TITLE

ENFORCEMENT OF ACCESS TO EFFECTIVE TECHNICAL SUPPORT SERVICES IN THE KENYAN SOLAR ENERGY SYSTEM

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ABSTRACT

Energy is the prime mover of development cutting across industrialisation, manufacturing and residential consumption. Recently, Kenya, being ranked high among the most developed countries in Africa, has mapped way for embracement of renewable energy technology with increasing debate on sustainable development and environmental issues associated with fossil fuels, as the prime energy sources.

Generally, Kenya is making efforts to Scale-Up renewable energy programs via construction of stand-alone solutions as well as various types of mini-grids. However, a common problem cutting across all these consumers is quick failure of such projects with very little access to technical solutions or none at all. Substantial developments in solar energy in Kenya, as one of the renewable energy sources, has been mainly challenged by lack of effective capacity building and poor technical support. This cuts across both domestic systems as well as the most rising aspect of small and medium sized minigrids.

This paper aims at investigating the leading role of access to viable technical support services in mitigating solar energy adoption challenges. The paper focuses on challenges faced by small and medium sized consumers in search for technical advice and support prior to purchase, during installation and after purchase and installation stages. The research conducted survey via questionnaries, analyzed data obtained, identified technical support factors in order of priority and gives adaptable recommendation for the state in ensuring that solar projects are sustainable and that customers find value for their money.

KEY WORDS:

Renewable energy

Solar energy

Scaling-Up Renewable Energy Program (SREP)

Technical support services

Policies and regulations

Enforcement

Customer Social Responsibility (CSR)

Coastal region and Arid and semi-arid areas

INTRODUCTION

In 2018, electricity prices shot up and later on, VAT was introduced on petroleum products. Recently, prices have continued to shoot as announced by Energy Regulatory Commission (currently Energy and Petroleum Regulatory Authority) in April 2019. As a result, cost of life has increased considerably and it is evident that the trend will not reverse in the future; instead, it will get worse. Consequently, it is the high time scholars and specialists dug deeper into the issue to get a reliever solution.

Solar is the centre of renewable energy as all other forms directly or indirectly rely on it. This outlines its great potential as a source of energy, hence why its adoption should be seriously considered. Of the key challenges of solar reliability is the low efficiency and the low potential of latitutes. However, Kenya, laying along aalong the equtor, a high potential latitude region, has a very wide-scale potential since daily solar irradiance is almost constant all year round. There is a unique nature of regions along the equator to maximize on solar energy as obserbed by Kabir, Kim, and Szulejko (2017).

Studies to reveal solar energy drawbacks in africa revolve around four factors, with Kenya not exceptional. Affordability and access to finance support was lanked the first challenge. Other challenges outlined by studies are enabling environment, technical support services and awareness (Da Silva , 2016). However, with several institutions understanding solar projects and offering required initial support, it seems the latter is more less a big challenge. The solar industry has become very competitve but one thing supplier lack in common, is proper technical support services thus lowering interest and confidence of customers on the technology.

In the past, Kenya has had more concentration on stand-alone systems as well as public and private mini-grids. However, currently we have a new look into community mini-grids as categorically observed by Economic Consulting Associates Limited (2014). Adoption and development of solar energy in kenya is greatly challenged by non-standard solutions and service providers. Customers are not able to get value for their money thus loosing trust in this particular technology.

Economic Consulting Associates Limited (2014), in their design study for off-grid electrification, observed that new policy and regulation frameworks required for best embracement of renewable energy in Kenya, would be in the direction good practice and experience, nationally and internationally. The latter would significantly reduce recurrent technical shortcomings of the latter systems. In this line, the government of Kenya in their

June 2016 energy and petroleum policy draft, reported among the challenges facing scaling up of solar energy as high costs, lack of potential and existing customer awareness, substandard services, all summed up by week and uncoordinated standards, regulations and policies (Ministry of Energy and Petroleum, 2016 and The World Bank, 2017). Unfortunately, the draft does not vividly describe the steps required to achieve the above.

Lampinen (2018) examined that good technical support is acheavable through technical quality (value and budget) in external engineering support, which depends on three major factors refered to as the PPT (people, process and technology). This paper will forcus on the first two, in regard to third-party inspection and verification, as follows:

1. People: Lampinen (2018) argued that quality technical work require technically qualified personels. The government ought to strengthen the specific qualification and creditials for people engaging in solar works that clients must look at before engagements. The government can source for such experts and deploy them to county levels for easy accessbility. Serious measures must be taken against violators (The World Bank, 2017).

2. Process: Lampinen (2018) also pointed out the need to come up with well designed execution framework that will focus on client diversities. The latter should foster excellent technical communication between the client and service provider. Service providers must understand that solar projects are basically outsourced services by clients, who are prone to both technical and operational difficulties and other perfomance related problems. They must then have customer resolution processes at hand. Effectictive strategic planning and compliance must be social-public goal-centred (OECD, 2013).

With media focus on solar energy, embracing the technology has not been a big challenge recently. Firms have also come up to finance solar energy adoption. In 2018, the Kenyan government in collaboration with World Bank, KPLC and REA deployed county renewable energy officers to 14 of the underserved counties in attempt to balance access to affordable energy across the country (The World Bank, 2017). Currently, most solutions experienced come from the projects implemented by Ministry Of Energy on community facilities through monitoring and evaluation programs, which is solemnly not sufficient.

The government must strategise on how to provide customer advisory, both technical and financial, prior to puchasing, educate the society on project handling and usage as well as engage them in after sale services. Customers want to see value for their money which could be through personal investment or taxes paid. The latter has not been the case, with suppliers competing to win tenders and there after turning their backs on clients once they receive the payment. No one cares to find out how the projects are fairing. Others never respond to client problems arising there after. As a result, very needy clients end up making a repeat purchase from a second supplier while others completetly abandon the concept and emback on their earlier conventional energy methods. If only the industry players came up with a management and monitoring policy where supplier are enforced to provide quality technical support services, the above menace would be completely handled. The latter has proved possible in other fields such as the health sector. Specialists must be accountable for their engagements. The aseessment in this paper matches that observed by (Kabir, Kim, and Szulejko, 2017) in a case study in Bangladesh whereby the author argued that stake holders need to strengthen after-sale services for ensured sustainability.

RESEARCH DESIGN

The study was conducted with respect to Smith, Gardoni, & Murphy (2013) social responsibility requirements of engineering professionalism which places profesional ethics at the centre. Engineers are required to develop and implement technologies with positive influent and hence shape the uninfected ways of life to the society. Emphasis is made on practices that protect client and avoids conflict of interest.

Due to the diversity of our government and the constitution, the research would be most effective in terms of respondent randomness and time if it concentrated on a single county, away from the most developed counties. It must be a county where a better half of its population lacks access to adequate grid power. Tana River County, in the coast region, was the representative county for this case.

The researcher conducted general public awareness training through methods that were considered available and most effective such as public meetings and individual discussion and questionnaires. The researcher then invited respondents from a chosen demography who provided reliable feedback verbally (or by filling the forms and returning them). Most

preferred were individuals aged between 18 and 80 years, mostly targeting the educated and those with knowledge of the new technology developments worldwide. Both male and female respondents were considered and all given equal open chances of contribution.

The researcher also chose to use survey questionnaires on the representative county, on technical support services in terms of awareness, availability, accessibility, competency, affordability, accountability, reliability, appropriateness, continuity, acceptability, timeliness, accuracy, attentiveness, comprehensiveness and responsiveness. However, this paper will focus on the five (5) most essential factors of the latter (awareness, availability, accessibility, competency and affordability).

RESULTS/ FINDINGS

1. Awareness

The general citizens of underserved regions are less aware of new energy technologies and have very limited engagement capacity in renewable energy and other off-grid electrification programs. Around 35 per cent of the people I engaged with are aware on solar energy existence but do not have much knowledge of how it works. 80 per cent of the 35 per cent above are in the youth bracket with less than 20 per cent being women.

2. Availability

Among the technologies, solar energy was the most familiar. Despite some citizens being aware of renewable energy technologies, they still faced a major challenge of investors and technical experts being unavailable for reach and consultation. Renewable energy technology experts were found to be concentrated within certain areas and more so counties/ regions within Nairobi, Rift valley and the lake regions. These are the same regions with easy access to grid power. However, regions that are more desperate for power and those in underserved counties were less covered by private investors more so due to low infrastructure developments, long travel distances and insecurity issues, the case in Tana River County.

3. Accessibility

Among the communities with existing solar energy projects, a common problem was accessibility of technology specialists to assist them whenever the projects had challenges. Some knew contact people who however, were not able to render their services in good time. As a result, the projects took long to get maintenance, thus sometimes completely destroying some components such as pumps and batteries. Consequently, this killed customers' trust in the technology.

4. **Competency**

The few technical assistance specialists available were averagely competent as they managed to sort most of small challenges effectively. However, high level problems such as solar water pumping and medium system solutions such as health facilities and school stand-alone systems remained a challenge to many.

5. **Affordability**

After sale customer services were very high. This could be possibly by providers setting their services cost very high thus exploiting the clients, instead of nurturing the technology.

DISCUSSION

1. **Awareness**

Citizens have the right to know of any technological advances in energy and expect to be presented with clear and timely information about the advantages and disadvantages of such technologies. Extensive citizen engagement and capacity building is required. The latter is advantageous for supplier to interact with the demand side for promotion of productive use of electricity from solar energy sources (Economic Consulting Associates Limited, 2014). The above could be through respective county planning or via consultancy plans so as to help identify skills, resources and necessary coordination to meet the growing energy demand.

2. **Availability**

Citizens have the right to know how to access energy technology advances. This requires the service providers to adequately interact with the clients to share their concerns, challenges

and any feedback on the technology or any services provided to them. Services providers should be readily available to offer customer guidance on how to achieve maximum benefit from their solutions and technologies. Operations and maintenance issues must be adequately addressed.

To address the latter, it is advisable for organisations and suppliers to do skill training to part of the community members as part of Customer Social Responsibility. Those already with such skills and coming from such communities could also be hired to encourage development of these technologies as well as offer consultancy services on the same as well as maintaining existing systems. The latter should be done while considering the unique requirements of various markets. The role of both women and men in the society must be well understood and solutions inclined to how various communities are impacted by such solar energy initiatives (Nelson & Kuriakose, 2017).

3. Accessibility

A good portion of energy-desperate communities have expressed their interest in solar energy technologies and their willingness to accept and support the innovation. The administration is much willing and supportive of the idea. They are willing to pay for effective products and services and thus require both pre-sales and after-sale services to be readily available and accessible. Consequently, infrastructure developments and compliance regulations set by government and its institutions need to be adequate clear in provision of sufficient resources for quick availability and easy accessibility to address key risks to ensure essential technical support is achieved as needed (OECD, 2013).

4. Competency

With quite adequate familiarisation with solar lighting solutions, competence in solving related challenges is averagely high. However, we need to equally invest in solar water and energy expertise. Strathmore Business School (2016) in their assessment on solar PV market in Kenya, pointed out the existence of unskilled solar technicians with great connections with solar distributors and retailers. These suplliers contract such incompetent technicians, which is in contrary to the existing government regulation that requires such works to be excecuted

only by licensed personels. Consequently, it is evident that some enforcement measures must be taken against such. This could be achieved via specialised partnership and training with key stakeholders in the sector such as water and energy appreciation courses offered by Davis and Shirtliff, a key player in Kenya in water and energy solutions, National Industrial Training Authority (NITA) and Strathmore school among others.

5. Affordability

There has been a common trend where after-sale expenses are considerably high when offered by a party different from the initial product supply party. This is commonly because each party wants to reap maximally from their services. This is the opposite when the initial product supplier has a maintenance contract for the product supplied or when the supplier is responsible for after-sale training either to the product owner of in form of Customer Social Responsibility (CSR) whereby operation and maintenance skills are passed to the community members.

Phadke, Jacobson, Park, Lee, Alstone, and Khare (2015) argued that high prices are key inhibitors of rapid development. The initial cost of the system and the subsequent maintenance services ought to be standardized, to a rational level. This is not always the case since in some cases, the prices associated with the new technology were found to be considerably higher than the old and less sustainable versions. The immediate consequence is inhibit of rapid technology uptake scale-up.

CONCLUSION AND RECOMMENDATION

From the above discussion, it is evident that lack of above factors has caused technical failure, reduced customer trust in the technology as well as scared off of potential customers and investors. It is thus recommended for the government, through relevant regulatory bodies, establishes enforcement and monitoring unit that ensures organisation and individuals

provide effective coordination for their products from pre-purchase to after sale developments.

Regardless of whether the supplies are made by individuals, organisations, system manufacturers or the government, products and systems quality assurance is critical for successful technology embracement. The latter would accelerate absorption of solar energy and present a better opportunity for large scale solutions such as solar mini-grids, solar water pumping, solar water purification as well as solar water treatment technologies. The latter stand great opportunities in underserved countries such as those along the coastal region and Arid and semi-arid areas that have good basis of good solar irradiation, good basis of underground water and saline waters.

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ILLUSTRATIONS (tables)

Survey questionnaire

Section I: Introduction

The survey purposed at understanding technical customer support motivation, benefits and challenges perceived by individuals/ bodies regarding adoption of solar energy systems in Kenya. An estimate of 500 engagements was targeted. Allowed responses were physical modes only. All responses were checked to ensure there were no duplicates i.e. no member participated twice in the exercise by ensuring that the sampled respondents were geographically distanced.

FACTORS CONSIDERED IN THIS PAPER

1. Awareness
2. Availability
3. Accessibility

4. Competency

5. Affordability

Section II: Demography-respondent background information

	Questions	Options	Noes/Comments
1.1	Name of the Respondent		
1.2	District name		
1.3	Respondent's Address and Contact Details	Mobile: Email (if any): Postal Address:	
1.4	Locality	1. Urban 2. Rural	
1.5	Type of Respondent	1. On-grid Consumer 2. Off-grid Consumer	
1.6	Category of Respondent	1. Domestic 2. Commercial 3. Agriculture 4. Industrial 5. Any other, please specify__	
1.7	Respondent's Gender	1. Male 2. Female	
1.8	Literacy level of the respondent	1. Uneducated 2. High school	

		3. Below graduation 4. Well qualified (Diploma, Masters, etc.)	
1.9	Monthly income Ksh.	1. Between 0- 10,000 2. Up to – 25,000 3. Up to – 50,000 4. 3. Up to – 100,000 5. 3. Up to – 200,000 6. Above 200,000	
1.10	Occupation	1. Unemployed 2. Self-employed 3. Government service 4. Private service 5. NGO worker 6. Others (Please specify) __	

Section III: Factors evaluation

	Questions	Options	Notes For Surveyors/ COMMEN COLUMN
2.1	Awareness: Have you heard of Renewable energy?	1. No 2. Yes	Renewable energy is energy that can be used without depletion.

	Have you heard of Solar energy?	1. No 2. Yes	Solar energy is energy obtained from the sun, via irradiation reaching earth's surface and can be used for lighting, heating water, cooking and powering equipment.
2.2	Availability: Do you know someone using solar energy in your locality? Do you know any solar experts (individuals or companies) available in your locality? Have there been any efforts (individual or government) to make the technology available to the residents?	1. No 2. Yes 1. No 2. Yes 1. No 2. Yes	If 'Yes', proceed to Q. 2.3 If 'Yes', proceed to Q. 2.3
2.3	Accessibility: Are you able to reach the experts for assistance? Are the experts friendly, concerned and approachable? What is the minimum time you spend to get to their locations? When experts are available, how much time do they take to respond	1. No 2. Yes 1. No 2. Yes 1. Travel 2. Phone call 3. Randomly within the area 1. Within 2 weeks 2. Months (_)	

	to your problems?	3. They never turn up	
2.4	Competency: If experts turn up, Do they offer quality services? Do they complete the task in considerable time or tasks are postponed and prolonged? Do they offer you technical advice on the system?	1. No 2. Yes 1. No 2. Yes 1. No 2. Yes	
2.5	Affordability: For new systems: Do you feel the prices charged are fare compared to the solution offered? Do different experts offer same range of prices? Do you feel overcharged or manipulated by service providers? For existing systems: Are the repair/maintenance costs considerable compared to purchasing an entirely new system?	1. No 2. Yes 1. No 2. Yes 1. No 2. Yes 1. No 2. Yes	
	FINALLY, WOULD YOU RECOMMEND SOLAR ENERGY SYSTEMS TO NEW CLIENTS?	1. No 2. Yes	EXPLAIN WHY:

THANK YOU FOR YOUR TIME AND COOPERATION

Date of the Interview: _____

Signature of the Respondent: _____