When mobile meets modular: pay-as-you-go solar energy in rural Africa

Dr Jeremy Wakeford discusses an energy revolution that is underway in parts of Africa.

One of the most pressing developmental challenges in sub-Saharan Africa is the dire need for modern energy services among the energy-poor, low-income communities who are beyond the reach of economically viable electricity grids. Some three-quarters of Africa's rural population lack access to electricity, forcing them to rely on expensive and dirty fuels like kerosene for lighting and diesel for generators – if they can afford them at all. Fortunately, a quiet energy revolution is underway, lighting up and powering African households and entrepreneurs with off-grid solar photovoltaic (PV) energy.

The Droogfontein solar plant near Kimberley opened in 2014
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Recent years have seen rapid growth in the market for small-scale solar home systems (SHSs), which comprise solar panels, batteries, inverters and a distribution board. A number of decentralised energy service companies (DESCOs) have established themselves in African markets, including M-Kopa, Off-Grid Electric, d.Light, Bboxx, Mobisol and Nova Lumos. Collectively, they have raised in excess of $360 million in financing and currently provide energy services to over 700,000 customers in East and West Africa. The key to their success has been an innovative financing model that uses the latest innovations in mobile payment systems.

Pioneering DESCOs provide integrated renewable energy solutions comprising hardware, software, distribution, and financing. The companies supply affordable SHSs in varying sizes, together with efficient LED lights, mobile phone chargers and a variety of basic electrical appliances such as radios and TVs. Several of the DESCOs launched their operations in East African countries – principally Kenya, Rwanda and Tanzania – and more recently have begun to expand in West African countries such as Ivory Coast. The companies are typically active in both peri-urban and rural settings, supplying products mainly to low-income households, but also to small business operators. Their aim is often not simply to supply products, but to forge long-term relationships with their customers as energy service providers.

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To overcome the challenge of rural “last mile” distribution, DESCOs use informal local supply chains to deliver their products at the lowest possible cost. The companies use sophisticated information technology systems – including web platforms, mobile apps and two-way SMS – to communicate with their customers and to manage SHS access and operations.

The financing model requires different forms of finance along a continuum, including start-up capital, operating capital and end-user finance. In the first phase, the entrepreneur needs seed capital to plan and initiate the enterprise – and many DESCOs have relied on support from development finance institutions or donor agencies.

The second stage requires operating capital, which is sometimes financed with loans from local commercial banks. Yet bank finance is often difficult for small and medium enterprises (SMEs) to access in developing countries, as banks shy away from the perceived risks, or the local banking system may be underdeveloped. Some DESCOs have garnered equity investments from venture capital funds or entered into partnerships with large energy utilities.

The major innovation has been the form of end-user finance. Several DESCOs have adopted a pay-as-you-go (PAYG) scheme, whereby customers pay a small up-front amount for the equipment and then monthly or weekly payments for the energy used, using mobile payment systems. For example, Off Grid Electric’s customers pay approximately $6 per month for entry-level systems, and $15-20 per month for small business kits that include various appliances, such as hair clippers, a television (for bars) or solar lanterns.

The PAYG business model has several major benefits. Customers pay for the level of energy service according to their needs and budget. The companies typically offer flexible payment terms and varying lease lengths, which reduces upfront payments and gives customers the flexibility to pay from savings or current income. This helps to reduce risks – such as non-payment – and thus lowers costs for consumers and suppliers alike. The daily cost of an entry-level system is similar to the amount customers would spend on alternative energy sources, such as candles, kerosene, and batteries. The modular nature of solar PV systems means they are scalable over time, according to the needs and incomes of individual customers.

To be sure, provision of off-grid renewable energy has its own unique set of challenges. These include gaps in the policy and regulatory context, difficulties in extending “last mile distribution” to customers in remote rural areas, the need to gain customer confidence and to understand customer needs, and the need to scale up rapidly in order to achieve profitability. Governments can support the growth of decentralised energy by establishing an enabling regulatory and policy environment that permits off-grid renewable energy products and services, and licenses mobile payment systems. The PAYG business model also requires capacity building among sales and distribution agents.

This innovative approach to lighting up and powering rural Africa provides an illuminating example of synergistic technological leapfrogging – not only are the latest generations of telecommunication (mobile), energy (solar PV) and finance (mobile payments) being utilised, but they are being fused in a novel way that makes a whole new genre of energy service possible among previously underserved communities.

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