the village level.[28]

As per the study conducted by GTZ, small hydropower is one of the most feasible options for renewable electricity generation, if geographic conditions allow for it. While being able to provide electricity for lighting and communication, which could also be provided by solar systems, it also has the capacity to supply mini-grids and thus "constitute the basis for various forms of productive use of electricity including small industrial applications."[29]

For example, the Nyafaru Co-operative Farm with 600 hectares of land in Zimbabwe has established a micro hydropower system to generate enough electricity (20kW) to power a shop, a clinic, a primary and secondary school and farm staff houses. The scheme is run by the Nyafaru Hydro Committee (NHC), which is also responsible to setting up and implementing the fixed monthly electricity tariffs. The tariffs are set at socially attractive levels supported by a subsidy from the school. This has enabled school children to use electricity instead of candles and kerosene lamps and women-owned weaving businesses to operate till late evenings.[30]

Biogas

A currently underutilised opportunity for off-grid electricity generation in ESA countries is biogas. According to the study conducted by GIZ, biomass gasification and conversion to liquid fuels propelling an electricity generator is one of the cheapest available RE sources for power generation. It can also provide local farmers with additional income by selling biomass to local off-grid biogas power system operators.[31]

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27 www.renewableenergyworld.com/rea/news/article/2010/07/kenyan-women-light-up-villages-with-solar-power

28 Supra Note 24

29 Supra Note 8

30 Khennas, S., Barnett, A. (2000), 'Best practices for sustainable development of micro hydro power in developing countries', The Department for International Development, UK and The World Bank.

31 GIZ (2010), 'Small-Scale Electricity Generation from Biomass: Experience with Small-scale Technologies for Basic Energy Supply'

Among the ESA nations assessed in this paper, Kenya and Ethiopia have already implemented pilot projects aimed at establishing the technical and socio-economic viability of biogas technology as an alternative source of energy for cooking and decentralised rural electrification. Furthermore, the 'Biogas for Africa Project' is mobilising stakeholders for the private sector disseminating biogas digesters in Tanzania among other African countries.[32]

In Zimbabwe, a community-based biogas plant is reportedly being constructed in Harare to convert organic waste to energy, other African countries, including Kenya are also planning to install similar plants. However, recent examples of power generation through biogas have shown that it has not been able to capture the market as a profitable technology. Most plants were dependent on international donor support in technical and financial terms. For non-feed-in options of electricity generation, market barriers could be identified including lack of awareness, experience, local capacity as well as a lack of available upfront financing. For generation for feed-in electricity into the national electricity grid, policy barriers such as guaranteed high feed-in tariffs for the power generation plants are required to operate without subsidies.[33]

Investment in Sustainable Energy

Some ESA countries have started introducing off-grid RE investments; however, large scale introduction of the different technologies will require significant private and public sector investment as well as financing options for communities to enable the setting up of electricity generating systems.

Two projects for off-grid solar lighting was installed in Turkana County (October 2010) and Wajir County (June 2011) for 100 lamps and 100 solar systems with two lamps, respectively. Similarly, Tanzania's Rural Electrification Master Plan estimates 32 percent of its rural population to be electrified by standalone PV or mini-grids in the short and medium term.

Off-grid renewable electricity solutions should be stakeholder oriented in order to provide the greatest possible benefits for its mostly rural consumers. The generation method chosen must be easy to operate by the local population and maintenance should be generating employment in the local community through training and capacity building initiatives.

Furthermore, upfront costs must be either financed through private or public investment or cooperative loans with low interest rates to the local community. Strategic locations must be chosen for the generation facility to ease business opportunities provided by the power source. Therefore, extensive stakeholder consultation must be carried out in target communities/villages to ensure the greatest benefits of access to RE solutions.

Furthermore, as identified by the speakers at the International Off-Grid Renewable Energy Conference and Exhibition held in Accra, Ghana in 2012, regulatory frameworks are the principal drivers to rural electrification initiative and therefore, there will be a need for specific policies that aim at off-grid electricity developments.[34]

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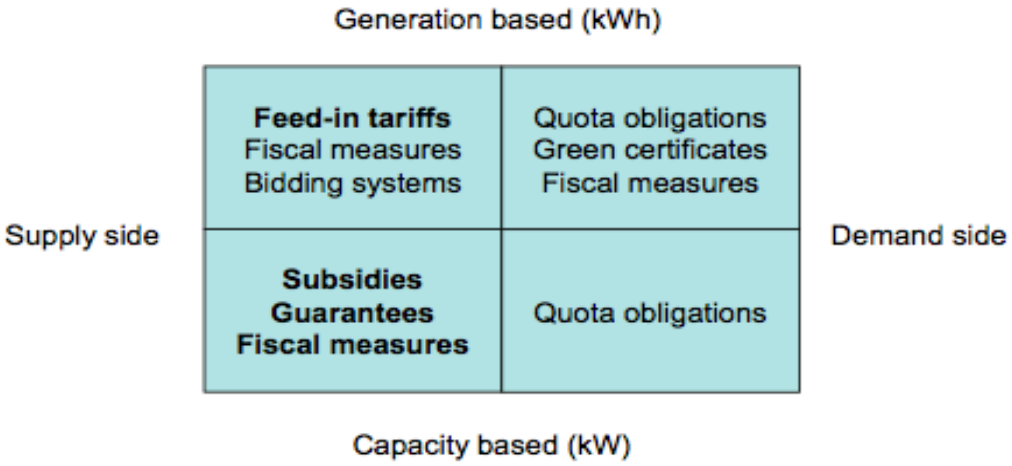
32 Supra Note 24
33 Supra Note 32
34 http://www.iorec.org

One of the critical factors for the successful investment in renewable off-grid electricity generation is favourable government policies that incentives for investment and private sector participation. Figure 4 shows different policy options available to promote RE sources.

Economic Community of West African States (ECOWAS) member countries have established the Centre for Renewable Energy and Energy Efficiency (ECREEE), forming strategic development pacts with several international organisations that include the United Nations Food and Agricultural Organisation (FAO) and the United Nations Industrial Development Organization (UNIDO). ECOWAS members target nearly 20 percent for the renewable makeup of energy by 2030, which include off-grid electricity serving 25 percent of the rural population. Southern African Development Community (SADC) and the East African Community (EAC) recently agreed to create similar regional RE programmes.[35]

Figure 4: Incentives for Renewable Energy Development



Source: GTZ 2010

As described above, there is great potential for the development of generating capacity from RE in the region. RE technologies are deployable in a decentralised and modular manner. This makes them a particularly suitable energy source for small grids or off-grid solutions, which, in turn, bear great potential in many rural regions where connection to the grid is too expensive. Electrifying the 66 percent of Africans living in rural areas would, in a majority of instances, require large and costly grid infrastructure expansion. Even though extensions of existing grids should be encouraged in SSA, "off-grid renewable solutions are increasingly acknowledged to be the cheapest and most sustainable options for rural areas in much of the developing world," according to REN21, a Renewable Energy Policy Network (REN21, 2011).

In cases where up front purchase of small or micro-scale RE equipment by rural consumers is not deemed to be affordable, initiatives for low-cost finance to purchase and install equipment should be encouraged by the government and other relevant stakeholders such as SACCOs and microfinance institutions. To provide a case for business investment for local investors, this initiative should also apply, as electricity generation and supply has the ability to generate

[35]Kurt Davis Jr, Africa's Renewable Energy Potential, Business & Finance

employment in the rural setting as well as to increase economic growth in the respective communities through business growth and diversification with access to electricity. At current high bank interest rates in countries such as Kenya, the business viability may be questioned and take-up of off-grid RE sources may be hindered.

Concluding Remarks and the Way Forward

In view of the above mentioned advantages of smaller-scale off-grid RE in an effort to electrify the majority of African residents in a financially and environmentally sustainable way is a suitable complementary measure to conventional grid electrification. In order to facilitate a wide-spread uptake of modular RE systems, a number of initiatives are needed to ensure sustainability and the successful contribution of RE units to rural employment, growth and poverty reduction. There are a number opportunities that can be utilised concerning off-grid RE systems, while there are also some obstacles to be overcome in order to advance the RE agenda.

CUTS, as organisation acting in the interest of consumers, would add an alternative discourse to RE and aim to act at a catalyst between demand generations, needs assessments among consumers and advocacy for beneficial policy and regulatory frameworks to meet consumer interests. Thereby, CUTS will provide backward and forward linkages between grassroots consumers and policy makers through a comprehensive advocacy process that aims to achieve participatory governance to advance the RE agenda for the benefit of consumers and local economic growth. By analysing the demand situation and influencing the regulatory and policy frameworks which would encourage private investment, CUTS will contribute to building a stronger business case to increase investment in off-grid RE sources.

CUTS's interventions are distinguished for its variety of social accountability approaches at all levels of governance. The proven strategy is to enhance voice of citizens to engage them for obtaining better services, rights and entitlements as well as for improving transparency, competition and service delivery.

The long-term goal of CUTS, therefore, is to leverage its well-recognised skills and expertise to improve the transparency and governance through regulatory interventions in the electricity sector of ESA region. Another aspect of the CUTS future involvement in the RE discourse will be to engage in strategic communication with potential consumer groups of off-grid RE systems. This would help raise awareness of the long term affordability of RE especially in rural areas that are reliant on diesel powered generators, tin lamps using paraffin for lighting and heaths threatening charcoal cookers.

CUTS would encourage consumers to consider switching their energy sources to affordable, sustainable and non-health hazardous RE systems. Thereby, latent demand for RE and other RE services will be enhanced and uptake increased for the benefit of local suppliers of RE equipment and consumers. In achieving this objective, CUTS would build the capacity of grassroots consumers as well as their representatives such as community based organisations, farmer groups, civil society organisations and county government representatives.

Some of the key items of a CUTS intervention would comprise:

- Campaign on off-grid, RE sources in terms to highlighting its benefits
- Assessment of policy, regulatory and administrative procedures to enable investment in RE sources
- Outreach and advocacy for greater attention towards off-grid, RE sources by government and development partners
- Pilot community mobilisation initiative to assess feasibility of off-RE projects

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