ICED Evidence Library

Increasing access to clean, affordable energy in underserved communities – the case of Zambia

Tags: Energy, Off-grid energy, Solar home system

Low levels of access to clean and affordable electricity remain a major barrier to development across much of sub-Saharan Africa (SSA). About 600m Africans do not have access to electricity. However, in recent years, increasing sales of stand-alone Solar Home Systems (SHS) have offered a solution to many households that might otherwise have waited many years, or decades, for access to the main electricity grid. According to data from GOGLA[1] (the Global Off-Grid Lighting Association), 3.83m stand-alone solar products were sold across SSA in 2016 (this figure includes basic solar lantern products).

While this is a positive development, some of the systems are sold to peri-urban households; the systems are also sold to households who (a) with connections to urban centres where sales agents are based, and (b) are able to afford the repayments to acquire a system. Electricity access remains low amongst the rural poor. In countries where population density is low (resulting in higher sales and servicing costs for SHS companies) and where there is an affordability gap for many households, increasing the adoption of off-grid solar solutions is particularly challenging. In Zambia, for example, sales of stand-alone solar products, according to the GOGLA data, were only 56,000 units in 2016.

A recent study by ICED analysed the affordability gap in the case of Zambia, and considered the range of possible solutions for catalysing the market. This note summarises some of the outputs from that work so that the learnings can be considered in other work to expand energy access, both in Zambia and elsewhere.

Realising the benefits of energy access in Zambia

Analysis performed by the ICED team using open-source geospatial planning tools[2] suggests that SHS are the least-cost solution to provide Tier 2[3] access to electricity for 70% of households in Zambia. For many households currently using torches and/or candles to meet their lighting needs (kerosene accounts for a relatively small portion of off-grid lighting in Zambia, compared to other countries in SSA) use of a SHS can reduce household energy spend by ~$7-12 per month.

Deployment of SHS can result in fiscal benefits for the Government as well:

1. Viable SHS companies generating profits will pay taxes on those profits;
2. Our analysis suggests that a robust SHS market in Zambia could create ~25,000 jobs. Those employed by SHS companies will pay taxes on their income and will have disposable income to spend elsewhere in the economy; and
3. Government spend on subsidies for other fuels may fall.

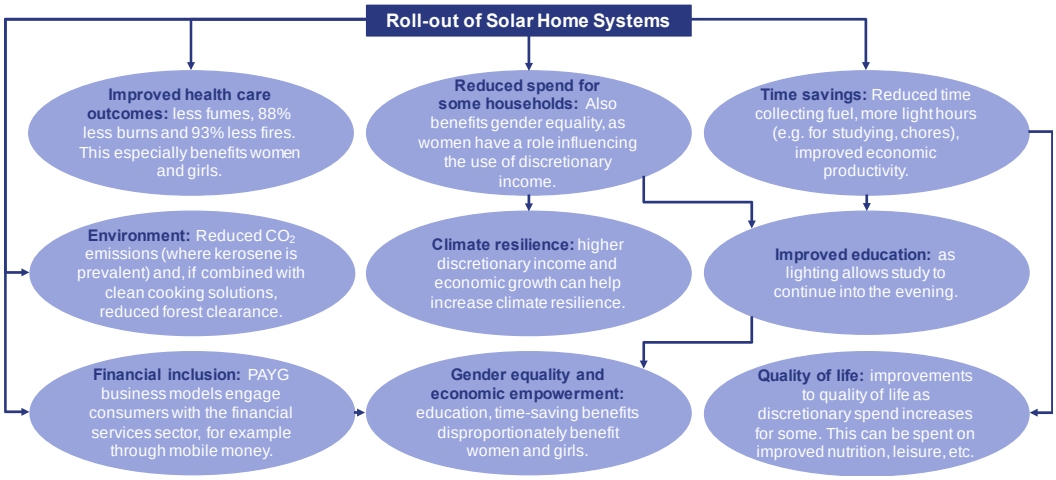
In addition to these financial benefits, SHS can help generate a wide range of well-documented social and environmental benefits, presented below.

---

[1] Global Off-Grid Solar Market Report, H1 and H2, 2016: https://www.gogla.org/sites/default/files/recource_docs/global_off-grid_solar_market_report_jan-june_2016_public.pdf, https://www.gogla.org/sites/default/files/recource_docs/final_sales-and-impact-report_h22016_full_public.pdf

[2] Geospatial analysis is limited to pre-defined scenarios on the World Bank's Energy Data website (https://energydata.info/); a more detailed study would be required to interrogate these numbers.

[3] As defined under the SE4All initiative's multi-tier framework.



Finding solutions and accelerating the market

Establishing strong foundations

To unlock these benefits SHS companies need the right enabling environment to be in place. This means removing barriers that might exist to rolling out SHS, for example ensuring technical standards and import tariff exemptions are non-discriminatory and that they are applied consistently. The Energy Compacts prepared under DFID's Energy Africa programme identify remaining barriers that need to be addressed by partner countries.

Governments should go further than simply removing barriers; Governments can be a vocal and pro-active supporter of all solutions that extend access to electricity. Electricity sector plans should consider all solutions, including SHS and mini-grids, so that the role of each solution in meeting energy access objectives is clearly defined, and is clearly communicated to potential investors.

Establishing robust foundations for the sector provides a clear framework within which SHS companies and other stakeholders can develop their own strategies and make investment decisions.

Expanding access to finance

Once a strong enabling framework is in place, finance is the primary obstacle to growth for SHS companies. Specifically, companies require a lot of working capital to grow their business: to finance increasing inventory levels and to finance accounts receivable once systems have been sold. ICED team analysis has estimated that >$100m of working capital would be required to serve a market of 2m households in Zambia, each acquiring a Tier 1/2 multi-room SHS.

'Stretch' actions to achieve universal access to energy

Establishing a strong enabling framework and facilitating access to finance are critical to catalysing a sustainable market for SHS. However, these actions will not by themselves achieve universal access to clean and affordable energy, the aim of Sustainable Development Goal 7 (SDG7). As already noted, there will be a portion of the population that is simply unable to afford a SHS. ICED team analysis suggests that in Zambia:

- ~4% of households are not even able to afford the most basic solar lantern, even if a mechanism is put in place to allow for payment to be spread over a 12 month period (basic solar lanterns are normally paid for up-front using cash).
- A further ~22% of households cannot afford a solar lantern with a basic mobile phone charger.
- A further ~28% of households (i.e. ~54% of Zambian households in total) cannot afford a simple Tier 1 multi-room SHS with payments spread over an 18 month period.

Meeting SDG7 requires an action plan that meets this affordability gap. Most donor programmes to date have focused on the first two requirements presented above: a strong enabling environment, and access to finance. Relatively little attention has been focused on addressing the affordability gap that prevents ~54% of Zambians from engaging with the SHS market.

A role for Government

Addressing this affordability gap is demanding and complex, but it is necessary if we are serious about meeting SDG7. Substantial public sector interventions have been required to achieve universal electricity access in most countries.

A private sector-led approach has achieved many successes in rolling-out SHS, and it is important to not undermine the many successes that it can continue to achieve, interventions will be required if the objective is to extend access to similar energy solutions to the whole population. Government interventions to date have been limited and the market has been characterised by competition between SHS companies in the market. This again leads SHS companies to focus on markets that are sufficiently large to withstand such competition. To reach more sparsely populated, or difficult to reach, areas a regulatory model characterised by "competition for the market" (e.g. following a concession or tender model) might be more appropriate. This may reflect an evolution of a market that has been considered largely as based on a consumer good versus a more utility-like approach which would reflect a public good targeted for universal access.

We have identified three basic principles that any intervention to address the affordability gap should adhere to:

- **Flexible, but rigorous** – where a Government creates a formal framework for supporting access, SHS companies should be encouraged to put forward their own proposals for reaching hard-to-reach areas so that the benefits of innovation – with multiple companies taking different approaches – are maintained. A rigorous evaluation of proposals is necessary, to test whether a company's plans can be delivered.
- **Adaptive** – Because of the hard-to-reach nature of many of the communities that a programme would need to target, 'facts on the ground' are likely to mean that the detailed design of an intervention will need to evolve over time. This will need to be considered in designing the regulation and/or commercial principles that govern disbursements under the intervention, for example by avoiding long-term fixed pricing while ensuring that SHS companies are held accountable for the delivery of outputs.
- **Sustainable** – The intervention must be sustainable, ensuring that outcomes persist and that the affordability gap is addressed for as long as it exists. Note that this is a requirement that many results-based financing (RBF) interventions do not meet, and may be a particular challenge of off-grid technologies that tend to have a finite lifespan.

These core principles do not tie governments or donors to a single intervention design, but adhering to these principles should help to improve the efficiency and the effectiveness of any scheme or programme. When designing such an intervention, there are a number of design considerations; we have identified nine below.

1. **Minimum energy access standard:** What should the minimum access standard be? Should it vary by geography, or by some other segmentation?
2. **Delivery of universal access:** Is the market left to deliver the minimum access standard, or is a universal access obligation placed on one or more companies?
3. **Financing needs to be targeted:** Is the intervention targeting the high costs of establishing a presence in hard-to-reach areas, and / or addressing the affordability gap?
4. **Quantum of support:** How much support is to be provided and how precisely is this matched to the specific affordability gap of each household?
5. **Targeting of support:** Building on (3), is support targeted by region or other segmentation? Is support defined in absolute terms, or as a % of the cost of any system?
6. **Impact on customer payments:** Does any support to individual households target up-front payments to SHS companies, and / or ongoing weekly / monthly payments?
7. **Disbursement channel for support:** Is support paid directly to companies, or to consumers? If the latter, is it paid as cash, or through some voucher scheme?
8. **Counterparty for support:** Who administers disbursements? Government, a donor, or some third party? Is a guarantee mechanism required / in place?
9. **Selection of delivery partners:** Can all SHS companies benefit from support, or is a more centralised approach taken, for example through the awarding of concessions?

Achieving universal access

This note has discussed the affordability gap that still exists, and will continue to exist, for many households that might otherwise acquire access to affordable and clean electricity. This affordability gap needs to be addressed for commitments to meeting SDG7 to be fulfilled. Governments in countries where there is a significant portion of the population without access to electricity need an action plan that sets out how the affordability gap will be addressed.

The first task for policy-makers is to clearly state its policy objectives on energy access, by defining a minimum electricity access standard, and stating by when this standard is to be achieved. Setting a minimum access standard is difficult: the highest incremental utility to a household might be gained through having access to a basic solar lantern, but a more sophisticated SHS could unlock a wider range of benefits. This defines the quantum of the affordability gap. Energy access goals in many countries remain focused on grid connections, and the desired outcomes with reference to the Sustainable Energy For All (SE4All) multi-tier framework are not defined.

Energy access policies and interventions should not favour one energy access solution over another, especially where the same quality of service is provided. Frequently, on-grid electricity benefits from subsidies (e.g. in upstream fuel supply, or in the form of lifeline tariffs), even though the grid typically only reaches the wealthiest consumers. Meanwhile, there are no subsidies for off-grid energy solutions. Where support or subsidies are required to meet policy goals (e.g. to achieve universal energy access) they should be targeted effectively towards those most in need of support and should not distort the relative economics of alternative energy access solutions (e.g. grid vs. mini-grid vs. SHS).

The ambition of government policies and interventions needs to match the scale of the challenge posed by the affordability gap. Governments need to think ahead and, where necessary, commit funds to address the challenge. This might include support for SHS companies setting up in high cost regions, and / or support for households unable to afford a system that would provide them with a minimum standard of electricity access.

An action plan is required to ensure that all households can acquire access to electricity – regardless of their income – so that SDG7 can be met.

About

Infrastructure and Cities for Economic Development (ICED) is a catalytic, flexible facility designed to accelerate DFID's infrastructure and cities initiatives across the world and promote resilient, inclusive, and transformative economic growth.

icedfacility.org | connect@icedfacility.org | @icedfacility