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Viability of Using Solar Photovoltaic Systems in Textiles Industries in Kenya: a Case of Rivatex East Africa Limited

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Abstract- The low supply and the high cost of electricity create a huge gap between demand and supply in Kenya, making industries to look for alternative ways of generating cheap and renewable power. This paper attempts to identify the challenges and drivers of the using solar photovoltaic system in textiles industries with a case of Rivatex East Africa Limited. The study adopted a qualitative research method in order to achieve the intended objectives. Data was collected using interviews. The findings indicates that for textiles industries to operate optimally and cut down on the production cost, there is need for alternative means of generating power and one of the options is to purchase and install solar PVC's. Another factor that motivates the textiles industry to invest on PVC is the sustainability that solar energy creates. The study also reveals that inadequate policies to encourage subsidies by the government, high cost of installation, challenges to access funding, high and fluctuating interest rates for loans to invest on renewable technology were identified as the major barriers to industries adapting to solar energy. Furthermore, the study revealed other barriers such as lack of awareness and inappropriate information concerning solar energy coupled with poor implementation of policies were also factors that were identified in the study. The study recommends that appropriate structures and policies that encourage subsidies for industries to be put in place to encourage such industries to invest in renewable energy. The government should also give support to industries in terms of funding renewable energy investments.

Keywords- Renewable energy, Textiles industries, Photovoltaic, Rivatex, Solar energy

I. INTRODUCTION

Energy is one of the major driving forces of a country's economy. Industries rely on adequate supply of power in order to operate effectively. The industrial revolution period ushered in an increased in consumption of energy to run machines in the industries. During those times, traditional forms of generating power such as the use of coal, fossil fuel to run the machines had adverse effects on the environment. The use of such traditional means of non-renewable energy was considered unsustainable, expensive and environmentally hazardous. In the textiles industries, consumption of energy has increase within the past decades, especially in the textiles industry that still have old and obsolete machines that still consume quite a lot of power.

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There is need to provide a more sustainable forms of energy in order to ensure that the cost of production is lower and environmental sustainability is also a very important goal that all industries in Kenya should strive to achieve.

Kenya's renewal of interest to support industrial development since Jubilee government came into power in March 2013 has attempted to lower the cost of electricity but it is still very expensive for production. One of the government strategies to attain vison 2030 was to promote industries with affordable energy infrastructure as a way of providing alternative, adequate and more cost-effective energy supply that is crucial for industrial take-off.

The current global threat of climate change has also re-ignited discussions about sustainability, which advocates production of sufficient energy to meet the present demands without compromising the ability of future generations to meet their own needs.

II. Literature review

Kenya is a country endowed with abundant resources which can be harnessed for energy generation. Despite the abundance of resources, Kenya still faces energy crisis for several decades. Chaurey and Kandpal (2010) noted that energy is essential for sustainable development of communities and also to reach the target set by Millennium Development Goals (MDGs). The electricity generating sector in Kenya is monopolized by Kenya Power Company (KPC) prior to this, it was previously known as Kenya Power and Lightening Company which was normally called (KPLC), Kirui (2006). For a country to attain development it is important to have adequate and reliable power supply system for both domestic and industrial demand, it is evident that supply of electricity in Kenya is still insufficient and unreliable to the entire country domestic and industrial needs. Is is in agreement with Randolph and Masters (2008) who argued that societies which must achieve sustainable energy in the future must strive to achieve improve energy efficiency in order to reduce demand and increase carbon-free energy sources. It is evident that Kenya energy is inadequate due to high rise in demand for electricity that is growing faster than the ability to install additional generation plants. Currently KENGEN produces up to 80% of electricity that is consumed in the country. Hydro power contributes 64.9% from 14 stations; geothermal produces a total of 45MW in Olkaria 1(1981, 1982, and 1985) and 70MW in Olkaria 2(2010), GOK (2011). Over-dependence on hydro-power exposes the country to power rationing due to extreme weather conditions that result in drought.

III. Solar Energy

When it comes to renewable energy, nothing can beat the sun. It has an expected lifespan of another 5 billion years. Yet, the sun and its solar power remain underutilized in many parts of India and most parts of the world. Too much electricity comes from sources that pollute the earth with harmful byproducts. Every day, there are scientists working on increasing the amount of power that solar panels trap from the sun and battery technology is also advancing by leaps and bounds to creates sources of power that are green and require a one-time investment and some occasional maintenance in the future as opposed to paying a company steadily month-on-month for the electricity provided to you. Photovoltaic devices generate electricity directly from sunlight via an electronic process that occurs naturally in certain types of material, called semiconductors. Electrons in these materials are freed by solar energy and can be induced to travel through an electrical circuit, powering electrical devices.

Globally, energy from the sun is one of the oldest and cheapest forms of primary energy which has been used traditionally for drying of agricultural commodity, preservation of foodstuff and drying clothes. Solar energy is a renewable form of energy gotten from the sun. Duffie and Beckman (1991) assert that primary energy obtained from the sun is harnessed and converted by solar panels to a secondary energy known as electricity.

The benefit of solar energy remains enormous even when compared to other forms of renewable energy forms, Haar and Theyel (2006). For example wind turbine, though a renewable energy source, normally have the associated problem of noise during operation, requiring open and spacious areas for installation while photovoltaic cell can easily be mounted on rooftops. Wind turbines also require much more maintenance than photovoltaic cells.

Hydroelectricity on the other hand, although from a renewable source, offers less benefit when compared with solar energy. Given the fact that for hydroelectricity to be supplied it requires construction of dams, which are expensive and building dams affects aquatic life and has the potential of altering an entire ecosystem.

IV. Rivatex

Rift Valley Textiles Limited (RIVATEX) was established in 1976 between the Kenyan government represented by the Industrial & Commercial Development Corporation (ICDC) and a consortium of foreign investors. The company was a vertically integrated textile mill with spinning, weaving and wet processing operations. Till 1990, the company operated effectively and profitably. In the early nineties the Kenyan government embarked on Structural Adjustment Programs (SAPs) instituted by the International Monetary Fund (IMF) and the World Bank. The main thrust of the SAPs was to make a shift from the protected domestic market to a more liberalized environment. The textile industry including RIVATEX was badly hit by the SAPs as the industry was not ready for competition from the established and modern technology in other parts of the world. The company became sick and eventually ceased operations in the year 2000. In terms of energy costs, the company has been incurring high cost leaving the organization with no other option but to look for alternative energy sources. Rivatex on its part has tried acquiring new technology which is energy efficient in various manufacturing areas thereby reducing energy consumption. Installing solar panels shall help reduce power bills and ease the pressure on the grid and thus allow others to utilize the released power consumption to create more jobs and spur economic growth. Rivatex East Africa Limited still relies heavily on wood energy to generate steam in the factory and this has a negative impact on the environment from deforestation and environmental pollution on burning of wood.

The demand for electricity in the company is 2839 KVA and the daily electricity consumption stands at around 54,879 units. The table below shows the cost of electricity rose in the year between 2010 and 2012 when compared to the previous financial year.

Table 1: Electricity consumption and saving annually

	2010/2011	2011/2012	%Change
Consumption (Kwh)	3,003,249	2,134,270	-29
Cost (Kshs.)	22,656,338	28,905,371	28

Source: Research 2015

However, in the above figures, it shows an overall increment in the total cost of electricity despite of the 29% saving in actual unit consumption. This is as a result in the increase in tariffs especially the fuel, forex and inflation adjustments.

As a result of high costs during the period, the company proposed to address the erratic unit cost of energy by putting in place modalities of installing solar panels for lighting in order to reduce electricity costs.

The company also operates on wood fired boilers which consume considerable amount of firewood which is detrimental to the environment. The company plans to phase out wood fuel fired boilers upon fruition of the wind power generation project thus reducing carbon emission and environmental degradation.

V. Materials and methods

The study was carried out using a descriptive, exploratory and explanatory way to provide in-depth insight due to the exploratory nature of the research. Examining different aspects of the context as a whole was aimed at enhancing the understanding of the present condition of solar energy technologies in industries. There exist different literatures concerning the adoption and barriers of renewable technologies and solar systems in terms of what the government has done or should do. In depth interviews was carried out in order to gain knowledge of specific issues or factors of the drivers and barriers to solar PV system. A survey of available solar information in industries in Kenya including previous projects by government and non-governmental organizations, meteorological service, and universities was carried out. Data and other relevant information were gathered and for validation selected for analysis.

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VI. Results and Discussion

Kenya being a developing country with growing energy demand day by day due to the growing population and setting up of new factories it can be noted that it will be hard for the energy sector to grow towards Solar PV system due to the long lead times. In the near future more thermal energy will be used as it has short lead times which can provide energy after the installation of generators running on fossil fuels.

The government has some targets which it intends to achieve by 2030 for example improving the current geothermal generation from around 200MW to 5,110MW. Though this is achievable it will need commitment and big incentives to attract investors who are more likely to invest on thermal energy. Another challenge is the cost factor; to generate 115MW thermal energy it cost the government 11Billion Ksh while to generate 300MW of wind for example the Lake Turkana project will cost 75Billion Ksh which could generate over 700MW from thermal in a shorter lead time.

The peak load in Kenya currently is 1500MW and is to rise to 2511MW is 2015 and later to 15026 in 2030. If the predictions are right and 15026MW will be required by 2030 then it provides the government with an enormous challenge on how to generate this energy in less than 20 years time. This can be a good time for Solar PV system like wind and solar to flourish if the government is to plan and acquire all the regime data required by investors. If the government does not pass legally binding targets in the next five years then it will be impossible to get substantial amount of energy from RE by this time. This will in turn open investment opportunities for thermal energy using fossil fuels to try to get enough energy for the economy.

Some of the initiatives that the government started before for example the 'umeme pamoja' can be effective especially in poor rural areas. In these areas most people struggle to get money for food and fees to educate their children. It is almost impossible for them to get loans to pay for grid extension. Another issue is that the cost of grid extension depends on how far a house is located from the grid, this provides another challenge where people are scarcely populated and they have less income. The government needs to extend the grid to every rural area so the distance to grid is less. The other best scenario is the use of micro grids for example use of solar panels of wind power to serve a certain region. Solar PV system requires some capital to start the projects and get them running. In a country which is still struggling with poverty, hunger and security issues the cost burden increases. In this scenario to be realistic the government will spend a substantial amount of its budget to buy food, provide security and improve the welfare of the people. Though energy is a key to improving the welfare of the people but it will be outcompeted by other factors like providing descent houses for example to people leaving in slums. Energy from Solar PV system is still attainable but it will cost the government to have legally binding targets and polices which have to be enforced if Solar PV system is to compete with other interests in the country. From the study, 12 participants confirmed that acquiring information about solar technology, its capacity, how it works, its maintenance needs, its reliability and longevity through professional advice, seminars and exhibition provided a good preparatory ground for their decision making.

However if there was a body responsible to sensitize and provide information regarding solar PV systems, where potential consumer could go or make a call directly to get professional advice or adequate information about the product, perhaps textiles industries experiences would have been limited to contact from such body or organization. Again it's impossible to establish if having such could facilitate the decision making process of consumers since consumers should be aware of who and where to contact in search of such information.

The respondents interviewed also highlighted that lack of knowledge, costs associated with solar PV system and industries preferring extension of grid other than use of micro grids creates a barriers to development solar PV systems in the company. Fear of inefficiency was also evident from the study; managers feared that installing expensive solar PV systems could bring in some inefficiency that even though the solar system provides much potential, it's impossible to capture all of its energy because most solar panels convert less than half of the sunlight beaming down on them into electricity. The respondents also cited that due to the fact that solar power is intermittent it is very hard to provide the same amount of power all day for example during the night time or during cloudy days the renewable energy generation falters. On the other hand, some managers who responded to the interviews noted that the maintenance costs of solar PV systems is high because every inch of a solar panel must be kept clean and clear of debris. This is owing to the fact that efficiency of solar system drops drastically even when a small portion of the panel is blocked by a leaf or a thin film of dust.

VII. Recommendations

The study recommends that appropriate structures and policies that encourage subsidies for industries have to be put in place in order to encourage future adoption of solar PV system in other industries in Kenya. The government should also put in place Solar PV regulations and enforce this rule, also licensing of solar PV technicians, contractors solar PV practitioners should be empowered across the country. Kenya being a third world country still faces developmental problems of low income per capita, which reduces the spending power of industries to implement solar PV system. The high cost of installing renewable energies presents an economic and financial barrier to contend with given the cheaper cost of conventional energy form. Such financial barriers arise from the lack of access to capital, inappropriate subsidies by government. Development of programs to educate and enlighten the industries both in the rural and urban will be very effective, so the industries will be well informed about the capabilities and benefits of solar PV systems. Such education will reduce the timeline for decision-making of potential industries to install solar PV systems.

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For the Kenyan renewable energy sector to grow the government should be play a critical role by having zero or minimum tax demand on companies intending to install solar PV systems, subsidies to encourage patronage of the new systems and enabling access to credit facilities in order to boost the renewable energy market. The research and development centers should be strengthened to promote local manufacture of equipment suitable for the industries conditions which has the potential of reducing cost from imported equipment and reduction of importing sub-standard products.

VIII. Conclusion

For a country to attain industrial development it is important to have adequate and reliable power supply system for industrial demand and a viable solution to combat energy deficit in Kenya is to enhance the use of solar PV in industrial sectors. From the study, there are still many barriers in installation and adoption for example the initial costs of acquisition and installation due to high taxes and duties, lack of awareness in solar PV systems requires government attention to address them. By adopting solar PV systems in both industries and on small rural citizen the country can overcome energy crisis and attain vision 2030 pillar of energy sustainability within a very short time.

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