Stand Alone Solar (SAS)

MARKET UPDATE

Uganda

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Catalysing Africa's Solar Markets

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The Uganda Stand-Alone Solar Market Update is one of a series of 14 national briefings published by the Africa Clean Energy (ACE) Technical Assistance Facility (TAF) to give stakeholders a snapshot of recent developments in the stand-alone solar sector, including those arising from the COVID-19 pandemic.

The Africa Clean Energy (ACE) Technical Assistance Facility (TAF) is a 4-year programme aiming to catalyse a market-based approach for private sector delivery of renewable energy electrification technologies, with a focus on high-quality stand-alone solar (SAS) systems. Funded by the UK Government through the Foreign, Commonwealth and Development Office (FCDO), and implemented by Tetra Tech International Development,

ACE TAF is working in 14 African countries:
East Africa: Ethiopia, Kenya, Rwanda, Somalia, Tanzania, Uganda
West Africa: Ghana, Nigeria, Senegal, Sierra Leone
Southern Africa: Malawi, Mozambique, Zambia, Zimbabwe

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition
ACE TAF	Africa Clean Energy Technical Assistance Facility
EASP	Energy Access Scale-up Project
ECP	Electricity Connection Policy
EIB	European Investment Bank
ERA	Electricity Regulatory Authority
ERT	Energy for Rural Transformation
EUR	Euro
FCDO	Foreign, Commonwealth and Development Office
GIZ	German Agency for International Cooperation
GOGLA	Global Off-Grid Lighting Association
GSMA	Global System for Mobile Communications
HC	Health Centre
MEMD	Ministry of Energy and Mineral Development
MFIs	Microfinance Institutions
PAYG	Pay-As-You-Go
PSFU	Private Sector Foundation Uganda
PUE	Productive Use of Energy
PV	Photovoltaic
QAF	Quality Assurance Framework
REA	Rural Electrification Agency
REP	Renewable Energy Policy
SACCOs	Savings and Credit Cooperatives
SHS	Solar Home System
SMEs	Small and Medium Enterprises
UBoS	Uganda Bureau of Statistics
UECCC	Uganda Energy Credit Capitalisation Company
UGX	Uganda Shilling
UIA	Uganda Investment Authority
UNBS	Uganda National Bureau of Standards
URA	Uganda Revenue Authority
USAID	United States Agency for International Development
USD	United States Dollar
USEA	Uganda Solar Energy Association
VAT	Value Added Tax

EXECUTIVE SUMMARY

The Government of Uganda's target of achieving 100 per cent electrification by 2030 cannot be achieved at its current rate of electrification, which is 36 per cent, including both grid and off-grid sources.[1]

The current focus in the electricity sector is shifting from adding generation capacity to the expansion and maintenance of the transmission and distribution network. **The recently adopted free Electricity Connection Policy (2018–2027) set a target to freely establish 300,000 on-grid connections per annum.**[2] However, the implementation of this policy faltered since the Rural Electrification Agency (REA) was not adequately resourced financially to meet the demand for new connections. It was put on a temporary hold in December 2020[3] but resumed in early March 2021 with funding from the Islamic Development Bank.[4]

The ability to pay for stand-alone solar (SAS) products by potential rural consumers is limited. Most do not have access to formal or informal financing. In total, **the financially excluded are estimated to be over 4.1 million, which is about 22.5 per cent of the adult population** in Uganda.[5] Another barrier that (potential) consumers face in accessing solar solutions is the lack of last-mile suppliers, dealers, sales agents and technical staff for installation and maintenance. Other barriers include limited consumer awareness around quality aspects and a limited level of financial literacy, for example, in calculating up-front costs against payments over time.

According to the Global Off-Grid Lighting Association (GOGLA), sales of stand-alone solar (SAS) products that meet the Lighting Global Standard in Uganda totalled 128,000 units between January and June 2020. Around 51,000 units were sold on a cash basis while pay-as-you-go (PAYG) sales were at 77,000.[6] **Whereas the current SHS share of total sales is the lowest of the three SAS products supplied (lanterns, pico and SHS), at 18 per cent, there is an expectation that its market share is going to increase over time**.[7] Suppliers of PAYG supported solar solutions are increasingly focusing on sales of bigger systems, moving away from hard-to-reach areas and customers – where the 'low hanging fruit' market segments have been served at this point – to servicing middle-income segments. Assuming the current grid expansion rate, REA estimates the market for SHS to be 31 per cent of the total population in 2030.[8]

The productive use of energy (PUE) market segment is growing, and suppliers are increasingly strategising about how to tap into this space. In the northern part of Uganda, there is a high potential for PUE such as water pumping and food processing. Promoting solar PUE technologies should go together with interventions aiming to boost productivity and profitability in the agriculture sector.

Suppliers deploy a variety of business models and are not faced with regulatory or procedural market entry barriers in the off-grid space. As such there are many unregistered companies in the country who tend to not adhere to quality requirements, and government seems unable to deal with the matter. Some sector self-regulation, therefore, has been extended to Uganda Solar Energy Association (USEA).

According to the Global Off-Grid Lighting Association (GOGLA), sales of stand-alone solar (SAS) products that meet the Lighting Global Standard in Uganda totalled 128,000 units between January and June 2020. **Around 51,000 units were sold** on a cash basis while **pay-as-you-go (PAYG) sales were at 77,000.**

1. *UBoS (2020). National Electrification Survey Report– 2018.*
2. *REA (2018). The Electricity Connections Policy (2018–2027).*
3. *Daily Monitor (2020). Access to electricity will be difficult to afford.*
4. *Kazibwe, K. (2021). Government resumes free electricity connection policy.*
5. *FSD Uganda (2018). Analysis of status of financial inclusion for women and youth in Uganda.*
6. *GOGLA (2020). Global off-grid solar market, January–June 2020.*
7. *ibid.*
8. *MEMD (2018). Electricity Connections Policy 2018–2027*

Solar companies encounter several challenges. These include:

- Lack of clarity and uncertainty on key areas of fiscal policy (e.g. taxation at the accounting level and at the tax payment level).
- Limited availability of market data, including data disaggregated by region, gender and other groupings.
- Lack of access to the right type of credit/finance for solar importers, distributors and systems integrators, especially the smaller companies.

There is government support for off-grid electrification programmes, although there seems to be a tendency among government officials to favour grid extension over off-grid solutions. Lack of coordination among and within several ministries and government bodies hampers the effective implementation of (off-grid) energy policies.

Other issues related to creating an enabling environment include:

- The Renewable Energy Policy (REP) is about 14 years old and needs to be updated. A revised policy is currently being worked on.
- UNBS needs to be supported in developing and enforcing quality standards. It is in the **final stages of developing a standard for SHS and pico-solar products – largely plug-and-play products.**
- An interim quality assurance framework has been put in place to guide public funding of off-grid solar programmes that use assembled solar components. This framework, which also adopts IEC standards for products, is expected to be adapted into a national Quality Assurance Framework and Code of Practice in the second quarter of 2021.
- The current solar products tax and duty exemption scheme is not uniformly applied by the Uganda Revenue Authority (URA).
- To a certain degree, there is mistrust between government and the private sector, building over time as the result of a perceived lack of transparency on both sides.

Many impact capital providers are active in the pico-solar photovoltaic (PV) market. They, however, tend to be driven by numbers and favour bigger and established solar companies over early-stage, second-generation companies. Established companies are more successful in securing equity and/or debt financing predominantly from the international market. **The only local debt facility currently in place is the USD8.5 million Working Capital Facility implemented by the Uganda Energy Credit Capitalisation Company (UECCC),** which has had limited success to date. There is also need for more innovative financing structures, such as securitised receivables through dedicated special purpose vehicles (SPVs). Grant financing is readily available in the market and provided by various multilateral funds.

Notwithstanding the limited financial literacy among end-users, there seems to be general awareness about mobile money services, which have been rising steadily. According to the Uganda Communications Commission (UCC), **the number of mobile phone subscribers in Uganda stood at slightly over 26.4 million by September 2020.**[9] It is estimated that approximately 30 per cent (or roughly 12 million people) of the rural population uses mobile money services. Despite the increased use of mobile money, enhanced use in combination with solar solutions is hampered by the poor coverage of the network of agents.

An increasing number of mobile payment options is becoming available in Uganda. Several business-to-people (B2P) payment opportunities exist in the agricultural sector, including in the coffee, tea, oil crops, vegetables and milk value chains.

9. *UCC (2020). Market performance report 3Q 2020.*

32m
Unelectrified population[i]

44m
Total population[ii]

213
People per km^2 population density[iii]

83 out of **100**
Framework for stand-alone systems - score
Regulatory Indicators for Sustainable Energy (RISE)[iv]

86 out of **100**
PAYG Market Attractiveness Index Score[v]

2030
Government target for universal electrification

7 Donor programmes supporting the SAS enabling environment

Uganda has the largest refugee population in Africa which is estimated at **1.2 – 1.3 million refugees and asylum seekers** due to continuing violence in neighbouring countries.

116 out of **190**
ease of doing business rank[vi]

The Uganda solar market potential is estimated at **USD 3.171 billion. The household market accounts for 37.8%** of that figure.[vii]

Figure 1: Uganda at a glance

i. International Energy Agency (2019)
ii. World Bank (2018)
iii. World Bank (2019)
iv. ESMAP (2019)
v. Lighting Global (2019)
vi. World Bank (2020)
vii. USAID's Power Africa Accelerator in collaboration with Uganda Bureau of Statistics estimates (unpublished report).

1. NATIONAL OVERVIEW

1.1 Current Context

The period leading up to Uganda's presidential and parliamentary elections on January 14, 2021 was filled with uncertainty that affected an economy already suffering from COVID-19 pandemic-related losses. Certain election related actions, such as the nation-wide Internet shutdown for a few days, interfered with business. Pay-as-you-go (PAYG) solutions providers, for example, were unable to monitor or manage customer systems or receive payments due to the shutdown.

About 43 per cent of households in Uganda depend on subsistence farming as their major source of income.[10] Many were unable to transport and sell their produce when the country went into a two-month partial lockdown due to the Covid-19 pandemic. This was as a result of the temporary closure of weekly mobile markets where most of such products are sold. This affected incomes at household level, not only for those who depend directly on agricultural produce, but also those in commercial trade, which accounts for 20 per cent of household incomes.[11] The sector also experienced loss of jobs among those who were employed, including teachers, drivers and those working in small and medium enterprises (SMEs).

Uganda has also experienced natural disasters: early 2020 saw the north-eastern sides of the country ravaged by desert locusts and there were long periods of heavy rainfall that resulted in flooding and landslides. It is highly likely that a large percentage of the population will slip back into poverty as a result of all these events. This is certainly already being reflected in sales of solar products by all the solar vendors interviewed.

1.2 Energy Access

Uganda has a surplus of grid electricity supply that is primarily attributed to efforts by the Ugandan government to secure investments in generation over the last 15 years. Currently, the country has an installed capacity of over 1.25GW, with peak demand in the range of 550-700MW (it reached a low of 530MW in April 2020, during the height of COVID restrictions).[12] Despite the surplus, the grid infrastructure is limited.

Uganda's current level of electricity access is estimated to be 36 per cent, which includes off-grid sources such as generators, rechargeable batteries and solar devices, mostly solar lighting systems (SLS) or solar lanterns.[13]

In terms of institutional access, 50 per cent of public institutions do not have access to electricity. In the health sector, all hospitals have access to electricity.[14] About 96 per cent of Health Centre IV (HC-IV) facilities have access to electricity while close to 50 per cent of the lower-level facilities (HC-IIIs and HC-IIs) do not. Those that have access are considered to be underserved relative to the level of service they should be able to provide and the electricity solutions they have.[15]

Over 79 per cent of education institutions do not have access to electricity. A majority of these are primary schools. According to 2018 data from the Ministry of Education and Sports, out of 19,718 public primary schools, only 3,154 have access to electricity. Most of the tertiary institutions and secondary schools have been provided with solar based electricity solutions or are connected to the national grid.[16] Information about private education institutions is not readily available. Education institutions have an average power demand of 500Wp to 1,000Wp. This implies a potential solar market of over 9GWp.

Uganda's population is estimated to be 41.6 million people. Of these, 25.5 per cent (10.6 million) live in urban areas while the remaining 74.5 per cent (31 million) live in rural areas. Table 1 presents the electricity access data for both urban and rural populations.

10. *UBoS (2018). Uganda National Household survey final report 2016/17.*
11. *ibid.*
12. *Energy Regulatory Authority (2021) Maximum Demand*
13. *UBoS (2018). National Electrification Survey Report– 2018. UBoS introduced the term 'solar lighting system' to connote a <Tier1 appliance, smaller than SHS.*
14. *ibid.*
15. *Ministry of Energy and Mineral Development (2019). Uganda Energy Access Scale-up Project.*
16. *ibid.*

Table 1 Electricity access[17]

Grid connections (%)	24% Urban – 63.9% (1,354,680 households) Rural – 7.50% (465,000 households)
Unelectrified population	32 million[18]
Grid tariff per kWh (All tariffs attract 18% VAT)	Domestic: UGX675.50/kWh (USD0.18/kWh) – 1.9% increase from 2018 to 2019
Average kWh usage	215kWh per capita

Photo courtesy: www.lightingafrica.org

17. *UBoS (2018). National Electrification Survey Report– 2018.*
18. *International Energy Agency (2020) World Energy Outlook 2020*

2. DEMAND-SIDE: CONSUMER INSIGHTS

There is still a huge demand for off-grid solutions in Uganda. The commercial solar photovoltaic (PV) off-grid market is estimated by UBoS to be 43 per cent of households, which is over three million households.[19] There is no sufficient data that can be used to stratify the commercial PV market hence the combining of those able to pay through cash or credit.

The most recent willingness to pay study was conducted by NRECA International in 2017 as part of its development of the Rural Electrification Master Plan, but this data has not been shared publicly.

2.1 Poverty and COVID-19

Previously, poverty levels in Uganda were measured using monetary methods such as consumption expenditure. Recent studies by UBoS have attempted to redefine poverty levels by using a combination of measures of wellbeing such as material things, along with education, health, vulnerability and deprivation.[20]

As of 2020, the poor represented 21.4 per cent of the population, a drop from 31.1 per cent in 2006 that has been attributed in part to favourable food prices and weather that has boosted the incomes of agricultural households in recent years.[21] This group lives on less than USD1.25 per day and is mostly unemployed. Among this group, 8.5 per cent are chronically poor. [22]

The COVID-19 pandemic is likely to have compromised Uganda's achievements in poverty reduction. The pandemic led to a fall in food prices, which alongside high production depressed incomes for farmers and other vulnerable households. About 64.3 per cent of Uganda's working population is engaged in agriculture, forestry and fishing.[23] The likely result of this is that many people who had gotten out of poverty will be pushed back. It is estimated that this slip back could raise the poverty rate to 25 per cent.[24]

Generally, some of the micro-economic effects of COVID-19 included:

- Some SMEs shut down.
- Limited trade activity across the country.
- Reduced household income coupled with increased household expenses, which was attributed to limitations to movement and reduced access to markets.
- Lack of alternative income sources for workers in sectors that were shut down (such as education).

2.2 Consumer awareness

Consumers in off-grid areas have largely become sensitised to solar technology as a viable energy source, however, misperceptions remain widespread about the potential uses of solar and quality issues related to substandard products and installations. As an example, users initially expect that the SAS systems will be able to handle a lot more than they actually can vis-à-vis their invested resources.

The lack of knowhow to discern between a good and a "fake" product, on the other hand, impacts negatively on the demand for SAS products. Potential consumers prefer to first observe others' systems to inform their decisions. In a market where many of the products are of low quality, chances are high that the decision will be delayed.

Generally, awareness can be looked at through the following categories:

- **Products access:** Solar products and dealers are now in nearly all major towns in Uganda. Sellers can also be found along major roads leading to the high population areas. Most of these products are sourced from Kampala, where most importers/major suppliers are based.
- **Function:** Most consumers understand the basic concept of solar power.
- **Immediate benefit, purpose and usability:** The use of solar solutions for specific and limited applications, which include lighting, phone charging and watching television, seems to also be well understood among both users and non-users. It is not very clear how well other applications, such as productive use of energy (PUE), are appreciated.

19. UBoS (2018). Uganda National Household Survey 2016/17 report.
20. UBoS (2020). Statistical abstract.
21. Development Initiatives (2020). Social economic impact of Covid-19 in Uganda.
22. ibid.
23. UBoS (2020). Statistical abstract.
24. ibid.

- **Quality issues:** This is one of the areas with the biggest gaps in terms of awareness. Users are un-informed and have limited or no means of differentiating between a good and a poor-quality product. Information about products is communicated by the suppliers and it is unlikely they would admit to their products being inferior. This lack of awareness about quality is also common among suppliers, especially those in the business to simply trade solar systems as consumer products. With no guidance provided, these traders will normally source what will maximise profits, which is often low-quality products.
- **Expected price of preferred solution:** Customers struggle with price disparities, especially when they compare products of varying quality.
- **Image of the technology:** Solar PV is often not considered a real electrification solution and is most times considered inferior. The technology is still considered for use out of necessity rather than preference.[25]

Photo courtesy: www./fundrazr.com/FINCASolarFund

25. *Consumer awareness information based on interviews with Pia Hoffenweisser (PREEEP), Benon Bena (REA), Emmy Kimbowa (USEA) among others.*

3. SUPPLY-SIDE: STAND-ALONE SOLAR COMPANIES

3.1 Pico-solar and Solar Home Systems (SHS)

According to the Global Off-Grid Lighting Association (GOGLA), sales of stand-alone solar (SAS) products that meet the Lighting Global Standard in Uganda totalled 128,000 units between January and June 2020. This was a 42 per cent decrease compared to the last reporting round (July to December 2019) and a 29 per cent drop from the first half of 2019. Both cash and PAYG registered decreases during this reporting period.[26]

Around 51,000 units were sold on a cash basis, a 33 per cent increase compared to the second half of 2019 but a 20 per cent decrease in comparison to the first half of the same year. PAYG sales, at 77,000 units, decreased by 46 per cent compared to the last half of 2019 and 33 per cent less than the first half of 2019.[27] The drop in sales was attributed to the restrictive measures put in place by government as part of efforts to control the spread of COVID-19.

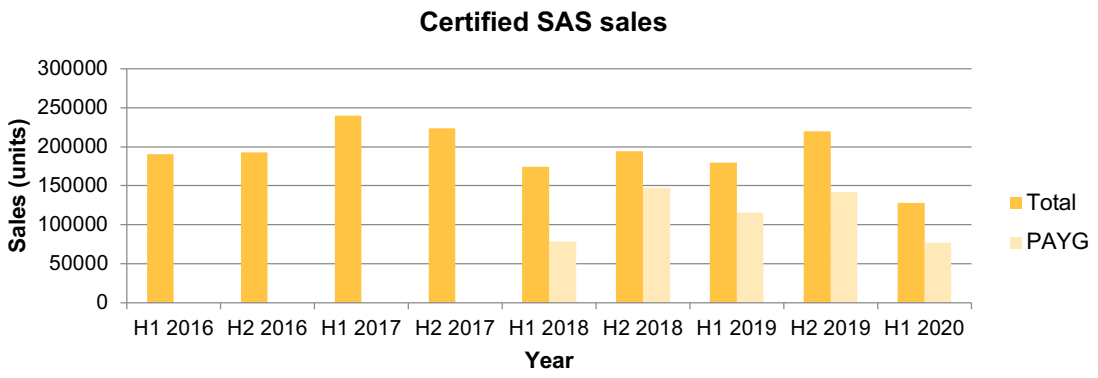

Figure 1: Certified SAS sales (Source: GOGLA)

Figure 2 shows the same total figures, dating from 2018, broken out according to certified and non-certified product, though GOGLA's focus on certified product may have skewed the data. There is no immediate explanation for the seemingly precipitous drop in non-certified product in 2020.

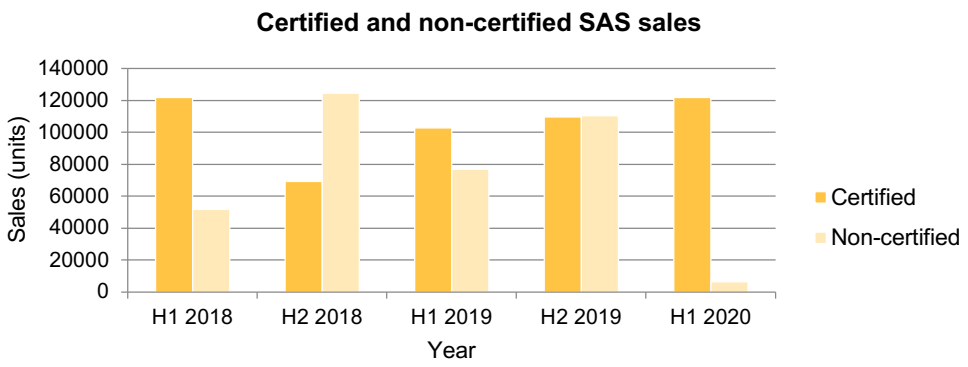

Figure 2: Certified and non-certified SAS sales (Source: GOGLA)

26. GOGLA (2020). Global off-grid solar market, January–June 2020.
27. ibid.

The Uganda Solar Energy Association (USEA) in 2020 indicated that annual sales of solar PV systems grew from 284,328 in 2018 to 428,100 in 2019.[28] The difference in figures between GOGLA and USEA reflects different membership, reporting and vetting mechanisms. Sales reported to USEA are assessed alongside information from the Uganda Revenue Authority (URA).

Demand appears to be highest for entry level systems. Interviews with Fenix International revealed that growth in sales of SAS PV solutions was driven by price, flexible payment terms and period of repayment (which tends to determine the daily rate).

Market growth has been negatively impacted by the COVID-19 pandemic. A survey conducted in May 2020 by USEA to establish the impact the pandemic had on members showed that companies were experiencing challenges in delivery of operational support services, managing customer credit, sales and financing.[29]

The loss in income had an immediate impact on cash-flows and sales for SAS suppliers. Companies like Fenix were forced to raise the daily payment rate in order to compensate for the loss and slowdown in daily payments.

There are a few firms that scaled down operations including M-KOPA and Barefoot Power. It is not clear though whether it was due to COVID-19 or the general business environment in Uganda. Solantis shut down and sold its business to Village Power. Discussions with the former Managing Director of Solantis suggested that COVID-19 was the final blow following many market challenges. This closure came even after a business expansion grant from USAID.

Some PAYG companies report customer default rates of 25 per cent and higher. These are not necessarily non-payments, but delayed payments that make it very difficult to plan.

The availability of good workmanship and professional installers remains a major problem countrywide.

Fenix International is by far the biggest in the pico/PAYG market space in the country. After being taken over by Engie, it was able to attract a loan from the European Investment Bank (EIB) which was closed in July 2020. SolarNow and M-KOPA are also big in the PAYG space but tend to offer relatively larger solutions. SolarNow also offers a mix of tailored and predesigned systems.

Table 2: Major SAS companies in Uganda

Company	Business model	Brand/product focus	Comments
Fenix International	Vertically integrated Branded PAYG solutions	Engie Energy Access Previously ReadyPay through a collaboration with MTN (relationship lasted over 6 years)	• Subsidiary of French group Engie, targets last-mile consumers. • Signed a USD12.5 million loan agreement with EIB recently. Through this financing, Fenix aims to electrify 1.4 million people living in rural areas. • Operates countrywide.
M-KOPA	Vertically integrated Branded PAYG solutions	M-KOPA products – two TV and one refrigerator. All have phone charging capability.	Relatively larger SAS systems with energy efficient appliances (TV & refrigeration systems).
Solar Now	Vertically integrated PAYG Component based	SolarNow	Venturing in water pumping and irrigation as part of PUE business promotion.
GreenLight Planet	Vertically integrated Predesigned kits Cash and PAYG	Sun King	Several outlets in cities and major towns in Uganda. Also has a model of door-to-door cash sales for single lighting kits.

28. USEA (2020). Uganda annual sales and impact data report, 2019.
29. USEA (2020). COVID-19 pandemic member needs assessment.

Table 2: Major SAS companies in Uganda (Continued)

Company	Business model	Brand/product focus	Comments
d-light	Vertically integrated Predesigned kits Cash and PAYG	d-light	Sold in Total fuel outlets.
Village Power	Component based predesigned systems	X-Range Solantis kits	Took over the Solantis product line.
BrightLife	PAYG Predesigned kits PAYG	Various product brands including d-light and Sun King	Social enterprise owned by FINCA Uganda, a financial institution.
Sologrid	Vertically integrated Predesigned kits	Sologrid	Relatively large system kits with both AC and DC capabilities.

All the companies listed in Table 2 have foreign ownership. Participation of local companies in the PAYG space has been limited. A few, such as SolarToday, PowerTrust and Annuel Energy, have attempted to introduce flexible payment arrangements for their customers, including using PAYG platforms such as Angaza and innovative e-management systems, as well as structured financing through local Village Savings and Loan Associations (VSLAs) or savings and credit cooperatives (SACCOs).

3.2 Distribution networks

Distribution networks that reach far flung customers are virtually non-existent and this remains an impediment to solar market growth. Solar companies have adopted models of partnering with existing community networks like cooperatives, NGOs and religious organisations. However, this has limitations when it comes to efficient demand creation, after-sales services and debt collection (for PAYG customers). The costs of business may be lower than owning the distribution network but are still high and prohibitive.

The following distribution channels have been put in place by SAS companies:

- **Freelance upcountry sales agents and installers:** Common with PAYG plug and play or kits suppliers. In most cases, these agents are paid commissions for sales.
- **Upcountry branches:** Some companies, such as SolarNow, GreenLight Planet and M-KOPA have branch offices in strategic locations around the country.
- **Local branches with freelance sales agents/ installers:** Some companies have a combination of the two types of distribution models. The branches are strategically located in major towns to provide backup technical support and ensure quick supply of products to the agents.

These models are common with the vertically integrated companies. Additionally, solar suppliers:

- Resell to other companies, system integrators and upcountry installers or outlets. This model is preferred by distributors who do not want to have a direct interface with the customers. UltraTec, AB Matra, KenGrow and Africa Energy are examples of such companies.
- Sell through fuel stations. For example, d.light sells through Total fuel stations.
- Suppliers such as BrightLife, which is a social enterprise owned by FINCA, provide solutions for end-users who acquire credit for products through the mother company.

3.3 Productive Use Systems

There is a noticeable trend of component-based solutions coming in higher capacities. Maximum Power Point Tracking (MPPT) regulators are beginning to take centre stage. These solar modules, which typically have 60 cells, come in capacities ranging from 250Wp to 350Wp. The average price for these large solar modules in Uganda is USD0.4/Wp–USD0.47/Wp, which is reflective of module prices worldwide. It is becoming increasingly rare to find typical 36 cell modules designed for 12V battery systems.

Many off-grid customers still prefer cash or short-term credit payment terms. Often they depend on local technicians to configure their own solutions. In many cases, these end up being poorly designed (over-sized or under-sized).

Water pumping and irrigation systems are quite common. The market for refrigeration systems is also highly supported by component-based solutions although some of the bigger companies also offer these as predesigned systems. Some of the leading companies (in no particular order) that are offering turnkey as well as tailored/customised solutions are:

- **Chloride Exide** – Variety of solutions with some international brands.
- **Davis & Shirtliff** – Mainly water pumping systems.
- **UltraTec** – Variety of solutions and represents several internationally recognised brands mainly in distribution.
- **Energy Systems** – Variety of solutions and targets the institutional market.
- **Power Trust** – Variety of tailored solutions.
- **Ital Trade** – Variety of international brands mainly offering turnkey solutions.
- **All-in-Trade** – Variety of turnkey and engineering solutions.

Suppliers of turnkey solutions are also very active in the on-grid space where they provide alternatives to power supply and backup where reliability is of concern. Some of the international brands in this space include Steca (for inverters and charge controllers), Victron, Outback, Tripplite, Sunlight Batteries, Phoccos and Schneider.

3.4 Uganda Solar Energy Association (USEA)

USEA is an independent non-profit formed in 2016 by private sector companies in the solar energy business with help from the Private Sector Foundation Uganda (PSFU), Ministry of Energy and Mineral Development (MEMD), and the Rural Electrification Agency (REA). Most of the companies that present themselves as solar businesses are members of USEA. The association, which is a member of GOGLA, currently has 191 subscribed members, up from just 42 in 2016.[30] This growth has been mainly attributed to the requirement for solar companies to have a letter from USEA before they can get exempted from paying taxes for batteries and better organisation with a functional secretariat.

USEA is active in promoting the sector, through marketing and awareness activities, and keeping members informed about financing opportunities. Between April and May 2020, USEA ran a survey to understand its members' current challenges as a result of the COVID-19 pandemic. The following are some of the major findings of the survey:

- Most solar firms were forced to rethink the way they do business and find new ways of reaching their existing and potential customers. These new approaches included use of call services and online outreach (email and social media).
- Companies offering credit (PAYG and pay plans), which generally have most of their clientele in the informal sector, experienced heavy defaults/late payments. These companies had to offer grace periods to clients and revise payment plans.
- In the health sector, SAS companies that offer component-based tailored solutions seemed to have performed slightly better. This was attributed to the fact that solar PV is still considered the best option for powering operations in last-mile rural communities, and health institutions had to be kept fully functional as part of the fight against the pandemic.
- The closure of schools seemed to have prompted a renewed interest in solar solutions as parents sought means to continue the education for their children. Companies reported an upsurge in inquiries for radio or television solutions, but this was not reflected in sales due to the drop in income.
- A number of development partner support programmes and projects were put on hold further affecting operations of those solar firms that were engaged in such.
- Members reported experiencing operational challenges as follows:
  - 80 per cent were unable to meet new orders or support current operations and customers.
  - 66 per cent had to scale back activities like movement of sales agents, technicians, and stock.
  - 46 per cent faced liquidity challenges.
  - 31 per cent opted to temporarily defer customer repayments by weekly or monthly extensions of grace periods or indefinite suspension of payments until normal business resumes.
  - Customers were given partial payment and renegotiated payment plans.

30. *USEA (2020). Solar company directory 2020.*

4. POLITICAL FRAMEWORK

4.1 Government Institutions

Oversight of the SAS sector remains the same, with a number of developments in different institutions.

Table 3: Government institutions involved in the SAS sector

Institution	Description and recent activity
Electricity Regulatory Authority (ERA)	Responsible for regulating the generation, transmission, distribution, sale, export and import of electrical energy in Uganda. In 2020, amended the isolated grid regulation, which was ambiguous and relatively impractical for mini- and micro-grid developers. This is the result of a 3-year effort supported by Power Africa. It is awaiting publication having gone through the legal processes. Expected to revise the Z-certificate within the next 6 months. The certificate is given to competent installers in specialised fields like switchgear, centralised heating, refrigeration, generator sets and solar systems. The Uganda Quality Assurance Framework for Solar Systems seeks a specially defined Z-certificate or otherwise for solar systems installers. These installers are expected to have either successfully completed a solar installation course or proven through a competence test that they understand specific grades of solar system installations.
Ministry of Energy and Mineral Development (MEMD)	Custodian and promoter of energy related laws, policies and regulations. In December 2019, a new minister was appointed to replace Eng. Irene Muloni who had served for over 8 years. New Minister Mary Goretti Kitutu is an environmentalist who formerly served as the State Minister for Environment. Through it, the government, with support from the World Bank, is preparing the Uganda Energy Access Scale-up Project (EASP). This is a follow-up to the Energy for Rural Transformation (ERT) Phase III. There seems to be a shift from REA to the MEMD in terms of implementation of the EASP.
Ministry of Water and Environment (MWE)	Responsible for the development, management, and regulation of water and environmental resources in Uganda. During ERT Phase II, MWE completed 35 solar powered mini piped water schemes. With assistance from Engineers Without Borders USA, it is in the late stages of developing an updated Ugandan technical standard for the design, installation, operation and maintenance of pumped powered water systems. Among the project goals is support of and improvement in the quality for solar PV water pumping systems.
Rural Electrification Agency (REA)	Role is to implement the government's rural electrification programme in line with the Rural Electrification Strategy and Plan. Has recently experienced major management changes including suspension of Deputy Executive Director (ED) Godfrey Werikhe and Projects Manager Abouf Tumwesigye. Mr Godfrey Turyahikayo, the long serving Executive Director, did not have his contract extended as was the case for many civil servants who have just reached the official retirement age. These changes were preceded by the dissolving of the agency's board. Eng. Joan Mutiibwa was appointed acting ED in July 2020 pending constitution of a new board that will recruit a new ED. Has been overseeing the Electricity Connections Policy (ECP) which aims to connect facilities within a few metres from the nearest distribution line for free. Implementing a sub-counties electrification project called Bridging the Demand Supply Gap through Accelerated Rural Electrification Programme (BDSGAREP) launched in May 2020. It is a USD212 million project that aims to connect over 550 sub-counties to the national grid. It is being financed through a concessional loan to the government by the EXIM Bank of China and is on-going. A project management unit was set up to implement this programme and it's headed by Eng. William Lutwama who had previously been appointed acting ED. The project has experienced slow implementation even though funding is available.

Table 3: Government institutions involved in the SAS sector (Continued)

Institution	Description and recent activity
	Supported the development of a quality assurance framework from 2019. This framework covers both solar kits and component-based systems. For the kits, it is supporting development of a local standard based on the IEC standard through the Uganda National Bureau of Standards (UNBS). It is also supporting UNBS in the development of a local products' standard that essentially adopts the IEC standards. This effort is simultaneously supporting the development of a design and installations industry code of practice.
Uganda Bureau of Statistics (UBoS)	The principal data collecting, processing, analysing and disseminating agency of the government responsible for coordinating and supervising the National Statistical System. Through funding from the World Bank, the bureau worked with MEMD in 2017 and 2018 to generate the National Electrification Survey Report 2020. Two recent publications that are indirectly relevant to the solar market are the Statistical Abstract released in November 2020 and the Key Economic Indicators 118th Issue: Q4 2019/20 (April–June 2020), which was issued in October 2020.
Uganda Energy Capitalisation and Credit Company (UECCC)	Set up as a limited company by guarantee and operationalised in 2013 primarily to facilitate investments in Uganda's renewable energy sector, with a particular focus on enabling private sector participation. It administers the Uganda Energy Capitalisation Trust, which is a framework for pooling resources from government and development partners for development of renewable energy projects. Working in partnership with regulated financial institutions (commercial banks, a handful of microfinance deposit-taking institutions and Tier IV microfinance institutions), UECCC has put in place a facility that enables households and commercial enterprises to acquire SAS systems on credit. This product is aimed at addressing the affordability barrier posed by the upfront cost of acquiring the systems. When it was launched in 2017, the facility targeted companies that were installing PAYG kits. In 2019, an interim Quality Assurance Framework (QAF) was put in place to allow companies that offer component-based solutions to participate. Interested companies are required to provide technical specifications of their products and demonstrate that they meet the prescribed standards. Checking the authenticity of the products has been assigned to international consulting company GSES. However, this role will be passed on to UNBS as soon as the QAF is incorporated in the local codes and standards Since the adoption of the QAF, none of the component-based supplier companies has successfully accessed the facility; three companies have tried and faced difficulties in getting clearance for some of their products. Other products and services offered by UECCC include: • Technical assistance for Independent Power Producers (IPPs) and participating financial institutions. • End-user loan facilities to connect to the grid. • Solar refinance scheme for end-users. • Partial risk guarantees for participating financial institutions.
Uganda Investment Authority (UIA)	Statutory agency mandated to initiate and support measures that enhance investment in Uganda and to advise government on appropriate policies conducive for investment promotion and growth. Supports and strengthens SMEs by providing market exhibition and promotional activities. Conducts investment promotion aimed at attracting and retaining value adding domestic and foreign investments in Uganda.

Institution	Description and recent activity
	Presents itself as the first point of contact for any potential investor to access various business registration, licensing, facilitation and aftercare services at the dedicated One Stop Centre. All these services are available to SAS companies.
Uganda National Bureau of Standards (UNBS)	Statutory body under the Ministry of Trade, Industry and Cooperatives. Quality assurance framework for kits and component based solutions. (i) Standard for solar kits coming into the country based on the IEC standard has been endorsed and is in the final stages of the public review process before adoption. A parallel effort of adopting a standard for products that come in as components. This includes the development of a code-of-practice. These two activities are supported by REA through funding from the World Bank. Regarding the new standard for kits, the maximum PV capacity of the systems is at 350 watts.
Uganda Revenue Authority (URA)	Responsible for enforcing, assessing, collecting and accounting for the various taxes imposed in Uganda. Under the DFID (now Foreign, Commonwealth and Development Office FCDO) supported Energy Compact, USEA and the United Nations Capital Development Fund (UNCDF) produced a tax guide book for solar companies.[31] Before importation of solar equipment a Pre-Export Verification of Conformity (PVoC) Certificate is required. Has an understanding with USEA that requires provision of a letter to ensure the importer is a genuine solar vendor

4.2 Energy Policy and Regulation

While the electricity sector in Uganda has a robust regulatory framework, codes and standards are less well defined in the SAS space compared to the grid. Updates on regulatory framework for solar in the country are outlined in Table 4.

Table 4: Policies and regulations in the SAS sector

Policy/regulation	Description and relevance
Energy Policy, 2002	In 2019, MEMD published a Draft National Energy Policy, which is a revised version of the 2002 policy. This is still pending ministry endorsement. Process was delayed by the COVID-19 pandemic.
Renewable Energy Policy, 2007	Policy being revised, still at ministry level. Process delayed by the COVID-19 pandemic. The policy has elements of SAS embedded in it.
Electricity Connections Policy (ECP), 2018–2027	Following funding from the Islamic bank, REA resumed implementation of the ECP in early March 2021. The ECP had been temporarily suspended towards the end of 2020 temporarily suspended due to lack of funds. The intention is to subsidize and thereby expedite the rate of electrification. REA exploring introduction of policy into the off-grid sector. There is no formal strategy for using the ECP in the off-grid space, but its application could prove to be a major driver for market growth. To ensure equity, there is need to determine who receives the subsidy (consumer or vendor), how after-sales service and support will be provided, and who pays for associated consumables (such as batteries). The government intends to undertake a study to inform the design of an appropriate approach.

31. USEA (2019). Solar taxation handbook.

Policy/regulation	Description and relevance
Isolated Grid Systems Regulation, 2020	Mini-grids typically use solar PV generation systems and are developed by private sector developers who sell electricity directly to end-users. The regulation defines licensing procedures, technical framework, tariff setting process, grid connection requirements and mandatory record keeping and reporting. These regulations apply to: • generating stations with a capacity not exceeding 0.5MW for commercial purposes. • isolated grid systems where the generation capacity does not exceed 2MW.
QAF for Component Based Solar System Installations	Developed: • product specifications based on IEC. • guidelines for design, installation and maintenance. • standards for products. • code of practice amendment. • It will be implemented through UNBS with support from MEMD.
Quality Framework for Solar Kits	Product standards for solar PV kits based on the IEC standard. Includes test procedures for the quality of lighting products accompanying the kits. This process is being led by UNBS and REA.

4.3 E-waste Regulation

Guidelines have been put in place under the Ministry of Information and Communications Technology on e-waste management. There are generally five options for end-of life management for e-waste:

- Reuse of functional electronics
- Refurbishment and repair of electronics
- Reuse and recovery of electronic components
- End-processing for recovering metals
- Disposal

According to the guidelines, reuse, refurbishment or repair of electronic products is most desirable since this option increases the lifespan of the product to achieve greater resource efficiency. Recycling allows for precious and special metals to be recovered, reduces the environmental impact associated with electronic manufacturing from raw materials and ensures that hazardous substances in electronics are handled correctly.

For SAS companies, the biggest e-waste product is batteries. A typical lead-acid battery collects about UGX1,000 (USD0.27) per kilo. A firm that was collecting old electronic parts, disassembling them and exporting them to China has since been forcibly closed for promoting mobile phone theft.

4.4 Financial and Mobile Payment Regulation

The government of Uganda acknowledges that mobile money services have transformed the financial services landscape and continue to deepen financial inclusion where the proportion of the population that is "banked" is still relatively low.[32]

Bank of Uganda currently shares the responsibility of regulating mobile money with the Uganda Communication Commission. But a new law in the offing, "the National Payments Bill," will transfer full regulation of mobile money services to Bank of Uganda. Generally, the bank has the sole responsibility of regulating financial services in Uganda, but financial services offered by telecoms have remained largely unregulated given that they are offered by non-financial institutions.

4.5 Gender and Social Inclusion Mainstreaming Regulation

Many project initiatives in Uganda have a component that looks into gender related issues, especially towards providing equal opportunities for women in the SAS space. From observation, women tend to take on management and administrative roles while men are more involved in the technical activities like installations.

Uganda has a gender policy and recognises that gender issues cut across all development sectors and levels. The policy gives a clear mandate to the Ministry of Gender, Labour and Social Development to oversee gender and social inclusion. All government institutions and sectors are mandated to mainstream gender. At the national, sectoral, district and community levels, planning, resource allocation and implementation of development programmes is supposed to be designed to ensure gender imbalance is addressed.[33]

32. UBoS (2018). Uganda National Household Survey 2016/17.
33. Uganda Gender Policy, 2007.

5. FINANCING

5.1 Supply Chain Financing

Supply chain financing in Uganda is a mix of foreign and local funding. Seven foreign organisations – Bamboo Capital Partners, Oiko Credit, CrossBoundary Energy, Symbiotics, Cordiant Capital, CDC Group and Nordic Funds – have funds focused on the Uganda SAS sector. The funds are a mix of equity and debt and add up to USD826.5 million invested in a number of SAS companies.[34]

Centenary Bank, Post Bank, Stanbic Bank, Absa and Finance and Trust Bank, funded by the World Bank, are providing the UECCC Solar Working Capital Facility to Vendors, with a total value of USD8.5 million. This is a concessional loan facility with the interest rate capped at 15 per cent. A vendor can borrow up to a maximum of USD1.5 million.

While financing is readily available thanks to UECCC and several other funds, accessing it is still a challenge, attributable on one hand to firms' inability to satisfy loan application prerequisites and on the other hand financial institutions' failure to understand the solar sector (business operations and technology). These facilities are underutilised as a result. Prior to the new Quality Assurance Framework (QAF) standards requirements, two local solar vendors were able to access local financing through the UECCC facility. SolarToday and PowerTrust got facilities worth UGX600 million (USD162,000) and UGX1 billion (USD270,000), respectively, to boost their inventory through Centenary Bank in early 2020.[35] But since the QAF was adopted, companies have struggled to access the funds.

As noted above, in July 2020, EIB signed a USD12.5 million loan agreement with Fenix International, now a subsidiary of the French group Engie.[36]

5.2 Consumer Financing

One of the major challenges of the solar market has been the issue of credit and its management. PAYG solar heavily relies on technology to collect payments and has proven quite effective in de-risking investments made in the solar products. PAYG is also considered an effective means through which consumer financing models can be implemented as it gives insights on the consumer. It is currently being considered by REA as the most effective model through which the ECP can be implemented for off-grid electricity access. The challenge for REA will be on defining the level of service.

In terms of access to consumer finance, of the 76 per cent of adults who live in rural areas, only 7 per cent are banked.[37] PAYG financing has attempted to bridge this gap to an extent and led to trackable SHS sales. However, like any other financial service, it is heavily impeded by its inability to reach far flung customers due to its inefficient distribution system.

A combination of poverty and inaccessible financial services makes it difficult for would-be solar customers to access finances to acquire solar products. Helpful government and development partner facilities are therefore underutilised because they cannot be accessed. In cases where financial services are accessible, there is general unwillingness to create solar-related products because either the financial institutions are not knowledgeable on solar products or they have no partnerships with solar products providers.

Development partner and government funded facilities exist to ease access to solar products. These include the end-user facility from UECCC, which is accessible through listed commercial banks and microfinance institutions (MFIs). A consumer must satisfy the bank's established terms and conditions to access this facility (where interest rates are significantly lower than typical market rates). Consumers who do not qualify for the UECCC end-user facilities through the banks opt for typical commercial facilities from commercial banks, MFIs and SACCOs, which are more expensive.

PAYG and cash are the financing mechanisms prevailing on the consumer financing side. Cash systems seem to

34. UOMA (2019). Market map of off-grid energy in Uganda.

35. Interview with UECCC staff member.

36. Africa Energy Portal (2020). EIB lends $12.5m to Fenix for solar electrification via solar kits.

37. FSD Uganda (2018). Report on banking and the status of financial inclusion in Uganda: Insights from FinScope 2018 survey.

be preferred amongst the off-grid communities that are much further from the main towns. End-users tend to make a comparison of the lump sum cost against the PAYG instalments. Those with seasonal incomes tend to prefer a one-time payment.

The number of PAYG transactions increased from 3.1 million in 2017 to 7.7 million in 2018. PAYG SHS customers in Uganda using MTN mobile money more than doubled from 257,859 in 2017 to 672,236 in 2018. Unfortunately, cash sales are cumbersome to track due to limited effective documentation.[38]

The growth of the mobile money sector saw the government propose legislation that put a 1 per cent levy on the value of all mobile money transactions, including cash-in, transfer and cash-out in May 2018. It was a controversial move that affected all transactions that depend on mobile money platforms (including PAYG) and was met with public outcry. As a result, this law was amended in November 2018 to a 0.5 per cent tax on the value of withdrawals only.[39]

Microfinance Institutions (MFIs): There are a number of MFIs in Uganda offering end-user financing for SAS products – see Table 5.

Table 5: Microfinancing options for SAS customers

MFI / Lender name	Description/Loan product available
Commercial Banks: Centenary Bank, Post Bank and Finance Trust Bank.	UECCC solar loan facility to end-users with a total value of USD1 million. Concessional loan facility (interest rate capped at 15%).
Pride Microfinance	Household user can borrow up to UGX15 million (USD4,050) and institutions up to UGX30 million (USD8,100).
Tujijenge Uganda, Hofokam, EBO SACCO and Buyanja SACCO	

Mobile money networks: Uganda has five mobile money service providers: MTN, Airtel Money, Uganda Telecom, Africell and Smart Pesa. By 2017, Uganda had the third-highest mobile money penetration rate (51 per cent) in the world after Kenya and Somalia (both at 73 per cent).[40] By the end of September 2020, there were 27.7 million registered mobile money accounts in Uganda.[41]

38. UNCDF (2019). Digital finance for energy access in Uganda: Putting mobile money big data analytics to work.
39. GSMA (2020). The causes and consequences of mobile money taxation.
40. GSMA (2020). Connecting the frontier: Last-mile distribution in Bidi Bidi Settlement, Uganda.
41. UCC (2020). Market performance report 3Q 2020.

6. MARKET SUPPORT

A number of development partners are supporting the market through financing and technical assistance. Through its Energising Development (EnDev) programme, German Agency for International Cooperation (GIZ) and PSFU in December 2020 mobilised EUR900,000 (USD1.07 million) from five European countries – Netherlands, Germany, Norway, United Kingdom and Switzerland – for a COVID-19 emergency fund.[42] Recipient companies will need to invest this money in infrastructure, upgrades to support medium- and long-term resilience, and training to improve skills. Solar and biomass companies will each be able to obtain between UGX65.6 million and UGX437 million (between USD17,712 and USD117,990) through PSFU's COVID-19 emergency window to help mitigate the loss of household electricity access and enable energy companies to connect their customers at a cost covered by the Fund.

Table 6 outlines the major development partners and the support they are offering.

Table 6: Development partners supporting the SAS sector

Development partner: Programme	Type of assistance[43]	Objective / comments
GIZ: EnDev	Grant	Supports market development and improved framework conditions for increasing access to sustainable energy for households, social institutions and SMEs. Support to companies and other stakeholders improves access to improved cook stoves and solar power for lighting and domestic appliances. With FCDO financing, EnDev has piloted market-based approaches for refugees and host communities in Arua.
Energy and Environment Partnership (EEP) Africa	Grants	Supporting Greenlight Planet (SHS and solar appliances, EUR 1,000,000), VAC Solar (solar-powered batteries, EUR 977,000), and Villageboom (solar lamps, EUR 286 000).
GIZ: Pro Mini-Grids	Grant Technical assistance	Promoting the use of mini-grids for rural electrification. It supports the government in improving the framework conditions for mini-grids investments with the private sector. During its timeframe, a total of 40 solar mini-grids will be installed, 25 in Northern Uganda and 15 in Southern Uganda. It further supports Technical and Vocational Education Training (TVET) for solar and mini-grid technicians.
GIZ: Promotion of Renewable Energy and Energy Efficiency Program (PREEEP)	Technical assistance	Supports strategies to increase access to clean energy in rural and peri-urban areas. This entails support for a coherent policy framework, improvement of market development, skills development for technicians and mainstreaming of energy issues at the district level.
GIZ: Green Peoples Energy	Technical assistance	Capacity building on renewable energy systems.
USAID: Power Africa Off-grid Program	Technical assistance, financial	Supports studies, business networks/linkages between financiers and vendors, tailored capacity building and advocacy to create an enabling environment and provide market intelligence. Guarantee funds in commercial financial institutions.
FCDO: Africa Clean Energy Technical Assistance Facility (ACE TAF)	Technical assistance	Assist 14 African governments to unleash the solar household market, tackle the policy and regulatory barriers to household energy access, and to accelerate a market-based approach to clean energy access.

42. PSFU (2020). Covid-19 Economic relief fund for the off-grid solar and cook stove sector.

43. In 2021, we're contracting 9 new SAS grant projects in Kenya, Rwanda, Tanzania, Uganda and Zimbabwe.

Table 6: Development partners supporting the SAS sector (Continued)

Development partner: Programme	Type of assistance	Objective / comments
German Cooperation, UKAid, Min. of Foreign Affairs of the Netherlands, Norad, Swiss Agency for Development and Cooperation (SDC): EnDev and PSFU	Financial	Newly launched Results-Based Financing (RBF) scheme for SAS companies in Uganda. Customer Remoteness RBF – intended to mitigate higher cost of customer acquisition and after-sales service to remote customers, with an incentive based on customer location using the project's Remoteness Index and adjustment for the duration of warranty contract. Asset Financing RBF – mitigates risk of reduced repayment/increased payment default rates, with incentives based on longer shelf time for systems bought on cash basis and delayed payments for PAYG systems. Customer Default RBF (optional) – to pay customer-specific partial compensation for losses made due to customer defaults on payments.
Swedish Embassy, with contribution from the Danish Embassy: Beyond the Grid Fund for Africa (BGFA)	Financial	Results-based capital investment into market expansion made by private sector entities selected through competition in 2021. The aim is to stimulate the scale up of sustainable business models, which incentivise the private sector to offer affordable and clean off-grid energy access at scale. It is a six-year SEK130 million (USD15.6 million) programme currently at the market scoping stage with intentions of launching a results-based capital investment in market expansion in 2021.

In terms of other forms of support, Stanbic Bank has a business incubator targeting off-grid companies.

Recent publications touching on the SAS sector include:

- ACE TAF (2019) Uganda Solar Water Pumping Report
- UBoS (2020). National Electrification Report
- UNREEEA, KEREA & USEA (2020) The East African Regional Handbook on Solar Taxation
- USEA (2020) Uganda Annual Sales and Impact Data Report 2019
- UOMA (2020) Mapping the Ugandan Off-grid Market

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