

Policy Brief



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Institute for Natural Resources in Africa

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Solar Energy as Alternative Energy Source in Ghana: Stakeholder Uptake and Business Case

Keywords: Ghana, solar energy, renewable, energy access, economic growth

● Summary:

In recent years, the discovery of oil and gas together with Ghana's quest for sustainable development has led to the positioning of renewable energy as one of the core technologies for power generation. The National Energy Policy aims at ensuring that renewable energy constitutes 10 % of Ghana's total energy mix by 2030. The United Nations University Institute for Natural Resources in Africa (UNU-INRA) undertook a study that aims at comprehensively assessing the uptake of solar energy in Ghana, exploring the potential and the enabling environment needed to ensure that green businesses operating in the solar energy business are profitable, as well as making recommendations on the enabling environment required for the scale up of solar installations and use in Ghana.

Introduction

The positive relationship between energy supply and economic development has been well documented in literature. Many developed countries have taken advantage of this relationship to develop their energy sector to spur growth and development. Ghana has many challenges with regard to energy demand and supply, with serious implications for economic growth and development. The low rainfall in the 1980s made it difficult for the Volta Lake to have the required volume of water for hydro generation which partially led to the energy sector reforms in 1994. One component of the reform was the diversification of the generation mix to include thermal energy. Today there are many Independent Power Producers (IPPs) in the electricity generation market which was hitherto reserved for the public sector. Involving the private sector in power generation has improved the situation through the inflow of additional capital and investments.

In recent years, the discovery of oil and gas together with the country's quest for sustainable development has led to the positioning of renewable energy as one of the core technologies for power generation. The National Energy Policy aims at ensuring that renewable energy constitutes 10 % of Ghana's total energy mix by 2030. Ghana's Nationally Determined Contributions stipulates a target of 150-250 MW of solar installed capacity of by the year 2030.

Following the launch of the Scaling-up Renewable Energy Program (SREP) in 2015, public and private support for renewable energy, especially solar energy, has fairly increased in terms of production, uptake and use. However, the expected patronage of solar energy as an alternative source of energy is yet to be achieved, suggesting that there is a gap between policy on one side, and production, uptake and use of solar technologies. For example, as of 2016, the share of renewable energy in Ghana's total energy mix was only 0.6 % of which solar installations comprised 93.4 %. It is in view of this that the United Nations University Institute for Natural Resources in Africa (UNU-INRA), the coordinating body of the Policy and Regulatory framework component of the Ghana Climate Innovation Center (GCIC) undertook a study that aims at comprehensively assessing the uptake of solar energy in Ghana, exploring the potential and the enabling environment needed to ensure that green businesses operating in the solar energy business are profitable, as well as making recommendations on the enabling environment required for the scale up of solar installations and use in Ghana.

Methodology

To effectively address the issues, data collection was sectioned into three main components –desktop research, stakeholder interviews, and a contingency valuation survey to gather consumers' stated preferences for solar energy. The survey also collected demographic, attitudinal, behavioral information as well as energy demand of households.

Results

As regards institutional structure for the management of the power sector, we observed that there is an adequate number of institutions with well-defined roles and responsibilities, namely: Ministry of Energy (policy formulation), Public Utilities and Regulatory Commission and Energy Commission (PURC and EC - regulatory), Volta River Authority and Independent Power Producers (VRA and IPPs - generation), Ghana Grid Company (GRIDCo - transmission) and Electricity Company of Ghana and Northern Electricity Distribution Company (ECG and NEDCo - distribution). These institutions have performed creditably to some extent. However, more needs to be done to improve the operational efficiency of the sector, especially that of the transmission and distribution institutions. Distribution losses alone is estimated at about 20%, which is too high.

The 2010 Energy Policy that takes cognizance of the United Nations Sustainable Energy for All (SE4ALL), and the Renewable Energy Act of 2011 have laid the foundation for the promotion of the energy sector, although most of the targets for conventional and renewable energies have yet to be achieved. Also, the SREP Investment Plan was launched in 2015 to accelerate the development of a sustainable renewable energy sub-sector. In 2017, the Renewable Energy Masterplan (REMP) was prepared and has helped increase investments in both public and private sector projects (REMP, 2017). However, many of the strategies put in place to promote the exploitation of renewable energy have not been fully implemented. A stakeholder consultation on the effectiveness of the policies concluded that the policy documents were only moderately effective in contributing to growth in power capacity.

In terms of solar mapping, the total volume of renewable energy, i.e. wind, solar, hydropower and waste to energy (W2E), installed in Ghana between the years 2013 and 2016 amounted to about 41,696 kW. This figure is a conservative estimate as majority of off-grid solar installations are not reported. Majority of these installations were made in 2014 as the installed capacity for that year was about 31090 kW. As per data obtained from the EC, total installed capacity of solar as a percentage of total renewable energy installed capacity is about 73.8%. This estimate should be taken as the lower bound since many users do not report the installations they make, especially at the household level.

Of the 133 installers licensed by the Energy Commission (EC), 93% of them are in the Greater Accra Region. Although solar installations began in earnest from 1998, about 99.3% of total solar capacity installations occurred between 2013 and 2016. It can be observed that after the enactment of the renewable energy law, solar technology took off strongly.

Disaggregated data by kind of major installation reveals that household installations do not yield significant capacities, compared to large business installations. Specifically, the over 853 household installations recorded by the EC nationwide had a total capacity of 426.50 kW while the six production companies recorded had an installed capacity of 20,644 kW. The implication is that small stand-alone household systems may not be the best option for expanding the share of solar energy. This could be attributed to economics of scale and efficiency, which increases in tandem with the size of installation, and the cost of storage which is omitted in large scale installations.

There are different brands and qualities of solar products, with the cheaper products being of inferior quality. A notable observation is that many households prefer cheaper products possibly because of low-income levels. Thus, they are more likely to experience problems. However, businesses are more inclined towards quality products; they can afford it and they benefit from lower unit costs because of the scale economics. Like businesses, households are quite satisfied with the use of the technology and are of the opinion that solar energy has the potential to solve the energy needs of the country, given the right policies.

For households, the decision to use solar technology was due to the unreliability of electricity supply by ECG. This implies that the non-availability of a reliable electricity system is the main driver for the adoption of solar systems and not the long-run cost effectiveness and environmental considerations. This could have serious implications for the future of the technology if awareness is not created. The satisfaction of households with solar technology is corroborated by majority of respondents who demonstrated willingness to pay more than they are paying currently for conventional electricity.

Business, financing and marketing models are not well developed in the solar energy industry. For instance, only three main financing models have been used in Ghana, a situation that does not help technology adoption. The fact that installers/importers of solar energy reported solar technology as having a future in Ghana aligns well with the willingness to pay for solar technology. Specifically, about 64.1% of households are willing to pay more for the use of solar technology. Overall, households were willing to pay about GHc14.00 more for the use of solar technology. Analysis of the factors that influence willingness to pay showed that ownership of property, savings, being a native, climate effects, average monthly expenditure, as well as being in professions such as trading, handicraft, mining, manufacturing and services, compared to farming, are the main factors that affect willingness-to-pay.



The National Energy Policy aims at ensuring that renewable energy constitutes 10% of Ghana's total energy mix by 2030.



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0.6%

Recommendations

Regulations:

There is the need to speed-up the implementation of reforms (privatization) at the ECG and NEDCo to improve their finances and credit-worthiness, while supporting GRID-Co to improve the structural integrity of the grid systems to wheel more energy to the end-user. Ensuring that non-tariff barriers and administrative bottlenecks at the ports are reduced will also spur growth of the industry. Furthermore, incentives should be provided to encourage local production of solar panels, and make them cheaper than imported ones. Effective implementation of the FiT (Feed-in-tariffs) together with the net metering system could also encourage more investors to go into the sector, which will benefit the up-scaling of solar technology.

Training:

Developing, in collaboration with the private sector, a standardized demand-driven curriculum for competency-based training on solar technologies, with emphasis on technical and entrepreneurial aspects such as financing, maintenance, production, installation, marketing, business development will benefit the industry immensely. It is also imperative to equip the technical universities in order for them to be able to undertake research and train solar technicians, while encouraging them to form partnerships with the private sector and industry to ensure that their training becomes relevant to the solar market.

Education and awareness:

Government should outline concrete programmes to educate the public and create awareness on the technology to engender the needed support and buy-in. Broadcasting specific radio and television programs both in English and Ghanaian languages, alongside promoting dialogue and generating feedback on the performance of the technology, is imperative.

Procurement and Knowledge Transfer:

Procurement in the sector should take into account Local Content Law. Government can facilitate this by establishing an office to serve as watch-dog for all contracting and procurement activities in the solar industry. Procedural guidelines should be outlined and applied strictly across all stages of the procurement process to ensure local content. To critically assess the local content of contracts, evaluation mechanisms should be put in place, with attention to key considerations such as value added in Ghana both in manpower and monetary terms. Emphasis should not be on ownership of company but rather whether the work will be executed in Ghana or abroad.

Research and technology development:

Government should grant relevant research institutes and universities technical assistance and financial support to build state-of-the-art laboratories to conduct research into solar technologies. The EC and stakeholders in the industry should identify research needs of the sector and collaborate with relevant institutions to address these. Also, licenses granted to international companies should make provision for technology development cooperation between such companies and Ghanaian institutions. Government should ensure that a specified percentage of research and development needs of foreign companies are sourced in Ghana, from Ghanaian institutions. Further, reducing the over-reliance on foreign expertise for execution of projects, through deliberate efforts to improve local expertise, is imperative. Improving local expertise would require the establishment of national competitive bidding systems (using the Renewable Energy Fund, for example) that give stakeholders access to grants to fund critical areas of research and development in solar technology.

Licensing and standardization:

It is imperative to review the renewable energy provisional license regime as well as the number of requirements for the acquisition of licenses. Also, creating an on-line platform for completing licensing procedure will facilitate the registration process for potential technology developers. Further, simplifying and decentralizing procedures for standardization and licensing as well as strict enforcement of standards will make it difficult for consumers to be cheated. As a way of supporting the industry, fees for licensing and standardization could also be reduced.

Marketing and financing models:

There is the need to incentivize financial institutions, particularly banks, to offer green loans at lower interest rates. Also, complementing and/or strengthening existing business and financial models such as proof of concept, pay-as you-go, supplier finance, end user financing as well as the creation of funds such as cooperation funds and revolving funds will help up-scale solar technology in Ghana. Also, efforts should be made to support solar technology upscaling by companies and business entities, considering they consume significant amounts of energy and have the resources to invest in large solar technologies. Harmonizing public information on investments from both public and private institutions will encourage competition in the market which can drive down price ultimately.

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The United Nations University Institute for Natural Resources in Africa (UNU-INRA) is one of the 15 Research and Training Centres / Programmes of the United Nations University (UNU). The aim of the institute is to bridge the gap between science and natural resources management policies in Africa. UNU-INRA's mandate is to contribute to the sustainable development of Africa's natural resources in a way that maintains the quality of the natural environment and transforms lives.

The institute's programme areas focus on the development, management and governance of Africa's renewable and non-renewable natural resources as well as green economy promotion. UNU-INRA's goal is to be a catalyst for knowledge creation and delivery for efficient use of Africa's natural resources in order to improve livelihoods.

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UNU-INRA

United Nations University

Institute For Natural Resources In Africa

For more information contact:

International House
Annie Jiage Road
University of Ghana, Legon Campus
Accra, Ghana.

T: +233-302-500396

F: +233-302- 500792

@UNUINRA

www.facebook.com/UNUINRA/

email: inra@unu.edu



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