



## Developing rural markets for solar products: Lessons from Ghana



William F. Steel <sup>a</sup>, Nana Akua Anyidoho <sup>a</sup>, Frank Y. Dadzie <sup>b</sup>, Richard H. Hosier <sup>c,\*</sup>

<sup>a</sup> Institute of Statistical, Social and Economic Research, University of Ghana, Legon, Ghana

<sup>b</sup> ARB Apex Bank, Ghana

<sup>c</sup> World Bank, USA

### ARTICLE INFO

#### Article history:

Received 11 January 2016

Revised 3 February 2016

Accepted 4 February 2016

Available online 5 March 2016

### ABSTRACT

This paper assesses market development as a sustainable approach to increasing the use of renewable energy, specifically solar, using the case of Ghana's Solar Project. This strategy is intended to overcome some weaknesses of donor-driven and fee-for-service models in sustaining gains beyond the end of projects. The literature shows that developing a sustainable market for solar products in underserved rural areas requires an integrated approach addressing demand, supply, financing, quality, and facilitation. The Ghana Solar Project was well designed to overcome constraints in all of these areas. Results were positive in terms of numbers of systems purchased and impact on perceived benefits and willingness to pay. Benefits were documented with respect to education, information, mobile phone charging, income generation, and health and fire risks. Competition increased, and system costs fell. Financial institutions expanded their products and outreach, and in most cases had good recovery rates. Nevertheless, sustained market growth may be constrained by the lack of local technicians and spare parts and by possible withdrawal of some local Rural and Community Banks from providing financing and Solar Project Officers to facilitate the process, in the absence of a line of credit and results-based bonuses.

© 2016 Published by Elsevier Inc. on behalf of International Energy Initiative.

### Introduction

The purpose of this paper is to assess market development as an approach to increasing the use of renewable energy, specifically solar, using the case of Ghana's Solar Project. Given the limitations of other approaches, Lighting Africa – “a joint IFC and World Bank program to accelerate the development of commercial off-grid lighting markets in Sub-Saharan Africa” (Lighting Africa, 2010a: 9) – has advocated mobilizing private actors to accelerate the market for solar products, while recognizing the significant challenges in reaching remote, underdeveloped areas of Sub-Saharan Africa. This strategy is intended to overcome the weaknesses of donor-driven and fee-for-service models in sustaining gains beyond the end of projects. This paper analyzes Ghana's experience to evaluate the effectiveness of the multi-stakeholder approach in using incentives and facilitators to stimulate potential demand and supply for sustainable market development. The impact on public perceptions of solar and its benefits is also assessed.

The primary emphasis is on the demand side, taking advantage of a recent assessment to ask the following research questions<sup>1</sup>: (i) did the project help stimulate demand that could support a sustainable market?

(ii) were the expected benefits to users realized? This paper also reviews the modifications that were made to the original design in order to overcome constraints on the supply side, in particular the role of facilitators. The findings indicate that some gaps will still need to be addressed before the rural market for solar products becomes truly self-sustaining.

### Background

Africa's unelectrified population is largely rural and growing fast enough to surpass Asia in absolute numbers within the next 20 years (Lighting Africa, 2010a: 22). Key reasons to seek ways of making renewable energy accessible to Africa's rural population include the lag of grid growth behind demand growth, environmental consequences of petroleum-based energy, health considerations associated with reliance on kerosene for lighting, and growing demand for charging mobile phones (ibid.: 14–15 and 23). Access to better lighting and energy can also benefit education and income-generating opportunities in rural areas and facilitate access to information through television, radio and mobile phones. Approaches to promoting solar energy in rural areas have evolved in the light of experience with different models.

### Alternative approaches to expanding solar

Martinot et al. (2002) highlight the shift at the beginning of the 21st century from the old paradigm of project-oriented, supply- and donor-

\* Corresponding author at: 1818 H St NW, World Bank, MSN J7-708, Washington DC 20433, USA.

E-mail address: rhosier@worldbank.org (R.H. Hosier).

<sup>1</sup> The assessment interviewed 7 out of the 9 participating banks with more than 150 clients, and 11 focus groups, 355 clients (out of 16,822) and 85 non-clients in 40 communities, as well as suppliers and officials (Steel et al., 2014).

driven promotion of renewable energy to market assessment with a user focus, viable business and financing models, and sharing of risks and costs to build sustainable markets. Nygaard (2009) identifies five variations of three basic approaches to promotion of solar home systems (SHS) in developing countries (Table 1):

- Donation, fully subsidized by a donor.
- Fee-for-service, in which national authorities award contracts that may give geographical monopolies (concession model) or involve limited competition (dealer or leasing model).
- Market sales, in which private suppliers sell directly to consumers, either with some subsidies and/or financing via other stakeholders (credit model) or without (cash sales model).

Historically, household and especially community use of solar has been driven largely by government and donor programs and subsidies (Hansen et al., 2014). Only rarely (India, Kenya) has the donation approach seeded a large enough market for competition to drive prices down such that commercial sales take over on a sustainable basis. Indeed Martinot et al. (2002: 330) conclude that “donations without any cost recovery destroy markets.”

A significant challenge for the fee-for-service model is generating enough competition, price reduction and scale for a market to emerge. Suppliers may simply exit when their contracts end, as was the case in Zimbabwe (Mulugetta et al., 2000, cited in Nygaard, 2009). The Sustainable Solar Market Package model, which was utilized by the World Bank to try to achieve sustainability relied upon a hybrid approach, where public institutions (health centers, schools, and other public photovoltaic (PV) installation sites in rural areas) were put out to a public competitive bid. The winning bidder was then contracted to supply these public installations and was also given an incentive to develop the market for private PV sales in those same local communities. An independent evaluation of the use of this model in Tanzania, Zambia, the Philippines and other countries demonstrated that in all but one case, the winning contractors showed little or no interest or ability to stimulate the market for private, household sales (Terrado, 2014). Other drawbacks of the model were the need for the contractor to make a large capital investment and the costs of collecting the fees (Martinot et al., 2002: 330).

Donor programs tend to be driven by broad socio-economic concerns. Lighting Africa (2010a,b) emphasizes impacts on the environment, health, education, income generation and reduced spending. However, evidence suggests that consumer demand for solar is driven more by the desire for improved services (television in particular) than decreased energy costs (vis-à-vis other substitutes for grid electricity; Martinot et al., 2002: 327). In Zambia, lighting for children to do homework and entertainment were the main perceived benefits by (the relatively wealthy) consumers, who were paying more than they previously paid for kerosene, candles and batteries (Ellegård et al., 2004: 1253). Hence a commercial approach based on direct sales of SHS to consumers is likely

to require a substantial middle class in rural areas to generate sufficient demand, as occurred in Kenya (Nygaard, 2009).

The multi-stakeholder programmatic model represents a step toward building up such demand, usually involving a credit programme to offset the lack of term financing available to most rural households, and facilitating expansion of suppliers into those areas through training and indirect support for market development, along with quality assurance. A review of PV projects in Africa revealed that the biggest remaining barrier to stimulating rural PV markets was the need for sustainable consumer financing in rural areas to enable potential consumers to afford the high up-front costs of SHS (Krause and Nordstrom, 2004). The Bangladesh PV program, which supported hundreds of thousands of household to obtain PV systems, was built largely around the well-developed market for of microfinance throughout rural Bangladesh (Khandker et al., 2014). However, there is a risk that financing, dealer presence and system maintenance will not be sustained beyond the end of the programmatic support; in the Zimbabwe Global Environment Facility (GEF) PV project, the dealers pulled out after donor support ended (Mulugetta et al., 2000). Hence it is important to have an exit strategy for gradual phasing out of subsidies and facilitation.

### Conditions for market development

Conditions identified by Nygaard (2009: 19–23) for the rural market for SHS to reach sufficient scale and affordability to become sustainable include:

- *Competition*: the programmatic model is intended to expand demand to reach a ‘critical mass’ and attract enough suppliers to drive prices down and provide superior products
- *Financing*: Although projects may include credit schemes (often with subsidies to offset interest costs and incentive purchases) through existing financial institutions, sustained availability of financing to lower-income consumers is generally problematic, especially in rural areas. Even where microcredit is available, the small size, short terms and group orientation typical of microfinance tend not to be suitable to borrowing for SHS. In South Asia, Palit and Sarangi (2011: 9) found that “lack of suitable financing was regarded as the most significant barrier to the uptake of SHS...of more importance than the technical and policy issues.” In Zambia, “the lack of a functional and dedicated financial market is one of the major constraints” to sustainability (Ellegård et al., 2004: 1256). Hansen et al. (2014) note that innovative financing schemes have been important in facilitating the transition to a market-based model.
- *Subsidies*: Subsidies are generally regarded as necessary to level the playing field for solar PV against the grid and other sources whose capital costs are highly subsidized, as well as to stimulate demand. The different models (Table 1) vary in how they apply subsidies, but all face the challenge of minimizing market distortions and sustaining demand and supply as subsidies are withdrawn.

**Table 1**  
Models for promotion of SHS.

Model	End-user	Owner-ship	Financing provided by	Subsidy level for investment	Responsible for installation, maintenance and after sales service
1. Donation	Institutions	End-use	Donor	High, 100%	End-user, committees
2. Fee for service:	Private, Institutions	Utility, ESCO <sup>a</sup>	ESCO	Medium to high	ESCO
2a. Concession					
2b. Dealer					
3. Sales:	Private	End-user	Donor, financing institution, dealer, end-user	Low to medium	Depends on circumstances
3a. Multi-stakeholder programmatic/credit					
3b. Cash sales	Private	End-user	End user	Zero	End user

Source: Adapted from Nygaard, 2009, Table 1.

<sup>a</sup> Energy Service Company.

Download English Version:

<https://daneshyari.com/en/article/1046818>

Download Persian Version:

<https://daneshyari.com/article/1046818>

[Daneshyari.com](https://daneshyari.com)