Exploring Challenges and Prospects of Solar Energy Entrepreneurship of Accra Metropolis in Ghana

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Abstract

The demand for power in Ghana is increasing at a pace of 10% each year. To shift away from traditional energy-intensive economic development and its negative environmental impact, the government has begun to heavily promote the development of solar photovoltaic technology. This study explored the challenges and potential of solar energy entrepreneurship as well as the capacity of solar energy enterprises in the production and supply of solar energy, and the methodologies for implementing solar energy businesses in Ghana's Accra Metropolis. The research took a qualitative approach and used an exploratory design. The data were analysed thematically with the aid of NVivo version 11.0. In comparison to predicted market demands, solar energy firms did not have the resources to produce and supply solar energy. In addition, to promote their operations in Ghana, solar energy companies have used techniques such as discounts, instalment payments, and price reductions for goods and services. Furthermore, high interest rates, inadequate incentives, insufficient access to finance, and a lack of technical know-how for the operation and maintenance of solar energy technology were all obstacles to investment in solar energy generation. Notwithstanding the difficulties associated with its operations, the prospects for solar energy production in Ghana remain bright. The study recommended that the Ministry of Energy, in collaboration with renewable energy technology companies, educate the public about the benefits of solar energy technologies; the Ministry of Energy, in partnership with the government, ensure that the promise made in the energy policy of a 50% tax reduction on all imports of electricity goods is achieved. Moreover, financial institutions should make it easier for energy-producing firms to obtain credit.

Keywords: Prospects, challenges, solar energy, entrepreneurship, Accra Metropolis

1. Introduction

With the greenhouse impact and the increase of the rate of power, new ways to supply energy are intensively developed consisting of gas mobile, bio-gas mobile, nuclear, biomass, wind electricity and Photovoltaic (PV). Amongst most of these renewable energies, photovoltaic appear very promising. Certainly, only 0.2% of the sun energy which touches the earth’s surface is enough to supply energy for the complete world (Aartsma et al., 2008; Tao, 2008). Several works have already been executed in this field with a view to enhance the efficiency of its supply. Renewable power technology provides natural techniques of harnessing strength for human use in this sort of way that the supply of energy is not depleted over the years. Photovoltaic sun electric technology era is one of the fine manners to offer energy in a clean manner without a doubt everywhere around the world. PV systems are modular, generating strength without delay from sunlight and do no longer provide upward thrust to harmful emissions. They (PV structures) can be deployed very swiftly in each rural and concrete environment. Sun PV call for has grown consistently with the aid of 20-25% per year over the last 20 years while

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solar cellular costs fell from $27 per watt of potential in 1982 to much less than $4 per watt these days (Anon, 2006).

Poverty alleviation is an international concern that has caused the United Nations to set the Sustainable development dreams. Those dreams can be fostered partly by making sure that electricity is made to be had to the rural populations of the arena, majority of that are discovered in growing countries. This has necessitated the need to harness renewable power resources for strength generation for the subsequent motives: together with a suitable battery, it may be hooked up in a totally quick time and could offer enough electricity for numerous compact fluorescent lights and a radio or television for 4 to five h an afternoon. This may be lifestyle-changing for a circle of relatives in rural Africa, Asia or Latin, the US, wherein small ranges (quantity or amounts) of electrical strength could make a sizable effect in their general of living.

The Renewable energy quarter has turn out to be a using pressure for a sustainable financial system in the twenty first century. Investments in renewable strength and power performance will lead the way out of the monetary disaster that Europe and the sector at large are going through nowadays (Hamm, 2014). Confronted not only with an economic disaster however, additionally with the venture posed by weather trade, as well as increasing import dependency and growing fossil gasoline charges, it is a matter of urgency that we give you an answer now and for destiny generations on the way to conserve financial and social livelihoods and keep a balanced ecological gadget. Through promoting renewable strength technologies such as solar electricity, we will tackle both the security of electricity, deliver, and hold the surroundings, whilst on the equal time growing a destiny orientated sustainable economic system (Friederike Adra, 2014). Because of the social, environmental, and financial problems related to other energy, Ghana has no other option than to take advantage of usage of its renewable electricity resources. However, most of the modern renewable electricity (RE) initiatives set up over the years in Ghana are not feasible and many have already collapsed.

Problem Statement

Over the years, there have been infinite discussions on the issue of strength, powerful and sustained get entry to electricity plays a huge function in enhancing people’s residing conditions and contributes to financial and human improvement. Strength offers offerings to fulfil many simple human wishes, especially warmth, mechanical power (e.g. water pumps and transport) and mild. commercial enterprise, industry, commerce, and public services along with current healthcare, training and communique are also particularly depending on get admission to electricity services (Apergis et al., 2010).

Certainly, there is an instantaneous dating between the absence of ok energy offerings and plenty of poverty signs along with toddler mortality, illiteracy, life expectancy and overall fertility fee. Inadequate get right of entry to energy additionally exacerbates fast urbanization in developing international locations, by means of driving humans to are seeking higher living conditions (Schipper & Meyer, 1992).

In reputation of the essential need to improve global access to sustainable, low cost and environmentally sound electricity services and assets, the UN Secretary general released a worldwide Initiative to obtain “Sustainable energy for All by the end of the year 2030”. The key goals of this initiative are: (1) making sure well-known get entry to trendy strength offerings; (2) doubling the price of enhancements in energy performance; and (three) doubling the share of renewable energy within the international strength mix (energy commission, 2012).
At the same time as kingdom rules regularly play an essential role in the promotion of RE technologies, entrepreneurs are key sellers for his or her development (Gabriel, 2016). RE marketers enhance the combination of the way of production and consequently represent a giant hyperlink in facilitating the transformation of innovation primarily based RE technologies and their transition into feasible strength structures (Nanda, Younge & Fleming, 2014). For example, in Ghana, the energy fee is charged to make sure these key targets. However, it wishes different corporations and private organizations to assist actualize those goals but, the hypothetical demanding situations and problems in manufacturing, distribution amongst others demotivate marketers from attractive inside the solar strength business. With all these in thoughts, this study sought to find answers to fill this gap in knowledge due to the shortage of empirical proof at the challenges and prospects of solar power marketers in Ghana. The study further explores the capacity of solar energy companies in the production and supply of solar energy as well as the strategies for the implementation of solar energy business in Ghana.

The outcome of the study is of infringe benefits since the findings will unveil the potentials as well as the challenges associated with the investment, production, and intake of solar power in Ghana. Moreover, the findings will provide in-intensity records to assist stakeholders consisting of buyers, NGOs, local solar energy carriers and authorities’ companies of their selection making toward investing, generating and consumption of solar energy. Ultimately, the results will contribute to the confined pool of sources at the demanding situations and possibilities of solar strength manufacturing in Ghana. this could contribute to academic discourse because it serves as yardstick for further and related research.

2. Methodology

This phase elaborates on the technique used in carrying out the study. It is vital for the conduct of this research as it puts a prism on all necessary activities for the study. It spells out the studies philosophy, studies method, research strategy, studies design, studies system and and, statistics collection and instrumentation. Furthermore, it includes very well clarification of each of the methods used and how its usage helps to actualize the ambitions and objectives of the study. The study was underpinned by the interpretivism philosophy which entails organised research into the socially meaningful movement of humans in the society through the direct and precise statement so that it will arrive at understandings and interpretations of the way human beings create and preserve their social world in a naturalist method (qualitative in nature). It was therefore, organized in a qualitative approach. A qualitative technique is interested in understanding the meaning people have constructed, this is, how people make feel of the world and the stories they have inside the international (Merriam, 2009). An exploratory design was employed in carrying out this study. This permitted the study to be conducted in a naturistic way through administration of interview guide to 10 participants who were purposively selected from their respective solar energy companies in Accra Metropolis. Saturation was reached on the 10th participant.

2.1 Data Preparation and Analysis

Data evaluation is a systematic search for meaning. It is the way of organizing and interrogating records in ways that allow researchers to look patterns, pick out subject matters, find out relationships, develop explanations, make interpretations, mount reviews, or generate theories. It regularly includes synthesis, evaluation, interpretation, categorization, hypothesizing, assessment, and pattern locating (Hatch, 2002). The recordings of the interviews conducted were transcribed verbatim. The write-up was subjected to the qualitative records analysis, consequently,
thematic analysis with the aid of NVivo version 11.0. With the qualitative analysis, salient functions that had been consistent with the research questions and subjects were compiled and coded. The research relied closely at the recording of speech and writing of moves and pronouncements with the aid of the people being studied. Consequently, recurring subject matters were recognized and interpreted. Direct quotations or verbatim expressions of the individuals shaped a vital part of the evaluation. A structured procedure was utilized in analysing the qualitative facts.

2.2. Credibility

Credibility was ensured with the involvement of wide range of key informants whose responses acted as a check on assertions or previous information shared. This form of triangulation involved the use of different methods, including IDIs, and observations, and content analysis of different documents to compensate for their individual respondents’ limitations. As indicated by Shenton (2004), the method served as a back-up or supporting evidence which provided extra data to explaining the background of the respondents and the phenomenon under study.

Furthermore, the sampling procedures was deemed fit to ensure credibility. Though purposive sampling dominated the procedure for selection, voluntary nature, according to Shenton (2004), negate any form of researcher’s bias in the selection of respondents. All the respondents were given the free-will to opt out of the discussions or interviews at any time they deemed fit, to ensure that respondents were only people who genuinely offered to take part in the study. In addition, Shenton (2004) advises that since there could be elements of lies and exaggerations, there is the need for conscious efforts of mitigation. The author suggested the use of probing to source for detailed data. This approach was employed in the designing of the data collection instruments, and during the fieldwork. Lastly, one key criteria observed, was the researcher’s ability to relate its findings to volumes of existing body of knowledge in the subject of inquiry, which according to Silverman (2001), is imperative for evaluating works of qualitative inquiry.

2.3 Trustworthiness

Trustworthiness refers to the degree of confidence in data, interpretation, and methods used to ensure the quality of data in the study (Pilot & Beck, 2014). Trustworthiness of qualitative research is criticized by many. The concept is seen as more obscure since qualitative researchers do not use instruments with established metrics about validity and reliability. Thus, it is indicated that concepts of validity and reliability cannot be addressed in the same way in naturalistic work (Shenton, 2004). Yet, it was relevant to address this issues by incorporating measures that have been prescribed by Pitts (1994) and Silverman (2001), that a qualitative investigator’s study findings should be credible, transferable, dependable and confirmable. In this study, parents who had children under five years with otitis media was interview since they were in the better position to give detail information about otitis media. Also, confirmability was ensured by providing detailed description of the methodologies used for the study as “audit trail”.

2.4 Ethical Consideration

Ethics means conforming to accepted standards and being consistent with agreed principles of moral conduct (Strydom, De Vos, Fouche & Del port, 2005). The study complied with the ethical concerns and code of ethics. The researcher sought permission from the management of the various solar energy companies in Accra and permission was granted to administer the interview guide. In the first place, the researcher introduced himself without providing any false impressions.
Secondly, informed consent was sought from the respondents. This was achieved by explaining or informing them about the nature and the objectives of the study upon which they willingly accept to participate by providing relevant information. Moreover, the study observed respondents’ rights of anonymity. It was further explained that names were withheld and will not attached to any report from the study. Finally, respondents were accorded their right to confidentiality. Information disclosed by respondents were used by the study for academic work only and not for any other purposes. Also, personal information and other important information were anonymized. Audio tapes were only accessible by the research team for. No names and unique identifiers were associated with any individual in the data. The audio tapes were deleted after a successful transcription and the transcriptions were then used for the analysis. Participants were also ensured of confidentiality during the field data collection.

3. Results and Discussions

3.1 Demographic Characteristics
Ten participants were interviewed from ten energy companies in Accra Metropolis. All the managers were males. Eight were Christians while 2 were Muslims. Four of them were within 31 to 40 years old, 5 were within 41 to 50 years while one was 54 years old. Most of the participants (8) were married while 2 were single. All their years of experience, 6 of the participants have been in the solar energy business for the past 10 years while 4 of the participants have worked for less than 10 years.

3.2 Capacity of solar energy company in the production and consumption of solar energy
This objective sought to examine the strength of the company with regards to the capacity in terms of skills, raw materials, and resources for production. Four sub-themes emerged from the various interviews gathered; Skills and the human resource to produce to meet the demands; How is your input (raw materials) issues in term of productivity; machines and tools for a larger productivity; Do you have special and needed equipment and machinery to produce the needed capacity to meet market demands; strength of the company in producing more to meet the demands of customers; and the strength of the company in producing more to meet the demands of customers.

Skills and the human resource to produce to meet the demands
On human resources, 8 of the participants claimed that they have employed not less than 15 workers while 2 of the participants have workers less than 10 and they normally hire some workers when there is huge contract. However, they agreed that is not easy to come by an engineer, electrician or worker who is expert in installation, repairs and maintenance among others, so normally they call for such expertise outside their company to assist them in big project or as at when their services are needed. Moreover, they complained that in case you even get those people, their terms and conditions or charges are high to bear. These were confirmed in the following except:

“Yes, we have employed several workers here who can do almost all normal work except big contract which demands experts or well trained and professional technicians, which for that matter, we have to hire outside to assist for such purpose. But apart from such cases, our workers here and good to do anything require by our individual customers and companies” (IDI – 54 year old, man)
“Yes, we have workers who are experts and well-trained in diverse ways with regards to solar energy technologies such as installation, repairs, and maintenance. Sometimes, when we get big contracts that demand more expert views and others, we call on the manufacturing company to send us some experts to accompany the goods and machines bought to assist us here for successful installation and others and those experts come and team up with our workers here to work for that. So our workers are ever ready to serve the market demands of our customers” (IDI – 42 years old, man).

“Yes, we have the workers here. As I said earlier, we have all the needed technicians and experts to do almost any kind of work with regards to solar energy technologies. For we have been in this business over 15 good years and we have worked on a number of projects here and there so we are ready to serve our customers with the best and quality goods too” (IDI – 49 years old, man).

“I will say yes because so far all the projects and work we have done so far here; we use mainly our workers here to do it all. Once a while, our technicians and experts attend workshops and refresher courses that improve upon their knowledge and skills in dealing with all manner of problems associated with solar energy technologies” (IDI – 38 year old, man).

According to Silva (2016) availability of technical assistance in the proximity of the end users is a key factor in countering the effects of market spoilage. The presence of technicians well versed in trouble-shooting, repair and maintenance of the MET systems in the locality increases the trust of the consumers. Due to the novelty or nature of most of the solar energy products, it is important to develop local maintenance capacity in the area where the products are being marketed.

Securing of input (raw materials) issues in term of productivity
Production cannot be successful without input or raw materials, therefore, to secure raw materials is a critical aspect of production when it comes to solar energy production. However, access to credit or finance for securing these raw materials is a great challenge to the companies. This was confirmed by 8 of the participants that securing of raw materials and other things for production is a problematic. Lucky for the remaining 2 participants, their company have partnership with some companies abroad that supply them with raw materials and needed machines intermittently that have been helpful for the effective production. These were confirmed in the following except:

“As for our company, we have some links with other companies abroad who normally send us goods on request intermittently. Thus, when we need anything, we just make a request to them and they get us our quantities to work with. It may only delays when they do not have it and have to search for some on our behalf and others” (IDI – 50 year old, man).

“My bro, securing raw materials and others for production is not an essay task. But the issue here is that, you cannot also do away with them, so definitely, you have to get such things for your work. Therefore, you have to get some credit or finance from these banks and you know their high charges and others so is not just easy for us. Aside that, even after getting the loan or finance, the dollar rate is also there waiting for you and you cannot skip it bro. so these and others make the work difficult and mind you all these processes affect our production which makes our charges for goods and services also high” (IDI – 45 years old, man).
“For securing of raw materials and others in this business is not easy ooo, but we are lucky to have joint or partnership with a manufacturing company abroad who supplies us with almost everything we need for production. We have worked with them for some time now, so some goods, they can give it to us on credit or pay part and receive it and immediately after the project, we settle them the balance. This has release a lot of burdens from us as compared to when we started business earlier that we were doing everything on our own. It was not just easy till we met such company and did some agreement to do business together” (IDI – 37 years old, man).

This confirms study conducted by Lay et al. (2013) that posited that access to finance has been defined as the most significant challenge to the penetration of solar energy technology in Africa of which Ghana is no exception. The effects of limited financing options are felt on all levels of the distribution value chain from the manufacturer through to the importers, distributors, dealers and finally the end user.

**Machines and equipment for a larger productivity**

On machines and equipment for larger production, 6 of the participants agreed that their companies do not have bigger plant or machines for larger production, but can do so only upon request as well as big contract. Due to the slow business of solar energy technologies, securing of huge machines and equipment just to keep them in your store without any serious business will be a waste of resources. Nevertheless, most of the participants (7) have the capacity in terms of machines and equipment as well as human resource to serve their customers for their demands, though, more hands may be needed for bigger project or contract that may either cause them to hire more or do outsourcing. Focusing on the future demands of solar energy technologies, 6 of the participants confirmed that they need to recruit more and train them to prepare for the expected market demand in the future since their current resources cannot serve such market demands soon. These were confirmed in the following except:

“As I have already indicated, we have some agreement with a foreign company that suppliers us with anything or machine we need for production. So if we get any contract that we think it may demand any additional machine or gadget, we just quickly link up with them and they will send it within time. So we are ready to serve our customers with the best and quality. So though we do not have almost every machine in Ghana but we can get any machine needed for our job when there is the need to do so.” (IDI – 50 year old, man).

“Yes, we have some machines here that can do the work. But when we get big contract that may demand additional machines, we will import some for such work. Therefore, just importing big machines with huge sums of money just to put them in our warehouse is not profitable. Last time we bought such machines, it was there for almost 3 good years without using it so some companies come to hire it for their production whenever they get contract that require its services. So have stop doing such things because it really affects our productivity, especially in this time that business is slow, so we can order for bigger machines when the market demands so and others.” (IDI – 54 year old, man).

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3.3 Strategies for the Implementation of Solar Energy in Ghana

Strategies count when it comes to productivity. Therefore, objective two sought to identify the various strategies employed by these companies in quest to produce to meet the demands of the customers, strategies to increase growth in customer base as well as the effectiveness of these strategies.

Readiness of the company to produce the request and requirement of customers

All the participants were ready to produce quality goods and act upon the request of their customers. They claimed that they have variety of goods and services that their customers can subscribed to. According to 4 of the participants, they have even instituted some packages for the working class that they can pay instalment and get their work done for them. Moreover, 3 of the participants have discount for some goods and services subscribe by their customers as market strategy to increase their market size. The remaining 3 do not have any special package for any group or service personnel, they claimed their goods and services are affordable so they normally take all their monies and delivery their goods and services to the customers. Furthermore, the seven (7) participants highlighted that their strategy was effective and successful since many people enrol on such package and get their work done for them. In addition, all these companies have their website where customer services are also provided, request and information are given to customers on goods and services as well as taking orders and specification demands from customers. These are some quotes from some participants:

“Yes, we have strategy to increase our customer base and market size. We have instituted a nice package for government workers where they can pay instalment while we get their work done for them. Due to this, we have a lot of government workers coming on board for solar energy technologies” (IDI – 41 year old, man).

“Yes, our strategy is that we have already reduce all our goods and services so it is affordable to all. Due to this, all manner of people come here to buy their goods and services. Is not meant for only the rich people, anybody can buy from us due to the quality and cheaper price we get here. And this strategy is very effective since it is meant for all people without any discrimination” (IDI – 38 year old, man).

“Yes, we have a strategy put in place. We have various packages for households and companies. It depends on the goods and services you prefer and you subscribed to. We have given discount on our goods and services depending on the category of goods and services you need. Even among households, some may prefer only lighting, others too prefer lighting, heating and even power for televisions, and even fridges so the discount packages differ. But the basic principle underlining the discount is that the more power you need, the more discount you get because the prices are higher with higher voltage or power” (IDI – 54 year old, man).

3.4 Challenges of Investment in Solar Energy Generation

Objective three was to examine challenges of these energy companies on investment. This reflected on the challenges of sales and distribution of solar energy technologies, effect of tax on production as well as securing of raw materials for production.

Challenges in the production of solar energy technologies
Generally, challenges with the production of solar energy technologies have to do with inadequate finance or access to credit, difficulty in securing of raw materials, limited skilled technicians, taxes among others. However, 8 of the participants admitted to the fact that inadequate finance or access to credit, difficulty in securing of raw materials, limited skilled technicians, taxes, climatic-related problem as well as installation problems. On the other hand, 2 participants claimed that aside weather conditions, taxes and raw materials, the rest depends on your expertise and experience in the business. These are some quotes from some participants:

“Yes, there is no business without challenges, however, with your experience in the business and the expertise you have, you can always reduce some of these challenges, especially problems related to installation, repairs and maintenance among others” (IDI – 45 year old, man)

“Yes, we face a lot of challenges in our production process of solar energy technologies. For most of the goods, we import, but just that we have to do some assembling here and there, repair and maintain some of them. But in all, money is the problem as well as limited skilled technicians to work with is the major challenge of this industry” (IDI – 42 year old, man).

Challenges in the sales and distribution of solar energy technologies
With regards to sales and distribution of solar energy technologies, 7 of the participants argued that there are low sales due to low trend in technology adoption in Ghana, especially among the low-income earners and illiterates. Comparatively, 2 participants claimed that business was good while a participant said that business was steady despite all challenges. This can be deduced that sales and distribution of solar energy technologies have reduce as compared to about 3 to 5 years ago when electricity power, especially the hydro power was a big problem in Ghana. The so called ‘dum sɔ’ period call for a higher market demands as compared to this period in which electricity power is quite stable for some time now. These were confirmed in the following except:

“on sales, I can say that it is normal. People do come and buy it small small” (IDI – 38 years old, man)

“Yes, sales of solar energy technologies is good. We have some of our agents who send the goods and services to the door step of the households, especially those living in the outskirt of Accra” (IDI – 42 year old, man).

“With sales, it is low. Comparatively, I can say that sales is low recently as you compare to 4-6 years ago. During the “dum sɔ” period, most of the people rely on renewable energy such as solar so there was great market for it, but now that the hydroelectricity power is stable, people have forgotten about us “ (IDI – 50 year old, man)

“sales are low, but it is business so we are managing small small” (IDI – 38 year old, man)

“as for sales, don’t go there for it has really come down. We are still doing our best to attract more customers especially in the period in which electricity power is stable and has been highly reduced for them. Hmmm, it is not easy for our business, but still we are it hoping for the best.” (IDI – 47 year old, man).
This was similar to the study conducted in Kenya in 2013 by Lay et al. (2013) that Some of the greatest operational failure risks include planning errors, installation defects, weather-related damage, and product performance related reductions in output during operation.

**Effect of tax on your production**

On taxes, all the participants (10) said that it really has effect on their production. They voiced that high tariffs and taxes on imports affect their production since almost all their raw materials are imported, therefore, when taxes on their goods are high, definitely it will affect the price of goods and services provided by them which in tend affect the market of solar technologies. Some commented that the energy commission has proposed a 50% weaver in their ACT which starts from 2021 so they look towards that promise. Others also complained that this really affect their day to day activities, especially with repair and maintenance since majority of the parts are imported and taxes will let it delay at the ports which also delays the repairing and maintaining of solar technologies. These were confirmed in the following except:

“hmmmmm, taxes and our production is directly related ooo. Boss, we cannot do away with taxes but high taxes affect our production negatively. It is not easy to secure even raw materials or inputs for production of solar energy. Little machine and the taxes make it very expensive while our local people too like cheap things, so how are we going to do it to maintain quality at the same time affordable? That is our problem and this really affect our business. This makes our goods and services a little expensive which makes most households think that it is only meant for rich people and they cannot afford such luxury goods. But, our goods and services are meant for each and everyone but due to some taxes here and there, our prices are not attractive to the low-income earners.” (IDI – 54 years old, man).

“Yes, tax really affect our production. You know we do not manufacture our raw materials in Ghana, so almost every raw material including machines for installations and repairs are all imported. Therefore, when taxes are high, it will affect the prices of goods and services and deter the customers from either not patronizing in our goods or not reducing the quantity of goods and services to deal with us. So in whatever ways, taxes really affect our business. And we keep on pleading with the government to do something about the taxes on importation of renewable goods.” (IDI – 50 years old, man).

“I can recalled that Dr Bawumia, at a town hall meeting in Accra in April last year, announced the policy which would see a 50 per cent reduction in the benchmark values for general imports. I was so happy to hear that and look forward to see that in reality. I know it will go a long way to help our industry as it will help to reduce prices of goods and services as well as improving days and time for responding to repairs and maintenance of solar technologies for individual customers and companies”. (IDI – 48 year old, man).

3.5 Prospects of Solar Energy Production in Ghana

The last objective, objective four (4) was to examine the prospects of solar energy production in Ghana. Through this, themes such as “market demands of solar panels and accessories”, solar
energy production in Ghana for the next 5-10 years, usage of solar technologies in the next 5-10 years in Ghana and opportunities for solar energy companies in Ghana.

Market demands of solar panels and accessories
Out of the 10 participants, 7 of them claimed that market demands for solar panels and related accessories will increase in the years to come. On the other hand, 3 of the participants were not sure and posited that it can be steady for some years before it can increase. Most of the participants expected the market demands to increase in next 5 to 10 years to come because they believed that gradually, hydroelectricity power is failing the country, so it is fading off the system and renewable energy such as solar, wind and biomass is taken over. Therefore, they expected that solar energy production will boom in the next 5 to 10 years ahead due to the prospect of the market to increase at an increasing rate. These were confirmed in the following except:

“Yes, we believed that market demands will increase with some time to come. I think people need sensitization and more education to adopt to these renewable energy technologies such as solar panel and the rest. I think that when people get to know the benefits and how they can save their income through the use of these solar energy technologies, they will come on board” (IDI – 48 year old, man).

“Sure, it is expected to increase, even looking at the policy by the energy commission, it is expected to increase by 10 percent, so we hope to see it happening in reality” (IDI – 54 year old, man).

“For increase, am not sure, but even if it would increase, it would be at a lower or slower pace. (IDI – 50 year old, man).

Usage of solar technologies in the next 5-10 years in Ghana
Concerning the future usage of solar technologies in the years to come, 7 of the participants had confidence that usage of solar technologies is bound to increase in the next 5 to 10 years to come. Nevertheless, 2 of the participants were not decisive or sure while a participant claimed that it will take some time for its usage to increase. This is not surprising since solar products keep on increasing which provides varieties of solar technologies usage to customers. These were confirmed in the following except:

“First, I thought it was going to increase at a faster rate, however, for few years after stabilization of the hydroelectricity power, things have come back to stay. Though we expect its usage to increase, but not at a faster or higher rate looking at how things are going on now” (IDI – 54 year old, man).

“Yes, definitely, usage is bound to increase but for the rate, I cannot tell. I think many factors may influence the rate of increase of usage of solar energy technologies” (IDI – 50 year old, man).

Opportunities for solar energy companies in Ghana
All the participants believed that there are more opportunities for the solar energy companies in Ghana, especially, in the time in which the government is also committed in the provision of renewable energy as an alternative for hydroelectricity in Ghana. Currently, the biggest renewable solar plant in in Ghana at Nzema. In view of this, there is high prospects of renewable energy

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sources in Ghana still require extra efforts to enhance their development and efficient utilization in the country (Asmah, Johanna & Ahunu, 2015).

Ghana is endowed with adequate renewable energy (solar, and wind) resources, which could be exploited to the benefit of the national power system. The average solar irradiation levels in Ghana range between 4-6 kWh/m2-day (Energy Commission, 2012). The high values of solar irradiation recorded during the dry season, which is mostly when hydro generation is inadequate due to low water inflow for instance, qualify for power generation using solar photovoltaics (PV).


Looking at the overall challenges of solar energy production, the findings of this study confirm that of Mudrasiru, Sarfo and Maduka (2020) that found that most challenging obstacles include; cost of financing high interest rate, lack/insufficient incentives (tax rebate, grants etc.), lack/inadequate access to finance and long-term capital, grid connection constraints and lack of grid capacity, instability of the local currency (currency fluctuations), insufficient technical know-how for the operation and maintenance of renewable energy technologies. Ghana has enough policies and regulations to overcome these challenges if they are well implemented and enforced (Mudrasiru et al., 2020).

4. Conclusion
The solar energy companies were not fully resourced for the production and supply of solar energy compared to the expected market demands of customers. Also, solar energy companies have adopted some strategies such as discount, instalment payment as well as reduction of prices of goods and services to boost their businesses in Ghana. Moreover, challenges of investment in solar energy generation included cost of financing high interest rate, lack/insufficient incentives (tax rebate, grants etc.), lack/inadequate access to finance insufficient technical know-how for the operation and maintenance of solar energy technologies. Furthermore, prospects of solar energy production in Ghana are high despite the challenges entangled with its operations. Based on these, the study recommended that the Ministry of Energy in collaboration with the renewable energy technologies companies should educate the populace on the benefits of solar energy technologies. More and effective strategic measures should be employed by solar energy companies to increase their customer base or sales. Moreover, the Ministry of Energy in collaboration with the government should ensure that the promise made in the energy policy of taxes reduction of 50 percent for all import on electricity goods should be implemented. Furthermore, financial institutions should increase access to credit facilities for energy producing companies. Lastly, the Ministry of Energy in collaboration with the stakeholders of the renewable energy sector and private companies of solar energy technologies should organise adequate workshops and skill training for technicians.
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