Energy Africa – Uganda

Fiscal policy options for Solar Home Systems (SHS): Final report

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Acronyms and abbreviations

BoP	Base/Bottom of the Pyramid
DFID	Department for International Development
ECA	Economic Consulting Associates
ERA	Electricity Regulatory Authority
ERT	Energy for Rural Transformation
GoU	Government of Uganda
GGGI	Global Green Growth Institute
kWp	Kilowatt peak
kWh	Kilowatt-hour
MEMD	Ministry of Energy & Mineral Development
NEP	National Energy Policy
NPA	National Planning Authority
O&M	Operation and Maintenance
PAYG	Pay-as-you-Go
PPA	Power Purchase Agreement
RBF	Result Based Financing
REA	Rural Electrification Authority
REP	Renewable Energy Policy
RESP	Rural Electrification Strategy and Plan
SHS	Solar Home Systems
SSMP	Sustainable Solar Market Packages
TA	Technical Assistance
TAF	Technical Assistance Facility (Energy Africa)
TEA	Transforming Energy Access
UNBS	Uganda National Bureau of Standards
UNCDF	United Nations Capital Development Fund
URA	Uganda Revenue Authority
USAID	United States Agency for International Development
USD	United States Dollar
W	Watt
Wh	Watt-hour
Wp	Watt-peak

Executive summary

The objective of the study

The objective of the study is to provide an analytical paper on the available fiscal policy options available to support the solar home system (SHS) market in Uganda.

The paper provides background to inform a more detailed cost benefit analysis, which will assess fiscal policy options to support energy access through off-grid solar systems and appliances for households at the base of the pyramid (BoP).

A number of support mechanisms have been devised globally by policy makers to attract the private sector into this relatively new market, while also improving the affordability of off-grid products. Fiscal support mechanisms, including subsidies and tax exemptions, are the most widely used tools for addressing the financial barriers to expansion of the off-grid solar market. These mechanisms are often justified on social equity grounds given the need for poor households living in remote areas to achieve a level of parity with populations that benefit from subsidized grid infrastructure.

Previous fiscal policies for supporting the off-grid market in Uganda

One of the more significant initiatives that aimed at supporting the expansion of the off-grid solar market is the Energy for Rural Transformation (ERT) programme that was implemented by the government of Uganda in partnership with the World Bank. ERT has been the main channel for delivering subsidies for off-grid solar products in Uganda.

The first phase of the programme, ERT I, was a demand-driven, purely commercial initiative, in which subsidies were designed to incentivise off-grid solar companies to market their products and accelerate the deployment of PV systems, even to commercially unattractive areas. The programme had overestimated the capacity of the institutions to implement. There was also a lack of prior investigation of the likely responses of the solar companies to the incentives provided. The programme did not achieve the aim of reaching new rural markets.

ERT II adopted the Photovoltaic Target Market approach (PVTMA). It was launched in 2009 to overcome the drawbacks of phase I. This also failed to meet expectations, mainly due to implementation problems that limited the effectiveness of the scheme including delays in delivering subsidy payments which negatively affected the cash flows of participating companies. The mechanism design provided an incentive to solar companies to sell larger PV modules, rather than small, more affordable systems. Also, despite mechanisms in place to prevent the misapplication of funds, there was an abuse of the system by several market players.

An output-based aid (OBA) Fund was established in 2012 to support access to grid-based electricity services. Even though initially the programme faced significant challenges, similar to the ones of the PVTMA scheme, these were identified during the early stages of the scheme and appropriate mechanisms were devised to address them.

The provision of tax exemptions on off-grid solar products was another fiscal policy that was adopted by the government of Uganda to support the expansion of the solar PV market. Even though the scheme improved the affordability of solar products and attracted private companies in the market, the targeting performance of the scheme was considered poor. Moreover, the

exemptions were abused by several private companies to import non-solar products. With other neighbouring countries experiencing similar problems, the East African Community (EAC) issued a directive that calls its members to remove duty exemptions on solar accessories in all EAC countries. As a result of that directive, the government of Uganda reintroduced import duties (25%) and VAT (18%) on solar-powered appliances and parts, such as solar-powered radios and mobile chargers.

Available fiscal policy options for supporting the off-grid solar market

Subsidies

There are three main models for subsidising off-grid solar products in general, namely:

- **Sales (or dealer) model**: A subsidy is provided for solar products sold by approved and competing suppliers. In this system the subsidy may go directly to the dealer after proof of sale with appropriate monitoring systems, or to the end-users in the form of a voucher that is collected by the dealer and handed over to the entity administering the subsidy. Variants of this approach have been adopted previously in Uganda with only limited success to date.

- **Market package non-concession model**: The main feature of this model is that a single supplier is awarded the right to receive a subsidy for systems sold to users in a defined rural area, thus reducing the element of competition in the area where the supplier is operating. The reduction in competition enhances the benefit to firms of marketing their products in rural areas. Such arrangements have been adopted in Bolivia and in the Philippines.

- **Market package concession model**: Under a concession model, a concessionaire is given the sole right to provide SHS and collect revenues from users in a certain area and for a specific period. The concession is normally awarded following a competitive tender. In this model, the concessionaire owns and maintains the systems. Examples of such arrangements include programmes in Argentina and Morocco.

The advantages and disadvantages of each of the above are described in the main report.

Tax exemptions

The subsidy approach allows the possibility of targeting support to BoP households. Tax exemptions, on the other hand, are a blanket approach to supporting the off-grid solar market. They can improve the affordability of products and attract private companies to the market.

However, implementation can lead to market distortions (e.g., favouring imported products that compete against locally manufactured products) if the exemptions are not carefully designed and unless prescribed in detail they can be misunderstood or misused by customs officers, causing delays in importing products and uncertainty over costs.

Assessment of tax exemptions and subsidies and their variants

Lessons from Uganda and elsewhere suggest that the success of the fiscal support schemes hinges on the detailed design and implementation and the flexibility of the scheme to adapt when implementation problems arise. However, some schemes require better design and more complex

and expensive monitoring and supervision than others and are better suited to some situations (population size, existing administrative structures, administrative resource availability) than to others.

Subsidies

Although subsidy schemes can be successful when well designed and implemented, the perception of policy makers and other stakeholders of subsidy schemes in Uganda is that subsidies for SHS are ineffective. This perception will likely be difficult to reverse.

What are the alternatives to subsidies? The alternative support delivery[1] channels to encourage electrification access are:

- tax exemptions on SHS and pico-solar products (distributed solar products),
- other support to firms supplying distributed solar products (e.g., credit support for working capital and guarantees provided to banks lending to distributed solar companies – as with ERT III),
- microfinance to support households,
- direct or indirect financial support for grid electrification, and
- direct or indirect financial support for mini-grids.

Tax exemptions (discussed below) provide some support for distributed solar products but are unlikely to be sufficient by themselves. Working capital credit support is another form of subsidy to firms supplying distributed solar products and its success is currently unproven in Uganda. It will likely be helpful but it is unclear how significantly it will impact market penetration, particularly for BoP households.

Microfinance schemes are available to support households obtain distributed solar products, but the microfinance has largely been replaced by mobile payment schemes that allow households to pay-for-use (and subsidies through microfinance will be perceived by policy makers in the same way as other subsidy support schemes).

Financial and other resources needed for extending the national grid to unelectrified areas is technically challenging, while the investments will have to be funded through higher electricity tariffs, placing an additional burden on existing grid connected electricity consumers.

Lastly, mini-grids are expensive and reach only a small proportion of the population. Without some form of support for distributed solar products many millions of Ugandan households will therefore be left without any form of access to electricity for a number of years until the grid arrives.

It therefore seems inevitable that policy makers must eventually return to support distributed solar products at some stage in order to help achieve the universal access goal.

Although the sales (or dealer) model that has been tried previously in Uganda is the easiest to implement and could, if properly designed, be effective, it will be difficult to persuade policy makers to introduce new programmes of this type in the short-term. However, consideration might be given

[1] This refers to support delivery mechanisms. There are other mechanisms for collecting revenues to support increased electrification access including, for example, levies on the consumption of electricity or petrol/diesel, etc. or cross-subsidisation from grid electricity consumers to non-grid consumers through the electricity utility.

by policy makers to one of the other market-based approaches that is sufficiently different from the previous approaches.

It may also be possible for Uganda's electricity distribution company to be the concessionaire thereby allowing direct cross-subsidisation of SHS without recourse to state budget support or an electrification fund. The concessionaire would continue to rely on the private sector to supply and install the SHS. Such arrangements would need to be properly regulated by the Electricity Regulatory Authority (ERA). Whichever support scheme is adopted, the scheme needs to be carefully designed to target BoP households, to avoid distorting the market and creating perverse incentives, and to minimise scheme abuse. Some guiding principles are provided in the main report. Taking into consideration these principles and the available subsidy models, we suggest that the following fiscal support options be examined further:

	RBF (sales model)	**Market concession model**
Timeframe	Up to ten years, reviewed after five years.	Ten years.
Targeting of subsidies	Only offer subsidies to companies installing SHS to rural and remote areas that are not commercially attractive. Delivery of subsidies should be by means of a voucher to end-users. Household income and female headed households could be used as proxies for the distribution of the vouchers.	Concession agreement to specify the areas where the SHS installations should be made. Prior investigation should be made by the implementing authority regarding the areas that should be prioritised by the support mechanism.
Product quality	Payment should be linked to the effective output of the system installed rather than the capacity of the panel. The subsidy per SHS should be based on brightness (lumens) and duration (runtime per solar day of charge) of light that the product is capable of providing[2]. The fiscal options model should include various pro-poor scenarios on the appropriate rate of subsidy.	The competition through which the concessionaire will be selected to specify the minimum technical specifications of the SHS that will be installed. Potential suppliers could compete for the lowest subsidy requirement (unless awarded to national utility and regulated by ERA).
Maintenance of systems	The implementing authority can provide incentives to companies to provide maintenance services to customers (i.e. retain a portion of the subsidy for maintenance).	The concessionaire should be obliged as part of his contract to maintain the systems on a regular basis.
Transparency	The institution implementing the subsidy scheme should have sufficient capacity to monitor solar company performance and ensure that the claims/vouchers submitted by the companies are legitimate.	The performance of the concessionaire should be monitored on a regular basis to ensure compliance with the agreement requirements.

[2] The minimum threshold for a product to be eligible for subsidies should be 100 lumen-hours per solar day. 24 lumen light output, with 4 hour run time/day solar charge

Tax exemptions

Tax exemptions have a role to play but will not provide a solution by themselves. They do not target BoP households. If designed badly they will cause confusion among customs officers and arbitrary decisions, may encourage the import of finished products at the expense of local manufacture/assembly, and may be used to avoid taxes on products unrelated to solar.

Contents

1. Introduction

Objectives of the study

DFID has engaged Economic Consulting Associates (the Consultant) to conduct a literature review and situational analysis of the various fiscal policy options available for supporting the market for Solar Home Systems (SHS).

The assignment is designed to deepen DFID's understanding of the pros and cons of the fiscal policy tools available to Uganda. More specifically, the main objectives of this study are to:

- Analyse the various fiscal approaches used globally and make recommendations on the most suitable tax and subsidy options for Uganda; and
- Review previous and existing fiscal regimes in the energy sector in Uganda with the purpose of identifying the most successful measures for supporting greater access to electricity.

To achieve the assignment's objectives, the Consultant conducted a review of the literature on the fiscal policies that have been implemented in Sub-Saharan Africa and South East Asia to support electrification through SHS. Information regarding the effectiveness of fiscal policy options was also collected through direct engagement with relevant stakeholders active in the off-grid solar market in Uganda. Stakeholders that were consulted for this study, through in-person meetings, phone and Skype calls, and emails, include:

- Ministry of Energy & Mineral Development (MEMD)
- Rural Electrification Authority (REA)
- Uganda Revenue Authority (URA)
- Global Green Growth Institute (GGGI)
- Uganda National Bureau of Standards (UNBS)
- National Planning Authority (NPA)
- Electricity Regulatory Authority (ERA)
- UNCDF
- Village Power

This assignment is part of the Energy Africa initiative, launched by DFID in October 2015, to accelerate the expansion of the household solar market in Africa, helping bring universal energy access in the continent forward from the 2080 forecast that current trends indicate, to 2030.

Structure of the report

This Final Report covers tasks relating to:

- Off-grid energy access in Uganda (section 2)
- Fiscal policy for supporting the electricity sector in Uganda (section 3)
- Fiscal policy options (section 4)
- Conclusions and recommendations (section 5)

2. Off-grid energy access in Uganda

In 2014, approximately 74% of Uganda's population, or approximately 25.7 million people, lacked access to the electricity network, while in rural areas only 19.9% of the population enjoyed the benefits of grid electrification[3]. This means that approximately 5.5 million households do not have access to electricity.

Those households that lack access to electricity rely on technologies such as kerosene lamps and battery powered torches to meet their lighting needs. These alternatives, apart from being more expensive compared to off-grid solar products, are also unsafe and damaging to health.

The government of Uganda, in the 10-year Rural Electrification Strategy and Plan (RESP) 2013-2022, has set a target to increase access to electricity in rural areas to 26% by 2022. This includes increasing the number of SHS installations by a further 138,500 connections[4].

An important step towards the implementation of the RESP is the Energy Compact, which was signed by the government of Uganda and the UK government. The Compact outlines the policy actions that are necessary to remove the most urgent market barriers in the household solar sector, with the purpose of accelerating the development of the market.

The following sub-sections provide some background on the household solar market in Uganda.

The Ugandan off-grid Solar Market

Institutional framework

Uganda's Energy Policy is defined in the National Energy Policy (NEP) of 2002, which outlines the government's intentions to increase access to modern affordable and reliable energy services as a contribution to poverty eradication, while also ensuring that energy becomes an engine to economic development.

Realising the important role that renewable energy sources can play in meeting the country's electricity demand requirements in a sustainable manner, the government developed a Renewable Energy Policy (REP) in 2007. The Government's Policy Vision for Renewable Energy, as stated in the REP, is to increase the share of renewable energy in the total energy consumption from 4% in 2007 to 61% in 2017. Some of the policy actions that were devised as part of the REP included the introduction of feed-in tariffs, and the provision of fiscal and financial incentives for renewable energy investment.

[3] MEMD 2015. Uganda's sustainable energy for all (SE4ALL) initiative action agenda
[4] REA 2013. Rural electrification strategy and plan 2013-2022

The current revision of the Energy Policy presents an excellent opportunity to consider policy options that incentivise greater electricity access.

The off-grid electricity market in Uganda is governed by various other policy documents, including:

- **SE4ALL Action Agenda and Investment Prospectus (2015):** The ambition of these policy documents is to achieve universal access to electricity by 2030. Solar PV is identified as the main driver for rural electrification.

- **Rural Electrification Strategy Plan (RESP) 2013 – 2022 (2012):** The ambition of RESP is to achieve universal access to electricity by 2040. The mandate of the plan is to increase the rural electrification rate to 22% by 2022. This target assumes that 138,500 households will gain access to electricity services through SHS. Another important objective of the RESP is the replacement of kerosene consumption for lighting with clean sources of electricity.

- **Uganda Vision 2040 (2013):** This policy document highlights the importance of access to energy as a channel for development, but it does not provide specific actions for expanding the solar market.

- **National Development Plan II (2015):** The latest national development plan places an emphasis on the dissemination of renewable energy technologies, but it does not provide any strategies for promoting such technologies for the off-grid sector.

While the above documents demonstrate the government's commitment in supporting the off-grid electrification sector, there are no clear policy actions on accelerating the market for solar PV.

However, the Government has established several institutions that focus on attracting private investment in the energy sector. The role of each institution in relation to the household solar market is briefly discussed below:

- **Ministry of Energy & Mineral Development (MEMD)** - The policy-making agent for the energy sector. The renewable energy department of MEMD is responsible for implementing renewable energy programme both in the on-grid and the off-grid space.

- **Rural Electrification Authority (REA)** - The Rural Electrification Authority (REA) was established by an Act of Parliament in 2001 to operationalize the government's rural electrification policy. It is mandated with increasing access to electricity in rural and marginalised areas.

- **Electricity Regulatory Authority (ERA)** – It is mandated with regulating the energy sector, including setting tariffs, and issuing electricity generation and transmission licenses.

- **Uganda National Bureau of Standards (UNBS)** – UNBS's mandate is to develop and enforce the use of standards to protect the public's health and safety.

- **Uganda Energy Credit Capitalisation Company (UECCC) –** Established to facilitate investment in Uganda's renewable energy sector, primarily through private sector participation.

The market for solar PV

The solar PV market in Uganda has grown significantly from a few Kampala-based importers a decade ago to more than 200 companies. Almost a third of these companies are members of the Uganda Solar Energy Association (USEA)[5]. These companies vary widely in the type of solar systems they sell, and their business models.

The main factors behind the expansion of the solar PV market are related to the lack of access to the grid in rural areas leading to high demand for off-grid products, awareness campaigns from the government and donor agencies regarding the capabilities of solar systems, the development of mobile payment, and the reduction in prices of these products[6].

The total number of SHS sales, including for productive, commercial, and social use, is estimated at around 50,000 per year[7].

In recognition of the importance of affordable and sustainable access to electricity, the government of Uganda has removed VAT and import duties from solar products. However, following a directive by the East African Community (EAC) to remove duty exemptions on solar accessories in all EAC countries, the government of Uganda reintroduced import duties (25%) and VAT (18%) on solar-powered appliances and parts, such as solar-powered radios and mobile chargers.

Key development partners active in the solar market

The Government of Uganda (GoU) and development partners have taken significant steps to stimulate the development of solar markets in off-grid regions. Development partners that actively support the household solar sector include DFID, World Bank, GIZ, UNCDF and USAID.

Development partner-funded programmes that currently support off-grid access include:[8]

- **World Bank (Energy for Rural Transformation, ERT I-III)**: This is a 15-year programme aiming at increasing access to electricity in rural areas in Uganda by providing financial support to the sector
- **World Bank (Lighting Africa)**: Aims at catalysing the market by providing market intelligence on the demand for off-grid solar products and through awareness raising campaigns.
- **DFID (Energy Africa campaign)**: An initiative focusing on removing policy and regulatory barriers to solar PV market expansion and aiming at improving the co-operation of donors to provide more effective support to the sector.

[5] DFID 2016. Energy Africa Uganda- Compact and plan of action
[6] According to discussions with stakeholders
[7] DFID 2016. Energy Africa Uganda- Compact and plan of action. GOGLA 2018 provided a more conservative estimate of 20,000 per year. Available from: https://www.gogla.org/sites/default/files/resource_docs/2018_mtr_full_report_low-res_2018.01.15_final.pdf
[8] Ibid

- **DFID (Transforming Energy Access, TEA)**: A five year project to support scale up of innovative technologies, including SHS, aiming at accelerating access to affordable and sustainable energy services for poor households.

- **UNCDF (CleanStart)**: Supports poor households and micro-entrepreneurs to jump start their access to clean energy through microfinance. Includes four components, namely finance, technical assistance, knowledge dissemination and partnerships.

- **EU (Scaling-up rural electrification using solar PV distribution model):** The objective of the programme is to increase the uptake of solar PV systems at schools, health clinics and businesses by providing training to community-based organisations (CBOs).

- **EU (Scaling up access to modern electricity services in SSA through fee for service business model)**: Aims at increasing electricity access via SHS and mini-grids in rural areas in Uganda, Cameroon, Mali, and Guinea-Bissau.

- **USAID (Scaling off-grid energy enterprise awards)**: The programme provides seed funding to solar companies that provide innovative solutions to scale up the use of SHS to unelectrified areas.

- **USAID (Power Africa Uganda Electricity Supply Accelerator, PAUESA):** The programme focuses on support to generation and access projects through grants, transaction advisory support, short term grants, technical assistance

3. Fiscal policies for supporting the electricity sector in Uganda

GoU, with support from development partners, has implemented several initiatives that aim at scaling-up access to modern and clean electricity services and promoting the participation of private companies in the sector.

This section provides a historical account of the fiscal policies that have been implemented in Uganda to increase the deployment of off-grid solar products and provides information about their effectiveness.

Energy for Rural Transformation (ERT)

In 2001, GoU, in partnership with the World Bank, implemented the ERT initiative to stimulate rapid growth in rural areas through access to modern and efficient energy. More specifically, the programme aims at[9]:

- Increasing the productive use of energy in rural areas
- Increasing the number of employment positions to reduce poverty levels
- Improving living standards in rural areas.

The underlying assumption of the programme is that facilitating access to clean energy in rural areas would lead to significant improvements in the productivity of enterprises and the quality of life at the household level. The programme, which has been divided into three phases, has been the main channel for delivering subsidies for off-grid solar products. A review of the two phases that have been completed so far is provided in the following sub-sections.

ERT I

The development objective of this phase of the ERT programme was to 'put in place, on the ground, a functioning conducive environment and related local capacity for commercially oriented, sustainable service delivery of rural /renewable energy and ICTs'[10]. To achieve this objective, the ERT I project was divided into six components, one of which focused on scaling up the use of solar PV systems to unelectrified villages, where grid extension was not a viable option[11].

[9] UN Sustainable development platform. Case study: Energy for Rural Transformation (ERT) programme- Experiences and lessons learnt, available from: http://www.un.org/esa/sustdev/csd/casestudies/e9_uganda.pdf
[10] World Bank 2010. Independent Evaluation of ERT I, available from: http://documents.worldbank.org/curated/en/165331474489022932/pdf/000020051-20140620075303.pdf
[11] Ibid.

ERT I was designed to be a demand-driven, purely commercial initiative, in which off-grid solar companies, supported by subsidies, would be responsible for marketing, selling, and installing the solar PV systems.

The subsidies to the private sector were channelled through the Private Sector Foundation Uganda (PSFU) upon proof of sales. Under this approach, the consumers would only pay 30% of total cost of the system directly to the seller, while PSFU would pay for the remaining cost of the system.

During the first phase of the ERT, the subsidy scheme supported the installation of over 1,300,000 watt-peak (Wp). While the target of 320,000 cumulative watt peak sales was exceeded, this was largely because many of the installed systems were for community-related services, rather than households[12].

The strategy behind this approach to solar PV market development was that subsidies would provide an incentive to solar companies to market their products and accelerate the deployment of PV systems, even to commercially unattractive areas.

However, the response of the private sector was rather disappointing. Despite the expectations of the scheme, solar companies did not penetrate new markets and only few companies expanded their operations to rural areas, with most solar companies restricting their sales around Kampala.

After the completion of ERT I, the government concluded that “the demand-driven, private sector model was found to be premature for the Ugandan economy, while Government has still a big role to play in extending services to the people”[13]. This was partly because there was no prior investigation of the likely responses of the solar companies to the incentives provided as part of the programme.

Despite the strong theoretical foundations underpinning the design of the scheme, the programme had overestimated the capacity of the institutions to implement such an ambitious rural transformation programme. Even though the programme included a training and capacity-building component, this proved not to be sufficient to overcome the severe capacity limitations.

After the conclusion of ERT I, other barriers that were identified at the time regarding the slow uptake of solar PV systems included:

- *Affordability of solar PV systems*: Even after taking account of the subsidy, the cost of these systems was still high relative to the disposable income of rural households.
- *Product awareness*: Most of the solar companies at the time were small with limited financial resources to spend on marketing. As a result, market perceptions regarding the capabilities and quality of household solar products were rather poor.
- *Financial risks*: SHS were perceived as a risky asset to most buyers. This is because product guarantees were rarely provided to consumers, while the re-selling of the

[12] World Bank 2009. Implementation completion and results report of ERT phase I, available from: http://documents.worldbank.org/curated/en/414141468108858762/pdf/ICR12880Revise1revious0records10111.pdf
[13] World Bank 2010. Independent Evaluation of ERT I, available from: http://documents.worldbank.org/curated/en/165331474489022932/pdf/000020051-20140620075303.pdf

systems was not an option. Lending institutions also perceive these systems as risky. This is mostly related to the poor credit history of SHS customers.

ERT II

Following the conclusion of the first phase of the ERT programme, the design of the subsidy delivery mechanism was amended to help overcome the challenges that underpinned the poor performance of the previous support mechanism.

The Photovoltaic Target Market Approach (PVTMA) programme was launched in 2009 to overcome the identified barriers that prevented the rapid uptake of PV systems in rural areas during phase one. The overall objective of PVTMA was to increase the penetration and sustainability of the solar PV market[14]. More specifically, the PVTMA targeted the installation of 20,000 SHS and the provision of subsidies was the core strategy for achieving this target.

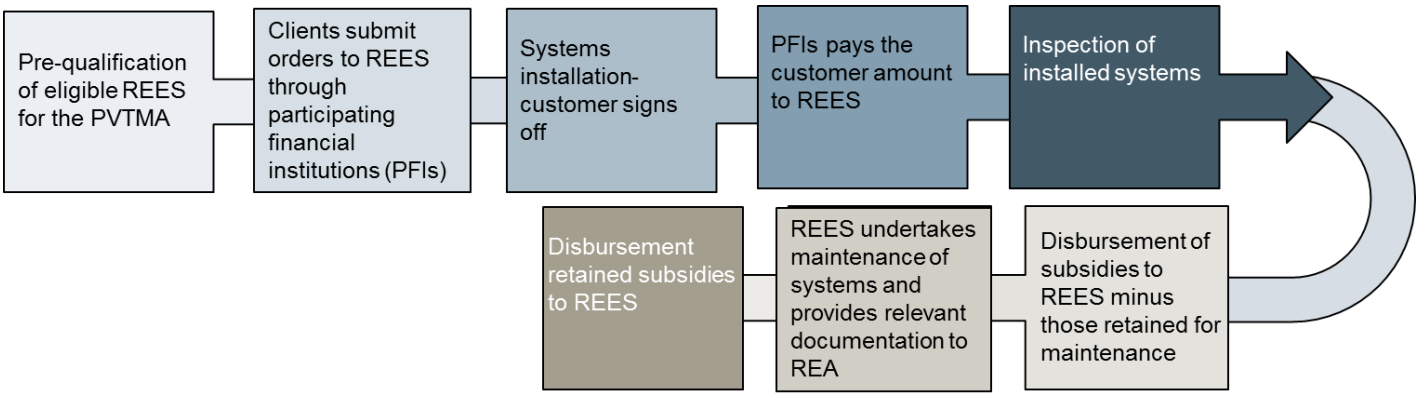
A solar company had to comply with certain criteria to be eligible for subsidies provided under the PVTMA, including meeting the minimum technical standards approved by the Uganda National Bureau of Standards (UNBS), and one-year warranties offers to consumers. Companies also had to demonstrate sales in the market for at least two years[15]. To incentivise the participation of rural solar companies in the programme, different application criteria were applied for rural-based companies and Kampala-based ones. For instance, Kampala-based companies had to submit a detailed business plan outlining their strategy for expanding their service network and a financial plan showing commercially viability of their business, while rural-based enterprises only had to submit a short summary of their business plan.

The prequalified REA Eligible Enterprises for Solar PV (REES) were eligible to receive customer subsidies for sales made in a particular area as outlined in the annual subsidy agreement that was signed between REA and the REES. The amount of consumer subsidy was equal to USD 5.5 per Wp installed, if the system did not exceed 50Wp, and USD 4 per Wp for systems up to 500Wp. The maximum amount that solar companies could claim was outlined in their subsidy contract[16].

For transparency purposes, consumer subsidies were channelled through approved financial institutions and subsidies were disbursed following verification of solar PV installations (figure 1).

Figure 1: PVTMA model

[14] REA 2010. PV Target Market Approach (PVTMA) Operational guidelines
[15] Ibid
[16] Piggins 2014. Powering Rural Transformation: Solar PV in Rural



The key aspects governing the new subsidy delivery mechanism under the PVTMA approach included:

- *Subsidies to end-users:* Subsidies that were previously delivered via solar companies in the form of lower prices did not stimulate demand because consumers could not 'see' the price reduction. Under PVTMA, the subsidies were instead provided to end-users.

- *Targeting of subsidies:* Consumer subsidies were channelled to solar companies through financial institutions and were targeted primarily to the poorest members of society. To achieve this goal, the approach of the PVTMA was to provide a higher subsidy rate for smaller SHS that would more likely be purchased by poorer households.

Despite the careful design of the PVTMA to tackle the barriers that seemed to be preventing the expansion of the household solar market, the programme failed to meet expectations. While the programme targeted 20,000 installations, only 14,000 were realised[17].

Apart from the general constraints that the off-grid solar market was facing, the subsidy mechanism experienced several implementation problems that limited the effectiveness of the scheme. These are briefly outlined in the sub-sections below.

Delay in subsidy payments posing a liquidity challenge

To prevent misapplication of funds, subsidies were to be channelled through registered financial institutions following the release of an audit report, as opposed to simply giving the subsidies to the solar companies.

However, this resulted in severe delays in the release of subsidy funds, negatively affecting the cash flows of participating companies, and their capacity to place new orders and meet their financial obligations. Some private companies that participated in the PVTMA scheme have reported having to wait for more than two years to receive the subsidy payments. The non-payment of subsidies in a timely manner had ultimately led to an interruption of the programme execution.

The delays that were reported regarding the installation inspection processes revealed REA's lack of capacity to perform its assigned duties.

[17] Piggins 2014. Powering Rural Transformation: Solar PV in Rural

The subsidy mechanism does not encourage companies to sell more energy-efficient equipment

The subsidy was in the form of a fixed amount based solely on the size of the solar panel, irrespective of the efficiency and output of the complete system. The subsidy programme provided an incentive to solar companies to promote products with larger PV modules, rather than small, cost effective systems where the emphasis is on providing lighting for longer periods of time[18]. This had negative implications on the customers at the base of the pyramid (BoP), who would be better off with small plug and play systems[19].

Inadequacy of the monitoring process

Despite all the mechanisms put in place to prevent the misapplication of funds, the limited efficacy of the monitoring and verification process led to the abuse of the system by several market players. According to testimonies by key stakeholders, the submission of fake receipts proving the installation of PV systems was a common practice.

Because of the above limitations of the subsidy delivery mechanism, and particularly the delay in subsidy payments, several companies that were pre-qualified for the scheme pulled out.

According to a World Bank report[20], 80 percent of the growth realised in the market took place outside the PVTMA programme.

ERT III

The subsidy mechanisms that were implemented as part of phase I and II of the ERT programme failed to meet expectations. During the design of the third phase of the programme, policy makers and solar companies alike were sceptical about the effectiveness of fiscal policy measures in supporting the development of the off-grid solar market.

This prompted policy makers to abandon the use of subsidies. Instead, according to the current design of the programme, a working capital facility was put in place to provide working capital loans to solar companies operating a pay-as-you go model. Partial risk guarantees will also be offered to financing institutions to reduce their credit risk associated with lending to solar companies[21]. While it is still too early to draw any lessons regarding the effectiveness of these support mechanisms, a challenge that many companies that wish to participate in the scheme are facing is the need for Lighting Africa accreditation. This has particularly affected companies selling component-based systems.

Tax exemptions

[18] Hülsen, A and Koch, S and Huth,T. 2016. Village Power scaling rural electrification in Uganda, Field Actions Science Report
[19] Piggins 2014. Powering Rural Transformation: Solar PV in Rural
[20] World Bank 2015. Project information document (PID) appraisal stage. Uganda Energy for Rural Transformation III, available from: http://documents.worldbank.org/curated/en/677741468310512969/pdf/PID-Appraisal-Print-P133312-04-15-2015-1429130135491.pdf
[21] UECCC website. Available from: http://www.ueccc.or.ug/index.php/services

The provision of tax exemptions on off-grid solar products was another fiscal policy that was adopted by the government of Uganda to support the expansion of the solar PV market. According to private companies, the removal of taxes on these products was an important step for improving their affordability and attracting private companies in this nascent market.

However, despite the relative success of this policy option, the targeting performance of this fiscal mechanism was rather poor. Given that tax exemptions were applied across all solar products, the policy did not provide any incentives to private companies to target certain geographical areas or particular segments of the population.

Moreover, the support scheme was abused by several private companies who took advantage of the tax exemptions to import non-solar products. Due to the lack of capacity and skills of customs officers at the borders to differentiate between solar and non-solar parts, importers of non-solar energy products were often benefiting from tax exemptions at the expense of taxpayers.

In order to tackle this problem, the East African Community (EAC) has recently asked for the removal of custom duty exemptions on solar parts and appliances in all EAC countries, including Uganda. Uganda has already enforced the EAC directive by re-introducing duties (25%), VAT (18%) and withholding tax (6%) on solar accessories and spare parts, such as mobile chargers and solar-powered televisions.

Even though the purpose of rescinding the tax exemption on solar parts and accessories aimed to limit the abuse of the fiscal support mechanism by non-solar companies, it ended up damaging the economic profitability of solar companies. Even worse, the tax was declared to be retrospective, applying to all solar parts and accessories that were imported during the 12-month period before the new law[22].

The current tax policy does not specify which solar accessories are subject to taxation, thus creating ambiguity regarding application of the tax exemptions. The lack of clarity regarding the parts that are exempt from taxes has created a lot of confusion among private players and customs officers alike. The latter do not often know how to differentiate between solar off-grid product components and other electrical components, and often the same products are treated differently depending on the judgement of each officer.

In anticipation of further changes in the tax policy, the companies have not passed on the additional costs to consumers, but they have been forced to reduce imports, while some have completely ceased shipments[23]. Solar companies believe that if they had to increase the price of their products to accommodate the higher tax burden, their customers would not be able to afford the products.

This situation also favours solar kits, such as the ones sold by Fenix, since it is easier for custom officers to classify them as solar products. However, this comes at the expense of local assembly of solar home systems and subsequently impacts local employment.

[22] USAID 2017, Supporting Off-Grid Energy Access in Uganda: Political landscape analysis
[23] Ibid

One of the largest solar companies in Uganda, Village Power, is currently working with DFID to develop a clear handbook that provides guidelines to solar companies and government agencies regarding the solar accessories and equipment that are exempt from tax[24].

OBA scheme for on-grid connections

An agreement was signed in 2012 between the Global Partnership on Output-Based Aid (GPOBA) and GoU to establish a Grid-Based OBA Fund that would support access to grid-based electricity services. More specifically, the USD 5.5 million fund aims at subsidizing grid connections, on an output basis, to approximately 132,500 low income households in rural peri-urban areas[25].

The cost of electricity connections has been a significant barrier to the electrification of rural households. The subsidies provided as part of the OBA programme reduce the capital costs of electricity connections, allowing more rural households to get access to the grid.

The subsidies are managed by REA, and the scheme is implemented by six service providers that are licensed by ERA[26]. The subsidies cover the full cost of connection and target poor households that are close to a low-voltage network and do not require any pole service. A portion of the total subsidy (67% of the total connection costs) is disbursed to the service provider following verification of installation, while the remaining subsidy (33% of total costs) is provided to the service provider after demonstrating proof of electricity consumption by the household for more than six months[27].

In its initial stages of implementation, the programme faced significant challenges similar to the ones of the PVTMA scheme, including[28]:

- Affordability of internal wiring
- Delays in installation verifications leading to delayed disbursement of subsidies to service providers, and
- Delays in identifying eligible households.

However, **unlike the PVTMA scheme, the OBA programme identified these challenges during the early stages of implementation and tried to address them**.

For those households that could not afford to pay for the installation of internal wiring, the programme introduced the following forms of support[29]:

- A ready-board with pre-paid meter connection for those households that were planning to install the wiring soon after the connection

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[24] Discussion with Village power
[25] REA website. Subsidies, available from: http://www.rea.or.ug/subsidies.html
26 GPOBA website. GPOBA establishes grid-based OBA fund to provide electricity to 100,000 rural homes in Uganda, available from: https://www.gpoba.org/node/654
27 REA website. Subsidies, available from: http://www.rea.or.ug/subsidies.html
28 GPOBA website. GPOBA establishes grid-based OBA fund to provide electricity to 100,000 rural homes in Uganda, available from: https://www.gpoba.org/node/654
[29] Ibid

- A load-limited ready-board connection for those households that lack the capacity to pay for internal wiring

In addition, GPOBA changed the disbursement schedule to a one-time payment following the installation of the pre-payment meter to make the disbursement of subsidies more efficient. This change has highly incentivised service providers and led to a significant increase in the connection uptake.

Part of the success of the scheme lay in the marketing campaign developed by REA to inform rural households about the benefits of the programme and the application procedures. Also, the structure of the subsidy mechanism, focusing on outputs, has provided an incentive to service providers to ensure the quality of connections[30].

The above actions to overcome the initial challenges that the project faced have led to an acceleration in the uptake of new connections. Within the first couple of years of the project, approximately 102,200 new connections were supported, benefiting around 511,000 people, and bringing the country closer to its rural electrification target of 26% by 2022, while also reducing illegal connections[31].

[30] GPOBA 2016. Output-based Aid for Energy Access, available from: https://www.gpoba.org/sites/gpoba/files/OBA52_OBA_%26_Energy_Access.pdf
[31] Ibid

4. Fiscal policy options

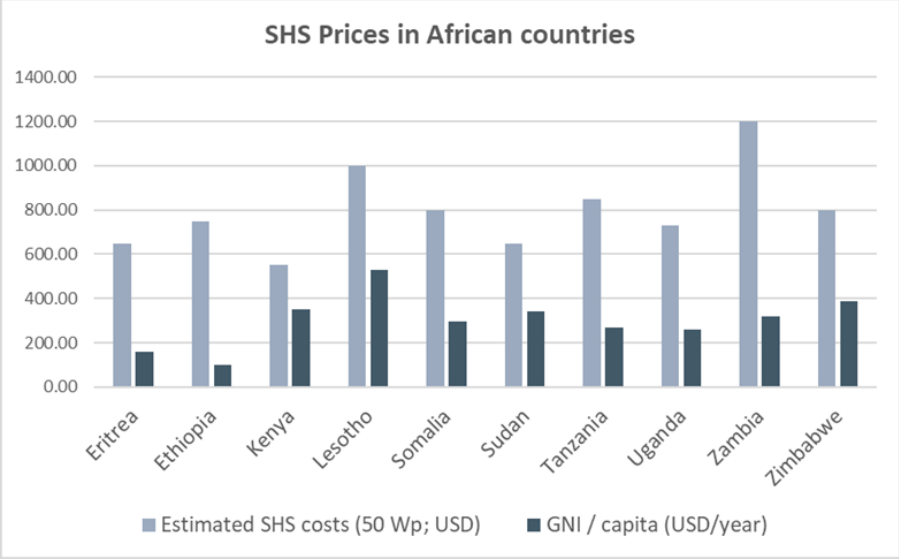
The importance of supporting the off-grid solar market

While the most cost-effective way to achieve universal access to electricity varies widely between and within countries, the extension of the grid, especially to isolated areas, is seldom financially viable. The most effective means to expand electricity for rural areas distant from power grids is expected to come from mini-grid or off-grid systems[32]. Off-grid solar solutions can provide basic electricity access to remote households several years or decades before grid connection becomes possible. Electricity generated by standard SHS not only meets the lighting needs of households, replacing the consumption of traditional sources such as kerosene lamps, but can also provide sufficient power for a TV and other small electrical appliances.

Acknowledging the important role that solar PV can play in achieving universal access to electricity by 2030, GoU has developed the SE4ALL Action Agenda and Investment Prospectus and committed to a target of 140 MWp of SHS installations by 2030.

Despite the size of the addressable off-grid market in Uganda (estimated to be 4 million households[33]), it remains largely untapped. One of the most important constraints to the deployment of SHS is customer affordability. As shown in the figure below, the average cost of a SHS in most Sub-Saharan African countries is higher than the average annual household income.

Figure 2: Comparison between SHS prices and household incomes in SSA

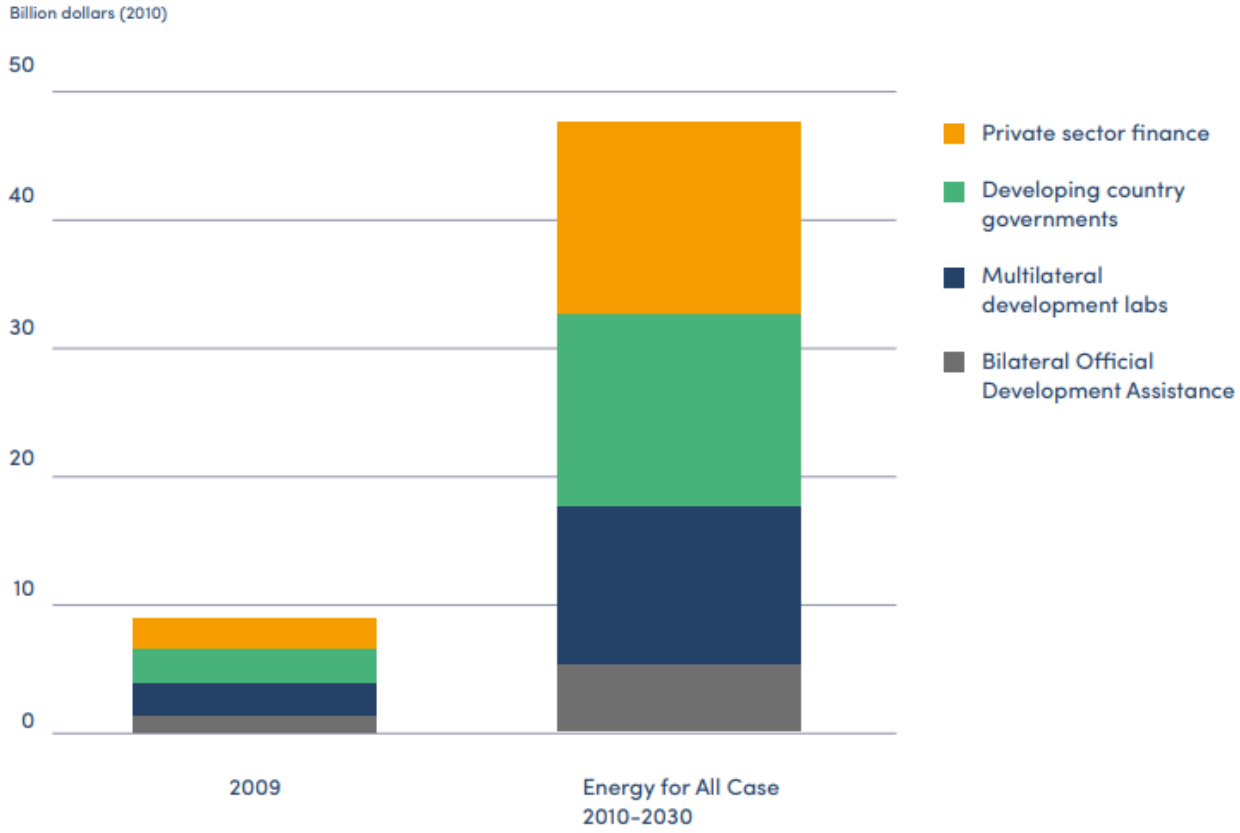


Source: ECA, adapted from World Bank 2009[34]

[32] IEA 2016. World Energy Outlook
[33] OCA 2017. Ugandan Off-grid Market Accelerator: Mapping the Market
[34] World Bank 2009. Tendering Subsidies for Electrification, available from: http://siteresources.worldbank.org/EXTAFRREGTOPENERGY/Resources/717305-1264695610003/6743444-1268073657582/15.2.Tendering_Subsidies_for_Electrification.pdf

In Uganda, where more than a quarter of the population lives below the poverty line, the cost of acquiring a SHS is an unrealistic option for a large proportion of the population. Unless the prices of SHS fall substantially, cash sales of SHS will be limited to the higher income classes. This highlights the vital role that public support can play in accelerating access to off-grid solar products. Investment would need to increase fivefold compared to the 2009 levels (Figure 3) to achieve universal access to electricity by 2030, according to the IEA. With most SSA governments, including GoU, lacking the financial resources necessary to fully fund household electricity access, the private sector can play a significant role in filling the investment gap. However, it is important for governments to provide an enabling policy and regulatory environment that is conducive to private sector investment to attract the private sector into this relatively nascent market [35].

Figure 3: Investment requirements by financing source for achieving universal energy access

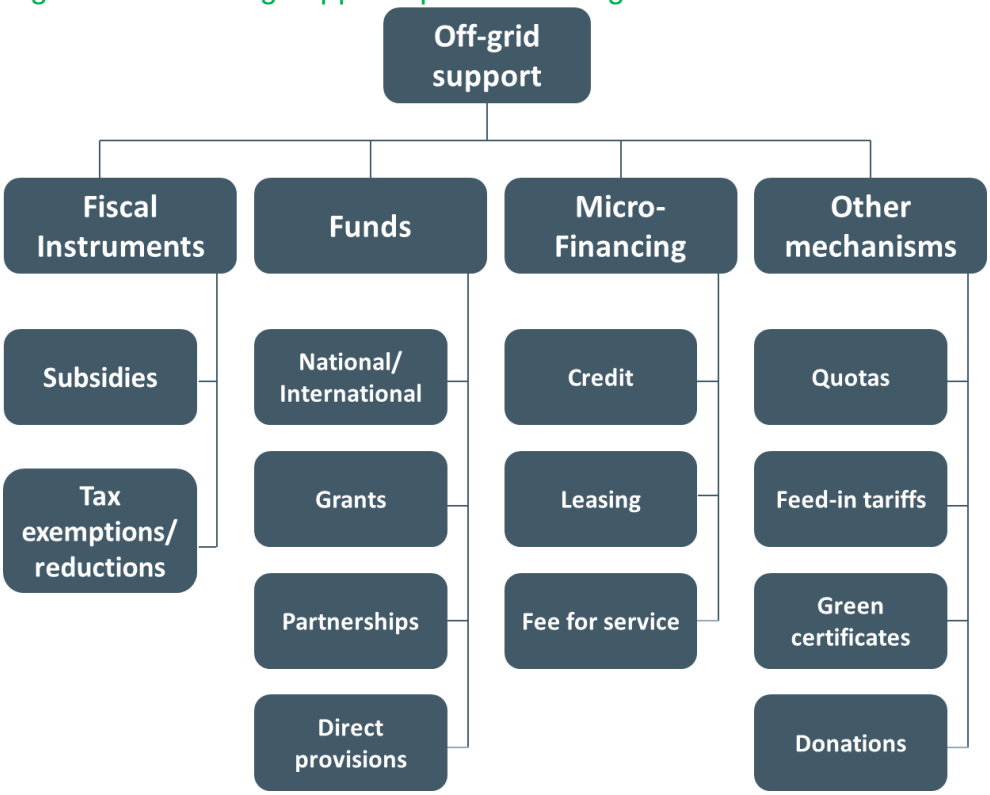


Fiscal options for supporting the off-grid solar market

A number of financing support mechanisms have been devised by policy makers to address the financial barriers to expansion of the off-grid electrification market, and subsequently ensure greater access to electricity in rural areas,. Such support mechanisms include fiscal instruments, national or international funds, micro-financing, and donations. The main financing support options for off-grid electrification are summarised in the diagram below.

[35] GOGLA 2016. Providing Energy Access through Off-Grid Solar: Guidance for Governments, available from: https://www.gogla.org/sites/default/files/resource_docs/energy_access_through_off-grid_solar_-_guidance_for_govts.pdf

Figure 4: Financing support options for off-grid electrification



Source: ECA, adapted from Bhattacharyya, S. 2013[36]

Fiscal support mechanisms, including subsidies and tax exemptions, have traditionally been used to improve the affordability of off-grid products and attract private sector investment into the market. These mechanisms are often justified on social equity grounds, given the need for poor households living in remote areas to achieve a level of parity with segments of the populations concentrated in areas that benefit from subsidized grid infrastructure.

Limited need for administrative capacity – as subsidies and tax exemptions are readily available instruments, they enable governments to provide visible benefits, particularly for low-income countries that may lack administrative structures to develop and implement efficient and equitable means of providing targeted benefits[37].

However, subsidies are often criticised for distorting the market and failing to achieve the intended objectives, including targeting the correct segments of the population. Subsidies provided to the off-grid electricity sector also compete with investments in other social programs that could benefit the poorest population of low income countries.

The following sub-sections provide an overview of the available fiscal policy options for supporting the off-grid solar market in Uganda.

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[36] Bhattacharyya, S. 2013. Financing energy access and Off-grid Electrification: A review of status, options and challenges, available from: https://www.dmu.ac.uk/documents/technology-documents/research-faculties/oasys/project-outputs/peer-reviewed-journal-articles/pj7--financing-energy-access--rser-paper.pdf

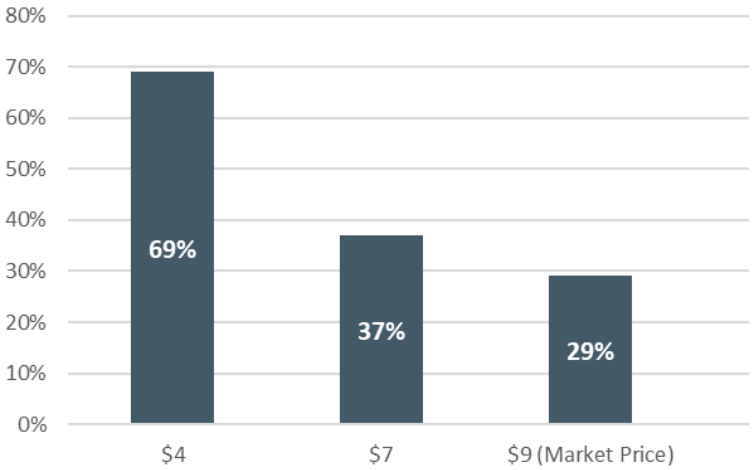
[37] IMF 2013. Energy Subsidy Reform in Sub-Saharan Africa Experiences and Lessons, available from: https://www.imf.org/external/pubs/ft/dp/2013/afr1302.pdf

Tax exemptions

Taxation plays a crucial role in creating an enabling environment for off-grid energy solutions in rural areas. Value-added tax, import and excise duties influence the price paid by consumers, and therefore the affordability of solar products. According to data collected by SolarAid, 82% of customers purchasing basic solar light in Uganda, Malawi, Kenya, Tanzania, and Zambia live below the poverty line. In this context, VAT and import duties can reduce uptake significantly through higher prices, putting off-grid products out of reach for the poorest segments of the population.

Evidence from other Sub-Saharan African countries suggests that removing taxation on off-grid solar products can have a significant impact on accelerating the deployment of off-grid solar products[38]. The high elasticity of demand for solar system is demonstrated by a study conducted in Kenya, showing that a reduction in the price of a solar lamp from USD7 to USD4 led to a remarkable increase in household uptake, from 37% to 69% (Figure 5).

Figure 5: Household uptake of SHS at different prices



Source: ECA, adapted from GOGLA 2016

Also, for those companies involved in the importation of off-grid solar products, VAT and import duties have a negative impact on their cashflow and, subsequently, on their financial viability. As such, according to private solar companies, taxation is a major impediment to the development of the market. Since the majority of household solar products sold to the market are imported, those involved in the distribution of such products face significant currency exchange risks that jeopardise the sustainability of these businesses. Taxes exacerbate that risk.

Although common concerns relate to the loss of revenue for governments, recent studies conducted in Mozambique and Malawi suggest that macroeconomic benefits exceed the foregone tax revenues. Such benefits include more employment positions, eventually leading to more tax revenues for the government, a reduction in carbon emissions and health improvements for society's most vulnerable groups.

[38] Solar Aid, 2014. Kenya celebrates VAT exemption for solar, available from: https://solar-aid.org/kenya-celebrates-vat-exemption-solar/

However, while tax exemptions on solar PV products benefit the poor compared with those with grid electricity, they do not target those at the base of the pyramid. As in the case of Uganda, tax exemptions can prove ineffective at increasing the uptake of solar products among this group.

Subsidy mechanisms

The three main types of subsidised financing and delivery models for SHS electrification programmes are:

- Sales (or dealer) model
- Market package non-concession model, and
- Market package concession model

The following section provides an overview of each model, while a summary of the key features of the three models is presented in Figure 6.

Sales/dealer models

In sales (or dealer) models a subsidy is provided for solar products sold by approved and competing suppliers. In this system the subsidy may go directly to the dealer after proof of sale with appropriate monitoring systems, or to the end-users in the form of a voucher that is collected by the dealer and handed over to the entity administering the subsidy. Vouchers may prove more effective in targeting subsidies to poor households than subsidies delivered directly to dealers, however they face several challenges:

- The distribution of vouchers requires the implementing authority to select the households that will receive the vouchers on the basis of certain criteria. While household income can in principle be applied as a measure of eligibility, lack of data can often be a challenge. Another proxy that may be used is that of female headed households.
- Those households that hold a voucher may be willing to sell their subsidy entitlement to a non-eligible household. While this might reduce the targeting performance of the subsidy, the voucher itself does not have a monetary value and, therefore, it can only be used by households that do not have access to electricity.

The supplier may also be required to provide a guarantee and maintenance contract for a certain period after which the responsibility falls on the user. The subsidy may be available for sales in rural areas and to specific population categories or may be available for all sales within the country. These programmes are also often accompanied by add-ons such as:

- Credit mechanisms to overcome affordability barriers due to the high upfront costs
- Minimum standards to ensure that subsidies are only provided for SHS complying with minimum quality and performance targets
- Maintenance contracts to oblige suppliers awarded subsidies to provide SHS maintenance

Overall, the model is relatively easy to implement, and benefits from strong competition between suppliers that is likely to lead to cost efficiency and product innovation. Moreover, private participants take full risk upon themselves until delivery, after which the incentive for maintenance resides with the household. The main drawback of the model relates to the pre-financing constraint and the implementation of monitoring systems that might impose additional costs.

Examples of sales models

Nicaragua

The PERZA programme implemented in Nicaragua is one of the typical dealer-based subsidy models. The programme was launched in 2003 with the purpose of installing 7,000 additional SHS. SHS developers that met the required technical standards were provided an output-based subsidy amounting to nearly 15% of the initial costs. MFIs made financing available to potential users to cover upfront costs, by providing loans to customers for the purchase of SHS, which were owned by the users as in all standard dealer models. Even though the programme met its target in terms of number of installations, insufficient consideration on maintenance obligations meant that after two years only 25% of installations were still functioning.

China

Another example of an SHS programme implemented with a typical dealer model is the Renewable Energy Development Programme (REDP) operating in China between 2002 and 2007. During the project, which provided 400,000 SHS in north-western China, 32 participating companies were involved as wholesalers to supply systems to local retailers. Competition between companies contributed to keep prices at very low levels compared to international standards, and good customer relationships were built through after-sales care provided by the retailers. For each SHS meeting quality standards, companies received a payment close to 20% of the retail price, which further increased in line with quality standards. Overall, it was estimated that subsidies equivalent to 20-25% of the SHS capital costs were provided by the project.

Market package non-concession models

The main feature of this model is that a single supplier is awarded the right to receive a subsidy for systems sold to users in defined rural area, thus removing the element of competition in the area where the supplier is operating.

Only one accredited supplier receives the subsidy for solar products that are sold in designated rural areas, and the supplier for each area is usually determined through a competitive bidding process to obtain value for money. Therefore, the bidder requesting the lowest subsidy is awarded the rights. This non-concession market package may have the same “add-ons” as the sales model, including maintenance obligations on the suppliers, minimum quality and performance standards for equipment supplied and involvement of micro-financing institutions to provide credit mechanisms and overcome affordability barriers.

The advantage of this approach is that the dealers’ marketing costs and the costs of meeting obligations and maintenance are significantly lower as the sales are concentrated in one area, with little threat of competition among suppliers.

Examples of non-concession models

Bolivia

The Decentralised Energy for Rural Electrification Programme (IDTR) initiated in Bolivia in 2003 to achieve universal rural electrification by 2025 adopted a non-concession model known as Medium Term Service Contract (MSC), which pays subsidies to the dealer for building a local service and training network. In 2005, 14 service contracts were bid out in a one-stage, multi-lot tender, based on the number of SHS systems.

The service providers oversee after-sale O&M services for four years following SHS installation, while users are responsible for covering maintenance and system failure costs once the service period has elapsed. Subsidies cover close to 60% of total costs with the remaining 40% contributed by end-users. The types of subsidies provided by IDTR include direct up-front customer subsidies for initial investment costs, service quality subsidies paid to suppliers against performance targets, market development service subsidies against training of local technicians, monitoring and evaluation, and indirect market development subsidies based on overall promotion activities, support of business development strategies and technical assistance.

Philippines

The Rural Power Project (RPP) supports investments in providing power services to rural areas in the Philippines. A dealer model to distributing subsidies was first implemented, which however led to several challenges related to finding customers, high marketing costs, and the small-scale and financial capacity of dealers.

A non-concession model market package model, the Sustainable Solar Market Package (SSMP), was subsequently implemented to overcome those challenges. This programme achieved the electrification of 41,980 villages in 2009, although the process of finding suitable private contractors was rather slow, highlighting a lack of capacity among private companies to carry out the requested services.

Market package concession models

Under a concession model, a concessionaire is given the sole right to provide SHS and collect revenues from users in a certain area and for a specific period. The concessionaire owns and maintains the systems and is normally awarded the rights to provide SHS following a competitive tender. Since the concessionaire is granted a monopoly in a specific geographical area, and given the difficulty of fixing the fees for the whole duration of the concession, the introduction of a regulatory framework to ensure that reasonable prices are charged becomes necessary. This is likely to increase the costs of implementing this model, while also suppressing the potential for innovations and cost reductions.

Examples of concession models

Argentina

The Project for Renewable Energy in Rural Markets (PERMER) was launched in Argentina in 1999 to provide electricity for lighting and social communication to rural households and service institutions. The programme was supported by subsidies from government and donors, and

concessions were granted through a competitive bid process to the bidder requesting the lowest subsidy level and demonstrating a minimum level of technical qualification and economic capacity.

Initial investment costs were divided between the user (about 10%), the concessionaire (30-40%) and an upfront subsidy. The concessionaire collects the subsidy upon evidence of installation fee payment by the consumer, equipment compliance with safety and technical standards, and other conditions specified in the contract. The system of paying after installation increases financing costs for the concessionaire but at the same time creates an incentive for service suppliers to install high quality systems. Nevertheless, the scheme failed to meet set targets, due to low uptake of SHS and bad maintenance services.

Morocco

Morocco offers an unusual example of a concession model for SHS subsidisation, where the state-owned electricity utility (ONE) holds the SHS concession and sub-contracts a private company (TEMASOL) to finance, install and maintain the equipment and collect fees. The customers pay an initial connection fee and a monthly service fee based on the type of service received, while the private operator installs the equipment after signing of the contract. Once it is installed and working, ONE gains ownership of the solar equipment, and the consumer is considered a customer of ONE, although the technical and financial aspects of the programme are manged by the operator, which is also responsible for replacing the equipment ten years after purchase. The total investment costs are covered by ONE (66%) and the private operator (34%). The subsidy makes the cost of electricity for consumers close to what city dwellers pay to receive electricity from the grid. Payment records since the end of 2009 indicate affordability of user fees and high overall satisfaction.

Figure 6 provides a summary of the key features of the three models used for SHS subsidisation.

Figure 6: Subsidy delivery models

	Sales/dealer models *Subsidy is provided for solar products sold by approved suppliers who compete with each other*	**Market package models** *A single supplier is awarded the right to receive a subsidy for systems sold to users in a defined rural area*	**Market package concession models** *A concessionaire is given the sole rights to provide SHS and to collect revenues from users in a given area*
Criteria	- Rural areas - Certain population categories - Quality standards	- The bidder requesting the lowest subsidy is awarded the rights - Quality standards	- The concession will normally be awarded following a competitive tender
Delivery mechanism	- Directly to the dealer after proof of sale - *Voucher to the end-user* - *Verification triggers disbursement*	- Directly to the dealer after proof of sale - *Voucher to the end-user* - *Verification triggers disbursement*	- The concessionaire owns and maintains the systems/acts like a small utility - Fee for service
Variations	- Credit option by supplier or MFI	- Credit option by supplier or MFI - *Maintenance contracts*	- Ownership of the SHS with supplier/end user - Allocation of concession to the utility
Pros and cons	- Easy to launch - Strong competition should lead to cost efficiency and product innovation - Private participants take full risk until delivery - The incentive for maintenance resides with the household - *Pre-financing constraint* - *Cost of monitoring (check claims by sellers/paper checks)*	- The dealers' marketing costs and the costs of meeting warranty obligations and on-going maintenance are substantially reduced - Removes the competition element	- Supplier is obliged to maintain the SHS, otherwise no fee - Takes out the 'wild west' aspect of SHS financing - The concessionaire is granted a monopoly so a regulatory framework is required - May suppress innovation and cost reductions

Source: ECA

Comparison between the sales and market package models

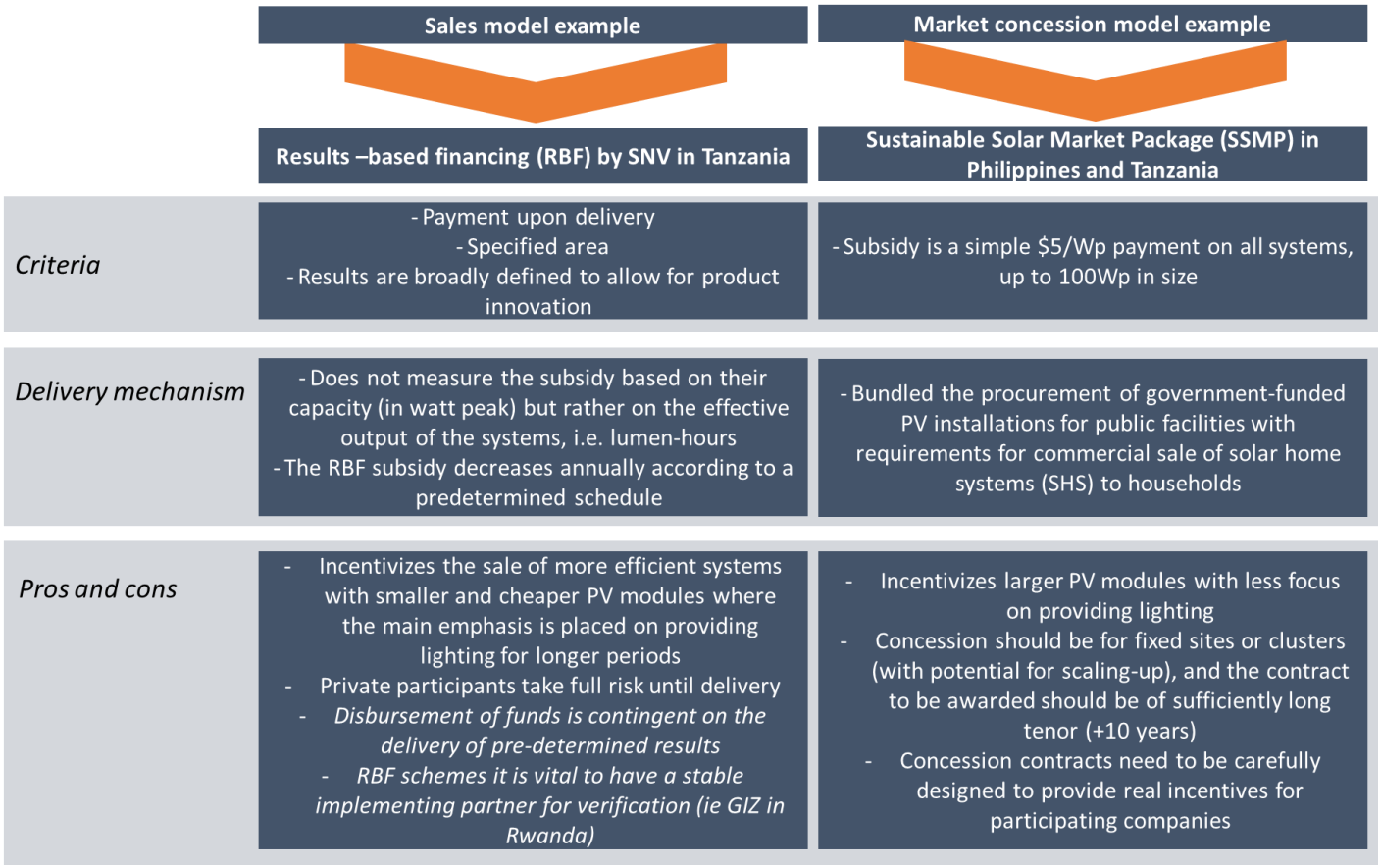
This section summarises the findings from a recent study[39]that compared the performance of a market package subsidy delivery mechanism in Tanzania, the Sustainable Solar Market Packages (SSMP) scheme, with a Results-Based Financing sales model that has been proposed as a potential new model for delivering subsidies in Tanzania. The comparison between these two models provides some interesting insights regarding the incentives provided under each model and the relative effectiveness of each scheme.

The method used to deliver the subsidy for SHS under the SSMP model is a simple USD5/Wp payment on all systems, while the RBF method measures the subsidy based on the effective output of the systems rather than on their capacity, thus encouraging suppliers to sell more energy-efficient products. In addition, the total subsidy available to a single household according to the

[39] Evidence on Demand. Energy Africa TAF Technical Assistance to the Rural Energy Agency of Tanzania- Final Report August 2017. ASD. (unpublished)

RBF scheme is capped at USD34, and it decreases annually according to a predetermined schedule.
A summary of the two models is presented in Figure 7.

Figure 7: Comparison between the SSMP and the RBF subsidy models in Tanzania



According to the results of the study, for a total subsidy of USD1,000,000, the number of households that would get access to a SHS are:

- 3,265 under the **SSMP** subsidy scheme
- 33,102 under the **RBF** sales scheme, or more than 10 times more than in the SSMP programme

Equally, it was found that for the installation of 4,500 SHS with a capacity of 100W, the total subsidy requirement under the SSMP model would be $2.2 million, or 13 times higher than under the RBF scheme (Table 1).

Table 1: Subsidy requirement under the SSMP and the RBF models

	Number of units	Capacity (Wp)	Subsidy – SSMP (total/per unit) (USD)	Subsidy – RBF (total/per unit) (USD)
Solar Home System	4,500	100	2,250,000 / 500	153,900 / 34

The analysis highlights several key points regarding the relative effectiveness of the two subsidy delivery mechanisms:

- The cost and number of households serviced varies due to the efficiency of the solar systems encouraged by each incentive mechanism

- The SSMP scheme encourages systems that are not optimized for providing lighting, while the incentive calculations do not consider recent advances in design, manufacturing and business models. For instance, the $500 subsidy that is provided for a solar system with a capacity of 100Wp is equivalent to the full retail price of an equivalent Lighting Africa Solar Home Module[40]. On the other hand, the RBF scheme rewards output (lumen-hours) over input (Wp) incentivising solar companies to market more cost-effective products. SSMP model does not provide adequate incentives for innovation in design and product range as it is focused on input rather than output.

- The innovative business models developed under the RBF scheme make SHS more affordable to end customers, while SSMP subsidies are expensive for households as systems often sell for more even after taking account of the subsidy.

- The potential for capacity-building at the local level is also much higher under the RBF scheme rather than the SSMP model, which reduces competition between suppliers and the incentive for innovation as suppliers do not need to build good relationships with local customers.

- One of the disadvantages of RBF compared to SSMP is that suppliers are required to cover the full up-front costs and financing costs for SHS before the subsidy is paid out.

[40] RBF Fund: Operational Guideline May, 2107

5. Conclusions and recommendations

Despite all the efforts from government and donor agencies to support the off-grid solar market in Uganda, it has not yet been possible to close the gap between the large potential demand in rural areas and the supply of household solar products.

Several factors are holding back the expansion of the market to rural areas, including high upfront investment costs, low payment capacity of potential clients and insufficient financing. While there are several options for supporting the expansion of the off-grid solar market, fiscal policy options have traditionally been the most widely used.

Although subsidy schemes can be successful when well designed and implemented, the perception of policy makers and other stakeholders of subsidy schemes in Uganda is that subsidies for SHS are ineffective. This perception will likely be difficult to reverse.

The alternatives are problematic for various reasons. Tax exemptions provide some support for distributed solar products but are unlikely to be sufficient by themselves and do not target those at the base of the pyramid. Working capital credit support is another form of subsidy to firms supplying distributed solar products and its success is currently unproven in Uganda. It will likely be helpful but it is unclear how significantly it will impact market penetration, particularly for households at the base of the pyramid.

Microfinance schemes are available to support households obtain distributed solar products, but the need for microfinance has largely been replaced by mobile payment schemes that allow households to pay-for-use (and subsidies through microfinance will be perceived by policy makers in the same way as other subsidy support schemes). Financial and other resources needed for rapid expansion of the electricity grid make this approach challenging and the consequence for electricity prices for existing grid-based electricity consumers is generally politically unpalatable. Lastly, mini-grids are expensive and reach only a small proportion of the population. Without some form of support for distributed solar products many millions of Ugandan households will therefore be left without any form of access to electricity for a number of years until the grid arrives.

It therefore seems inevitable that policy makers must eventually return to support distributed solar products at some stage in order to help achieve the universal access goal.

Although the sales (or dealer) model that has been tried previously in Uganda is the easiest to implement and could, if properly designed, be effective, it will be difficult to persuade policy makers to introduce new programmes of this type in the short-term. However, consideration might be given by policy makers to one of the other market-based approaches that is sufficiently different from the previous approaches. It may also be possible for Uganda's electricity distribution company (Uganda Electricity Distribution Company Limited (UEDCL)) to be the concessionaire thereby allowing direct cross-subsidisation of SHS without recourse to state budget support or an electrification fund. The concessionaire would continue to rely on the private sector to supply and install the SHS. Such arrangements would need to be properly regulated by the Electricity Regulatory Authority (ERA) to ensure that UEDCL is not negatively impacted financially by taking over this responsibility and meets its mandate to serve rural customers.

Whichever support scheme is adopted, the scheme needs to be carefully designed to target BoP households, to avoid distorting the market and creating perverse incentives, and to minimise abuse of the scheme. Some guiding principles are provided in the main report.

Taking into consideration the above principles and the available subsidy models that were presented in section 4, we recommend that Open Capital Advisors consider the following fiscal policy scenarios:

- RBF (sales) model, and
- Market concession model

The suggested features of these two options are presented in the table below.

Table 2: Recommendations for the subsidy delivery mechanisms

	RBF (sales model)	Market concession model
Timeframe	Up to ten years, but the performance of the scheme should be reviewed after five years and if considered unsatisfactory to be discontinued.	A period of ten years will provide sufficient time to the concessionaire to meet the agreed targets.
Targeting of subsidies	In order to ensure that subsidies are well targeted, a number of criteria need to be fulfilled for the companies to receive payment. More specifically, the scheme should only offer subsidies to companies installing SHS to rural and remote areas that are not commercially attractive. Also, in order to ensure that subsidies are only provided to targeted households, the delivery of subsidies should be by means of a voucher to end-users. Household income and female headed households can be used as proxies for the distribution of the vouchers. While there is always the risk that some households might attempt to sell their voucher entitlement to a non-eligible household, the scheme is more likely to succeed in targeting subsidies than a delivery mechanism where subsidies are given directly to private companies.	The concession agreement has to specify the areas where the SHS installations should be made. Prior investigation should be made by the implementing authority regarding the areas that should be prioritised by the support mechanism.

	RBF (sales model)	Market concession model
Product quality	The subsidy payment should be linked to the effective output of the system installed rather than the capacity of the panel. More specifically, the subsidy per SHS should be based on brightness (lumens) and duration (runtime per solar day of charge) of light that the product is capable of providing according to the product specification sheet. The minimum threshold for a product to be eligible for subsidies should be 100 lumen-hours per solar day[41]. The fiscal options model should include various scenarios on the appropriate rate of subsidy that would make SHS more affordable to the poor.	The competition through which the concessionaire will be selected has to specify the minimum technical specifications of the SHS that will be installed. The potential suppliers will then compete for the lowest subsidy requirement.
Maintenance of systems	Even though maintenance of systems is not a common feature of the sales model, the implementing authority can provide incentives to companies to provide maintenance services to customers (i.e. retain a portion of the subsidy for maintenance).	The concessionaire should be obliged as part of his contract to maintain the systems on a regular basis.
Transparency	The institution that will be selected to implement the subsidy scheme should have sufficient capacity to monitor the performance of solar companies and ensure that the claims made by the companies are legitimate.	The performance of the concessionaire should be monitored on a regular basis to ensure compliance with the agreement requirements.

Tax exemptions

The developmental impact of electricity access provided via SHS is largely determined by the level of consumption and the actual use of electricity. Available power will not automatically translate into productivity gains for a commercial user unless the latter makes efficient use of it.

At the household level, higher consumption of electricity means greater use of electrical appliances, which is indicative of better living standards. Those that possess not only the basic electrical appliances, but also a fridge and an electric cooker, enjoy the benefits of electrification more than those that simply have access to a few lamps and a radio. Thus, a taxation policy that incentivises the use of solar accessories and appliances will lead to more significant developmental gains than a scheme that only supports access to lighting.

[41] 24 lumen light output, 4 hour run time/day solar charge

It would therefore be useful for the fiscal options model to include a scenario that assesses the financial and macro-economic impact of reintroducing the tax exemptions to solar parts and accessories. It would also be useful to consider the careful design of the exemptions to make them targeted and clear; they should also be consistent with EAC rules.

Recommendations for some design features of the schemes

Several key lessons can be drawn from the application of subsidy mechanisms aimed at supporting the dissemination of SHS in Uganda and elsewhere. These should be the guiding principles when designing a new subsidy delivery mechanism for supporting the off-grid solar market.

Limited timeframe

It is important for policy makers to fully understand the tasks that subsidies need to fulfil and ensure that the subsides will be removed once this have been achieved. A lack of specific timeframe for the provision of subsidies is likely to result in market distortions.

Well-targeted subsidies

It is important for subsidies to be targeted to those that need them most. This can be achieved by tying the subsidies to particular products, areas and performance targets, as in the output-based aid model. Well-targeted subsidies are more likely to ensure value for money.

Maintenance of systems

An important aspect that is often ignored in the design of financing support mechanism for SHS is the after-sales support. The disbursement of subsidies is often linked to the installation of the system, incentivising solar companies to sell poor products that do not last, as in the case of the SSMP scheme in Tanzania. For the subsidy mechanism to promote a sustainable market, a greater emphasis should be placed on the maintenance of solar systems.

Transparency

One of the main reasons behind the limited success of the PVTMA subsidy scheme that was implemented under ERT II was the lack of appropriate monitoring of service providers. Without an effective auditing system in place to ensure that sale claims are legitimate and that solar companies are meeting the agreed criteria for the disbursement of subsidies, the scheme is likely to fail. For that reason, it is important before designing a subsidy delivery mechanism to ensure that the institutions that are responsible for implementing the scheme have sufficient capacity to do so.

Agility

Any subsidy scheme must be dynamic and have the ability to respond quickly to any challenges that may arise. The OBA scheme for on-grid subsidies is a good example: when the initiative was first implemented, the rate of uptake of new connections was very slow because many households could not afford to pay for internal wiring. Had the design not evolved to address the challenges it would be highly unlikely that it would meet its targets. The key stakeholders of the subsidy delivery mechanisms need to have the mechanisms in place to overcome any obstacles that may arise.

Addressing the poorest of the poor

It is important when designing a subsidy delivery mechanism that aims to support the deployment of SHS to recognise that access to electricity might not be a priority for the poorest members of the rural population. Only once they can cover their basic needs, such as food and shelter, will they seek to gain access to electricity services. Acquiring a SHS on a commercial basis requires some savings for the up-front payment and a constant source of basic income to cover the operational costs of a SHS.

Electrification support programmes that were deliberately designed to provide the very poor with access to basic electricity services cannot be sustainable as they depend on the ongoing provision of financial support from the government or implementing agencies and donors.

Therefore, it is important to conduct an analysis of the economic situation to determine the target group for the support mechanism prior to deciding on the optimal design of the mechanism.

Product quality

The product quality and the extent to which potential users are aware of the capabilities and limitations of these products is an important factor that determines the market growth, irrespective of the design of the fiscal mechanism for supporting the dissemination of SHS. Users that are unaware of the SHS limitations, or are faced with a poor-quality product, are less likely to meet their repayment obligations, while also damaging the reputation of the technology.