

# LESSONS LEARNED

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## Improving Rural Energy Access through Solar Home Systems in Ghana

### DEVELOPMENT CHALLENGE AT PROJECT PREPARATION

In 2008, when GPOBA was preparing the solar PV systems project for the rural poor in Ghana, the country had a relatively high electricity grid access rate for Sub-Saharan Africa, at 54 percent of the population.<sup>1</sup> However, nearly four million people lived in small rural communities, including isolated islands in Volta Lake, that are too remote to reach in a cost-effective manner through extension of the national grid. The most cost-effective option for low-density rural areas to access electricity is through solar home systems (SHSs) and photovoltaic (PV) lanterns, but awareness of the potential benefits of solar power was low in rural areas, and attitudes to solar power had been adversely affected by the poor quality equipment available from local traders. In addition, while prices of quality solar equipment had declined over the preceding years, SHSs and PV lanterns remained beyond the ability to pay of most rural households.

remaining 20 percent. The service providers for the project were approved private dealers who were members of the Association of Ghana Solar Industries (AGSI). The AGSI served as a key interlocutor for the project, working on raising awareness of SHSs, capacity building, and helping the service providers to access finance. GPOBA provided subsidies to the service providers of 50–60 percent of the total cost of purchasing and maintaining SHSs. Service providers were required to (i) supply and install systems; (ii) provide satisfactory maintenance and timely repair service over three years; and (iii) provide one battery replacement at year two or three. The project disbursed a tiered flat subsidy for four products: US\$40 for solar lanterns, US\$300 for small SHSs (10–20 Wp), US\$450 for medium SHSs

<sup>1</sup> As of 2015, 64 percent of Ghanaians have access to electricity. Source: World Bank data indicators.

### THE PROJECT AND ITS PARTNERS

In 2009, the Global Partnership on Output-Based Aid (GPOBA) approved a US\$4.35 million grant to support electricity access for 15,000 households in off-grid areas in Ghana through SHSs and PV lanterns. The project was part of the Renewable Energy component of the US\$90 million Ghana Energy Development and Access Project (GEDAP), complementing its focus on grid extension. ARB Apex Bank, which serves as a mini-central bank for Ghana's 133 rural/community banks, was the implementing partner. ARB Apex Bank managed an IDA-supported line of credit to refinance 80 percent of loans from 12 participating rural banks for their clients to purchase SHSs; the rural banks contributed the

### RESULTS ACHIEVED

- The project exceeded its targets, supporting the purchase of 8,831 SHSs and 7,991 lanterns for 16,500 households, benefiting approximately 100,000 residents in remote, off-grid areas.
- Approximately US\$1.6 million in consumer loans for SHSs were accessed through 12 rural banks. Seven banks had a 98 percent or higher repayment rate; overall loan recovery rate was 78 percent.
- The number of participating solar equipment suppliers increased from three to seven.
- There was a significant reduction in the use of kerosene, from 86 percent of clients prior to acquiring SHSs/lanterns to 21 percent at the close of the project.

The Global Partnership on Output-Based Aid

**GPOBA**

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(21–49 Wp), and US\$550 for large SHSs (50 Wp). Users paid the remaining 40–50 percent of costs through loans for the SHSs and out-of-pocket for lanterns.

The project substantially increased consumer awareness of solar power and demonstrated the latent willingness to pay for it. In a beneficiary assessment, over 93 percent of clients expressed strong satisfaction with their SHS/lantern, and 97 percent expressed willingness to pay for maintenance and repairs, if delivered promptly. The best-liked feature overall was increased lighting, and about 91 percent of clients reported that children in their homes used SHSs/lanterns for studying or reading at night. Eighteen percent of SHS owners and 29 percent of lantern users reported using the equipment for direct income generation.

## Lessons Learned

**1 Rural households in Ghana are willing to pay for quality energy services.** Vendors were surprised by the breadth and depth of the market once they began servicing remote rural areas. Willingness to pay was strengthened by the growing affordability of LED color TV, reflecting consumer aspirations for modern energy services. As an effort was made to ensure that all systems supported under the project met quality standards (Lighting Africa<sup>2</sup> certified), the chance of low-quality products killing or dampening market growth was minimized. The market varied considerably for different systems, with sales of large SHSs (over 50Wp) and lanterns (the most affordable option, but without loans available) substantially exceeding expectations, while sales of smaller SHSs were lower than expected. Clients expressed a strong willingness (97 percent) to pay for the cost of future repairs and maintenance.

**2 An intermediary was essential to facilitate the market between potential consumers and potential suppliers, and helped to build community ownership and trust.** The Solar Project Officers engaged by the rural banks (initially subsidized by the project for two years) made a strong, positive impact on moving the project forward. These Officers, who were all from the localities, helped to jump-start the market by mobilizing groups of potential clients, increasing consumer openness to adopting new solar technologies, processing paperwork, enabling loan recovery, and establishing relationships with local dealer representatives. They also

facilitated dealer responsiveness to technical problems. As the dealers were concentrated in Accra, the capital city, far from the project communities, and had little local presence after installation, the Solar Project Officers were the only reliable point of contact for clients needing technical support or experiencing maintenance issues with their SHS or lantern. This local capacity, which the project helped to build, was key to project success.

- 3 Availability of financing was important for both consumers and suppliers, and needed to be in place at the earliest phase of project implementation.** Affordability of SHSs for consumers was enhanced by the availability of loans for 12–36 months, despite relatively high interest rates (which more or less offset the value of the subsidy). However, small- and medium-scale solar dealers tended to have limited access to affordable commercial bank financing or had already pledged their available collateral. Therefore, the project team needed to assist dealers in obtaining trade finance and working capital in order to enable them to purchase systems in bulk and build their retail networks up-country.
- 4 Quality assurance and timely after-sales service were critical and affected loan repayment rates.** Engagement of independent verification agents (IVAs) to verify the quality of installed systems and monitor consumer satisfaction was important in assuring value for consumers and establishing a good relationship between vendors and consumers. While costly and logistically challenging, a verification system helped to instill confidence in both consumers and funders. Although overall satisfaction was very high (over 93 percent of consumers expressing strong satisfaction with SHSs and lanterns), delays in repairs tended to adversely affect loan repayment. Strong local capacity, in the form of the Solar Project Officers, contributed to a decrease in the likelihood of loan default as the Officers helped to improve responsiveness and system maintenance.

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<sup>2</sup> Lighting Africa is part of the World Bank Group's contribution to Sustainable Energy for All (SE4All). It is implemented in partnership with the Energy Sector Management Assistance Program (ESMAP), the Global Environment Facility (GEF) and the governments of Australia, Austria, Denmark, Finland, France, Germany, Iceland, Italy, Lithuania, the Netherlands, Norway, Sweden, the UK, and the US.