

**COUNTRY PROFILE**

**OFF- AND WEAK-GRID SOLAR  
APPLIANCE MARKET  
UGANDA**

**AUGUST 2021**  
EFFICIENCY FOR ACCESS COALITION



**This country profile covers market and appliance performance data for off-grid appliances sold in Uganda based on findings from Efficiency for Access market surveys.**

The profile explores the overall market landscape in Uganda, the common power type, size, price and warranty of off-grid appliances sold in retail markets, and other findings. This publication is relevant for sector stakeholders working in the off-grid solar market in Uganda including development programmes, distributors, manufacturers, mini-grid developers, policymakers, and others.

This profile was developed by Energy Saving Trust and CLASP on behalf of the Low Energy Inclusive Appliances programme, a flagship initiative of the Efficiency for Access Coalition.

Efficiency for Access is a global coalition working to promote high performing appliances that enable access to clean energy for the world's poorest people. It is a catalyst for change, accelerating the growth of off-grid appliance markets to boost incomes, reduce carbon emissions, improve quality of life and support sustainable development. Efficiency for Access consists of 17 Donor Roundtable Members, 16 Programme Partners, and more than 30 Investor Network members. Current Efficiency for Access Coalition members have programmes and initiatives spanning 44 countries and 22 key technologies. The Efficiency for Access Coalition is coordinated jointly by CLASP, an international appliance energy efficiency and market development specialist not-for-profit organisation, and UK's Energy Saving Trust, which specialises in energy efficiency product verification, data and insight, advice and research.

This report was authored by Théo Schuhmacher (Energy Saving Trust), Elisa Lai, Francis Ndonga, and Riley Macdonald (CLASP).

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## INTRODUCTION

### Efficiency for Access Country Profile Series

**Insufficient data about off-grid appropriate appliances<sup>1</sup> makes it difficult for manufacturers, policymakers, distributors, mini-grid operators, investors and other market actors to make informed decisions and identify high quality, efficient products.** To help address this challenge, Efficiency for Access has worked to gather data on the availability of off-grid appropriate appliances in key countries.

Since 2018, Efficiency for Access has conducted market scoping surveys in 10 countries.<sup>2</sup> The countries have been selected based on the population size, solar home system (SHS) sales volumes,<sup>3</sup> and uniqueness of the market.<sup>4</sup> The survey results have informed programme decisions, such as selecting products for testing through [VeraSol](#).<sup>5</sup> To utilise this data and share insights from the surveys more broadly, Efficiency for Access has developed a series of country profiles that share insights on the off-grid appliance market and contextualise data with supporting research and stakeholder feedback.

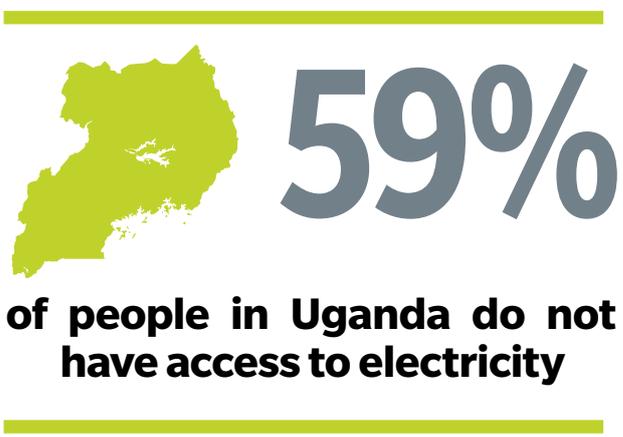
Product specifications collected through market surveys may not be accurate. The data cited in this country profile includes claimed values provided by shopkeepers or from consumer-facing materials, such as a product packaging or user manuals. As such, it may differ from data generated through third-party testing, which is available on the [VeraSol Product Database](#). Nevertheless, this data provides preliminary and useful observations about Uganda’s local off-grid appliance market.

### About Uganda

**Uganda’s electrification rate is growing rapidly, but the majority of people (59%) still do not have access to electricity.** The grid has reached 71% of the urban population, as of 2019. However, energy access remains low in rural areas, with only 32% of the population having access to electricity.<sup>6</sup>

Efforts to expand Uganda’s electricity sub-sector have led to an increase in total installed generation capacity from 400MW in 2000 to 1,237MW in 2020 and is expected to rise to 1,837MW by mid-2021.<sup>7</sup> The primary source of electricity is hydropower, accounting for 82% of electricity generated with an additional 12% of electricity coming from other renewable energy sources, such as solar. New grid connections have been relatively expensive, and cost about USD 200 per connection, including generation, transmission and distribution infrastructures. Due to low population density, this cost is even higher in rural areas. As a result, the Government of Uganda passed the Electricity Connections Policy<sup>9</sup> in 2018 with the aim of connecting 300,000 homesteads annually to achieve a 60% electrification rate by 2027. Despite a pause in 2020, the implemented policy achieved 299,000 connections of the annual target. Still, many households lack a grid connection in the short term.

As a result, there is a great opportunity for off-grid solar energy solutions to help the remaining 68% of rural households without access to the grid.<sup>10</sup> This is illustrated by the growth experienced by the off-grid market in Uganda in the last few years. Sales of off-grid solar lighting products reported by GOGLA affiliates increased by 9% from 368,000 units in 2018 to 400,000 units in 2019.<sup>11</sup> However, in 2020 sales of solar products have dropped due to COVID-19.<sup>12</sup>



1. In this document, off-grid appropriate appliance refers to appliances that can be powered by distributed energy systems like SHSs and mini-grids, or are appropriate to use in weak-grid conditions.  
 2. The selected countries are India, Sierra Leone, Uganda, Nigeria, Cote D’Ivoire, Ethiopia, Kenya, Myanmar, Tanzania, and Pakistan.  
 3. Sales volumes of SHS kits can be an indication of off-grid appliance ownership.  
 4. Uniqueness of market is used as selection criteria to enable data collection on a larger variety of brands and models, and to have a wider geographical scope.  
 5. VeraSol tests and generates consistent and comparable performance data to support scalable markets for durable, high-performing, and affordable off-grid appliances and productive use equipment.  
 6. The World Bank, 2019, Tracking SDG7, Uganda. <https://trackingsdg7.esmap.org/country/uganda>  
 7. Electricity Regulatory Authority (Uganda), 2020. <https://www.era.go.ug/index.php/sector-overview/uganda-electricity-sector>  
 8. Lighting Africa, 2018. <https://www.lightingafrica.org/country/uganda/>  
 9. Rural Electrification Agency, 2018. <https://www.rea.or.ug/index.php/ecp-policy/>  
 10. Ministry of Energy and Mineral Development (Uganda), Rural Electrification Strategy and Plan, 2013. <https://s3-eu-west-1.amazonaws.com/s3.sourceafrica.net/documents/119217/Strategy-and-Plan-2013-2022.pdf>  
 11. Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data GOGLA 2019, H2 2019. [https://www.gogla.org/sites/default/files/resource\\_docs/global\\_off\\_grid\\_solar\\_market\\_report\\_h22019.pdf](https://www.gogla.org/sites/default/files/resource_docs/global_off_grid_solar_market_report_h22019.pdf)  
 12. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data. H2 2020. <https://www.gogla.org/resources/global-off-grid-solar-market-report-h2-2020>

Efficiency for Access market surveys found that there is a strong market for DC-compatible solar appliances in Uganda, with a relatively wide variety of products sold compared to other surveyed markets in Sub-Saharan Africa. Uganda has seen a sharp increase in mobile money operations and is one of Africa's most established markets for component-based solar energy systems.<sup>13</sup> These trends provide a foundation for appliance sales. Televisions (TVs) are the most widely distributed and popular appliance, while the market for fans, refrigerators and solar water pumps (SWPs) is still relatively immature. The off-grid refrigerator market, however, is showing positive growth, with the majority of refrigerators surveyed identified as DC products designed for use with a solar home system (SHS). Field consultants also noted that counterfeit versions of popular solar brands are a problem in Uganda, and the detection of these counterfeit products is becoming increasingly complex for shop owners. For example, shops selling water pumps observed an increase in concentration of counterfeit versions of popular water pump brands.



## COVID-19 IMPACT

Uganda was impacted by the COVID-19 outbreak during the 2021 survey conducted by Efficiency for Access. A strict lockdown was enforced in the country in March 2020 to prevent the spread of the virus, and it has been periodically reinforced since then. This and other factors caused a major economic slowdown in Uganda, with the GDP declining by 0.5% in 2020 after growing by 7.5% in 2019.<sup>14</sup> The slowdown heavily affected Uganda's commercial and manufacturing sectors including retail and wholesale trade. According to a recent World Bank report, the pandemic pushed between 1.1 – 3.2 million more people into poverty in Uganda. The report also noted that Uganda is Africa's largest hosting country for refugees, meaning that delivering essential services, such as energy, has become even more critical and challenging.<sup>15</sup>

In interviews with retailers and distributors, Efficiency for Access field consultants found that most retailers in Kampala who did not have online selling channels witnessed a decline in sales as a result of the pandemic, while their counterparts who were able to sell online had an increase in orders. Distributors in Kampala targeting low-income earners saw a drastic fall in orders. PAYGO sales also reduced drastically since customers were reluctant to get a loan during the lockdown. In Arua, a commercial centre located in the Northern region, some shops offered discounts, but the demand for solar appliances still decreased mainly due to cross-border travel restrictions. Recent GOGLA sales data also reflects the trends of declining sales for appliances in Uganda. Between July and December 2020, GOGLA affiliates sold 8,200 appliances in Uganda, which is a decline of 11% compared to the first half of 2020, and a drop of 58% for the second half of 2019.<sup>16</sup>

On a positive note, the COVID-19 pandemic has helped foster a wave of innovation and digitalisation, enhancing the efficiency of many last-mile distributors. Companies adapted to lower and less predictable customer incomes, and digitised customer relations to help mitigate difficulties in engaging with customers in person during lockdowns. Off-grid solar companies have also innovated new ways to manage their field teams remotely during COVID-19, including providing online trainings and peer exchange, as well as developing new ways to keep their staff engaged and cared for.<sup>17</sup> Development programmes have also stepped in to help the sector during the pandemic. For example, EnDev and BMZ launched a EUR 1 million relief fund from November 2020 to March 2021 to help solar and cookstove companies navigate staff salary, defaulted customer payments, and inventory challenges.<sup>18</sup>

13. Component-based solar energy systems refer to solar energy systems that not plug-and-play and typically are not sold in as a packaged kit. A system integrator or installer need to assemble various components to build a customized solar system based on based on energy needs of a customer. A component-based system can be AC, DC or AC/DC hybrid.

14. African Development Bank Group, Uganda Economic Outlook, 2021. <https://www.afdb.org/en/countries/east-africa/uganda/uganda-economic-outlook>

15. World Bank, Uganda COVID-19 Crisis Response and Recovery Budget Support to Mitigate COVID-19 Pandemic, 2021. <https://www.worldbank.org/en/news/factsheet/2021/03/14/uganda-covid-19-crisis-response-and-recovery-budget-support-to-mitigate-covid-19-pandemic>

16. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data. H2 2020. <https://www.gogla.org/resources/global-off-grid-solar-market-report-h2-2020>

17. CDC, How is the last mile distribution sector adapting and innovating following COVID-19?, 2021. <https://infohub.practicalaction.org/bitstream/handle/11283/622784/CDC%20Plus%20GDC%20publication.pdf?sequence=3&isAllowed=y>

18. EnDev, EnDev Uganda's COVID-19 Relief Fund for the Solar and Cookstove Sector, 2021. <https://endev.info/endev-ugandas-covid-19-relief-fund-for-the-solar-and-cookstove-sector/>

# MARKET LANDSCAPE

## Market Conditions

**According to Efficiency for Access' 2019 State of the Off-Grid Appliance Market Report, the market for off-grid appliances in Uganda is categorised as high potential due to the country's large off-and weak-grid<sup>19</sup> population and strong mobile money market.** As a result, Uganda has been one of the fastest-growing markets for bundled appliances in recent years.<sup>20</sup> Based on market research in 2019, the solar appliance market for TVs in Uganda was valued at USD 26 million in 2018 and is expected to grow to USD 39 million in 2030. However, there were no figures on the market for fans, refrigerators, or SWPs in Uganda given that the penetration is so low.<sup>21</sup> An estimated 7% of rural households in Uganda own a TV and only 2% own a refrigerator. For comparison, the penetration of appliances in rural Kenya was 19% for TVs and 2% for refrigerators.<sup>22</sup>

There is also a strong market in Uganda for product use equipment (PUE), such as refrigerators, solar mills and SWPs. This is due to Uganda's strong agricultural sector, as 70% of the working population in Uganda is employed through agriculture and 80% of these workers are rural smallholder farmers.<sup>23</sup>

## Government Policy and Programmes

**The Government of Uganda is increasingly recognising the need for off-grid energy to drive rural electrification.**

Over the past decade, the government has committed to various electrification targets and the rural electrification rate has already increased from 3% in 2013 to 32% in 2019.<sup>24</sup> The government and the World Bank have also developed the Energy for Rural Transformation III (ERT III) programme, which runs from June 2015 until December 2021. This programme aims to increase access electricity in rural Uganda through three main components: on-grid connections, off-grid solar, and technical capacity building.<sup>25</sup>

In addition, in April 2021, the Government of Uganda adopted the new National PV Quality Standards - Test Methods (IEC 62257-9-5) and Quality Requirements (IEC 62257-9-8) for off-grid energy systems up to 350W, ensuring solar energy systems in the domestic market are meeting quality requirements. The Government of Uganda and partners including the World Bank, have also begun implementing the first-ever quality assurance framework for component-based SHSs.

These standards will play a critical role in keeping sub-standard products off the market and ensuring that market stakeholders can have confidence in supporting and using off-grid products.

Uganda was one of the first countries in the East African Community (EAC) to take steps towards supporting a favourable tax environment for solar products. As of June 2019, SHSs are exempt from a VAT or import duty, but most appliances sold with solar systems are subject to a 25% import duty and 18% VAT. Some solar appliances such as solar refrigerators, solar water heaters, and solar cookers are exempt from VAT, while other agricultural products such as grain millers, solar irrigation, and solar water pumps have no import duties.<sup>26</sup>

## Market Development Programmes

**Numerous development programmes have been supporting the deployment of affordable off-grid solutions in Uganda in recent years.** Marketing and consumer awareness campaigns have been important drivers of willingness to pay for off-grid solar products. One study that aimed to estimate the solar market potential in Uganda found that awareness campaigns run by the government and its partners were one of the key factors that leading to a growth in the solar PV market in the region.<sup>27</sup> These include programmes such as Lighting Africa (funded by the International Finance Corporation (IFC)) and the Let's Go Solar Campaign (funded by UK aid and UN Capital Development Fund (UNCDF)), which sold over 590 solar products and trained 60 solar experts over five years.<sup>28</sup>

More recently, programmes such as the Ugandan Off-Grid Energy Market Accelerator (UOMA) have led to growth in the off-grid appliances sector. This has been achieved through increasing access to local currency debt finance for private sector actors, researching how to best reach underserved populations, and supporting development of PUE technologies.<sup>29</sup> In addition, the Beyond the Grid Fund for Africa (BGFA) announced its third call for proposals from off-grid solar energy providers in Uganda. The successful companies will receive grants totalled at USD 20.7 million for the development of their off-grid electrification projects.<sup>30</sup>

Other donors operating in the region, including EnDev, European Investment Bank, GIZ, UNICEF, and USAID, are supporting energy access initiatives in areas such as solar financing, mini-grid development, and solar for health applications, all of which are contributing to the growth of the off-grid solar appliance market.

19. A grid is considered weak when consumers have access to the AC grid, but it is highly unstable and/or has intermittent electricity supply

20. Efficiency for Access, The State of the Off-Grid Appliance Market Report. 2019. <https://efficiencyforaccess.org/publications/2019-state-of-the-off-grid-appliance-market-report>

21. Ibid

22. Ibid.

23. UOMA, LESSONS FROM THE UGANDA OFF-GRID ENERGY MARKET ACCELERATOR (UOMA), 2020. <https://uoma.ug/1336-2/>

24. The World Bank, 2019, Tracking SDG7, Uganda. <https://trackingsdg7.esmap.org/country/uganda>

25. World Bank, Energy for Rural Transformation III <https://projects.worldbank.org/en/projects-operations/project-detail/P133312>

26. USEA, Ugandan Solar Energy Association Handbook on Solar Taxation, 2019. [https://sun-connect-news.org/fileadmin/DATEIEN/Dateien/New/UG\\_Solar\\_Taxation\\_Handbook\\_0.pdf](https://sun-connect-news.org/fileadmin/DATEIEN/Dateien/New/UG_Solar_Taxation_Handbook_0.pdf)

27. Estimating Market Potential for Solar Photovoltaic Systems in Uganda, 2021 <https://www.frontiersin.org/articles/10.3389/fenrg.2021.602468/full>

28. CREEC, Over 590 Solar Products Sold in CREEC Lets Go Solar Campaign. <https://www.creec.or.ug/over-590-solar-products-sold-in-creec-lets-go-solar-campaign/>

29. Ugandan Off-Grid Energy Market Accelerator (UOMA). <https://uoma.ug/>

30. Afrik 21, UGANDA: BGFA to subsidise solar off-grid providers again, 2021. <https://www.afrik21.africa/en/uganda-bgfa-to-subsidise-solar-off-grid-providers-again/>

## Consumer Financing

**Consumer financing is key in Uganda given that one of the main barriers to growth of the solar market is affordability.** Uganda benefits from high and fast-growing bank account ownership and mobile money penetration relative to other Sub-Saharan countries. In 2014, 35% of the population was using mobile money and this increased to 51% in 2017.<sup>31</sup> Such a high level of mobile money usage is promising for the Ugandan market as it is a key enabler for PAYGO financing models. These financing options allow customers to buy or upgrade their solar systems and appliances with reduced upfront energy costs. Other third-party consumer financing options are available to consumers in Uganda through Savings and Credit Cooperative Organisations (SACCOs) and Micro Finance Institutions (MFIs), such as FINCA. In addition, other asset financing companies such as Cycle Connect and EnerGrow are emerging in the Ugandan market to provide smallholder farmers with consumer financing for PUE. Despite the growing capital available to off-grid Ugandans, especially smallholder farmers, several challenges remain. Rural consumers tend to have lower levels of financial literacy and have lower access to banks given that they live in hard-to-reach areas. Banks also struggle to lend to smallholder farmers due to their seasonal cashflows and varying crop cycles.<sup>32</sup>

## Product and Technology

### Methodology and Sample Source

**Efficiency for Access engaged field-based consultants to survey key off-grid retail markets in Uganda. Efficiency for Access engaged field-based consultants to survey key off-grid retail markets in Uganda.**

The first round of surveys was completed for SWPs in 2019, and a second round of surveys was completed for TVs, fans, refrigerators, and SWPs in 2021. The purpose of these surveys was to identify product models sold in the retail markets and to identify any changes in the market over time.

The field consultants visited retail shops to collect data on brand, model name/number, appliance size, power input, voltage, warranty and retail price. This data was pulled from rated claims on the product packaging or user manual, or from a shopkeeper's knowledge of the product, and thus may not be as accurate as tested data. The Efficiency for Access team also purchased 17 TVs, seven fans, and two SWPs identified during the surveys for further performance and quality evaluation through laboratory testing. The analysis of this lab-tested data is included in each product specific section below, and the detailed data of the tested products are available on the [VeraSol](#)

In addition to gathering data on product specifications, the field consultants conducted interviews with owners of small shops to collect qualitative anecdotes and evidence. This anecdotal evidence complements quantitative data and may provide more insights on perceived product demand, quality and performance.

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The field consultants visited two key markets in Uganda: Arua city in North-Western Uganda and Kampala in central Uganda (Figure 1). Arua is a regional market hub for solar products in West Nile. It has a mature ecosystem of distributors and vendors serving West Nile and neighbouring refugee communities. Eight out of 14 solar distributors interviewed regard Arua as the main solar distribution hub in Northern Uganda. Kampala is also the capital and central commercial hub in Uganda, and provides access to electronic shops that are bigger in size and selling a larger sample of solar products compared to Arua. Additionally, it is the landing place for most imported solar appliances, making it an interesting location to study. A total of 54 shops and distributors were surveyed, with the majority of products surveyed in Kampala.

31. World Bank Global Findex database, 2018, <https://globalfindex.worldbank.org/>

32. UOMA, LESSONS FROM THE UGANDA OFF-GRID ENERGY MARKET ACCELERATOR (UOMA), 2020. <https://uoma.ug/1336-2/>

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### Data Analysis on Appliances

The below section analyses off-grid appliances available in Ugandan retail markets in May 2019 and March 2021, primarily focused on TVs, fans, refrigerators and SWPs. Efficiency for Access also expanded the survey recently to collect data on other products found in the market, such as solar energy kits, electric cookers and solar water heaters, and to document the type of connectors or plugs integrated into or sold with the product. The data was analysed based on the following characteristics:

- **Power type:** Are there more alternating current (AC), direct current (DC), or AC/DC appliances available? (See Box 1)
- **Size:** What are the most prominent sizes for the products?
- **Price:** What is the range of product retail price?

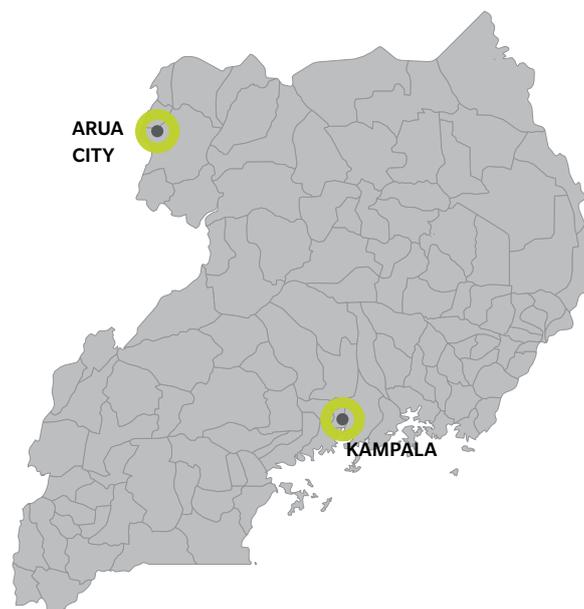
- **Warranty:** How many products are covered by a warranty, and how long is the warranty?
- **Energy consumption:** What is the lab-tested power consumption of appliances sampled from Uganda and how do they compare with other markets?
- **Connector/Plug:** What kind of connectors and plugs are provided with the products?

### BOX 1

#### AC vs DC Appliances

Appliances may be specified to be used with only DC power, AC power, or compatible with both AC and DC power. An end-user may have access to the AC grid, DC or AC mini-grids, or DC SHSs. To power the appliance, an end-user has to ensure that the power type (AC or DC) and voltage ranges are compatible with the appliances they are using. When the power supply and appliance are not directly compatible, a power converter, such as an inverter or a rectifier, is required. An inverter converts DC power to AC power, while a rectifier converts AC power to DC power. The use of a power converter adds additional power consumption, and typically increases the complexity of the system set-up, as well as adding cost and quality considerations.

Figure 1: Geographic area covered



## TV MARKET INSIGHTS

**TVs have become key drivers of off-grid solar energy system uptake and are the most in-demand appliance for off-grid households in Uganda.**

In 2020, GOGLA affiliates sold over 14,000 TVs in Uganda, and in the second half of 2020, TVs accounted for 94% of the appliances sold in the country with close to 8,000 units.<sup>33,34</sup> Field consultants noted that TVs are the most available appliance on the market, with a broad variety of brands and sizes present. Still, the penetration of TVs in rural Ugandan households is relatively low and was estimated at 7% in 2018.<sup>35</sup>



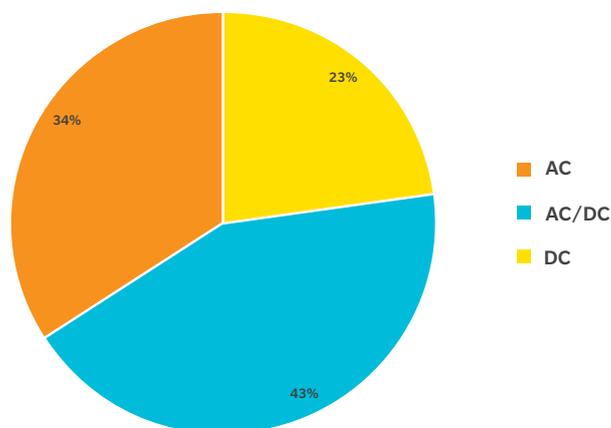
### Field consultants captured technical specifications and price data for 65 unique TV models sold by 25 brands

Field consultants captured technical specifications and price data for 65 unique TV models from 25 different brands. The most common brand is a Ugandan company called Cortina, representing 17% of models surveyed, with Hisense, another popular brand sold throughout Sub-Saharan Africa, as the second most common (11%). More than two thirds (69%) of the TVs available on the market are sold as standalone products, while 31% are sold with an SHS.

### Power Type

**43% of the TVs surveyed during the market visits are AC/DC-compatible, which is proportionally greater than other African markets in which Efficiency for Access has performed surveys.** For comparison, only 21% of the TVs available on the Nigerian market are AC/DC compatible.<sup>36</sup> In practice, this means that the products have an inbuilt inverter or include an inverter so that the product can be powered with either the AC grid or a DC solar system. DC-compatible TVs are more commonly available in Uganda than in comparable markets, meaning that these products are designed to be used with an SHS. However, their availability is still lower (23%) when compared with AC TVs (34%).

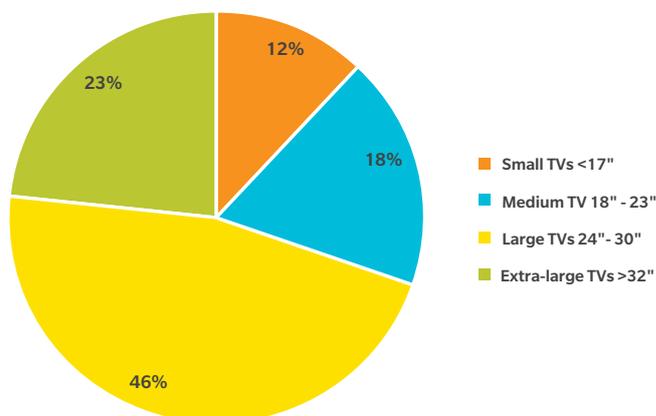
Figure 2: Distribution of TVs by input current type



### Product Size

**TVs available on the Ugandan market range between 15 – 60 inches.** The survey screen size data is divided into four categories (small, medium, large, and extra-large) based on diagonal screen size and measured in inches. Large TVs, between 24 and 32 inches, are the most common (Figure 3). The demand for large TVs is consistent with other off-grid markets in Sub-Saharan Africa where Efficiency for Access has conducted market surveys and with insights from TV manufacturers who shared that the solar TV market seems to be settling on 24- and 32-inch TVs.<sup>37</sup> According to field consultants in Uganda, 24- and 32-inch TVs are the main offering because of their lower prices and availability.

Figure 3: Distribution by TV size



33. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data. H1 2020. <https://www.gogla.org/resources/global-off-grid-solar-market-report-h1-2020-sales-and-impact-data>

34. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data. H2 2020. <https://www.gogla.org/resources/global-off-grid-solar-market-report-h2-2020>

35. Efficiency for Access, The State of the Off-Grid Appliance Market Report. 2019. <https://efficiencyforaccess.org/publications/2019-state-of-the-off-grid-appliance-market-report>

36. Efficiency for Access, Off- and Weak-Grid Appliance Market: Nigeria, 2021. <https://efficiencyforaccess.org/publications/off-and-weak-grid-appliance-market-nigeria>

37. Efficiency for Access, Solar Appliance Technology Brief: Televisions, 2021. [https://storage.googleapis.com/e4a-website-assets/EforA\\_Solar-Appliance-Technology-Brief\\_Televisions\\_May-2021.pdf](https://storage.googleapis.com/e4a-website-assets/EforA_Solar-Appliance-Technology-Brief_Televisions_May-2021.pdf)

## Retail Price

In general, the retail price gradually increases with larger TV sizes, with the exception of extra-large TVs sold with an SHS (Table 1). When only looking at TVs sold separately from an SHS, the extra-large TVs are more expensive than the small TVs, but the price difference between extra large and small TVs is relatively minimal. This insight helps to explain previous observations from Efficiency for Access research, which found that consumers now have a higher demand for larger TVs.

This can be a good investment for consumers since larger TVs provide a better viewing experience and can be used in business settings, such as a village cinema.

When looking at the prices of TVs by power supply type (Table 2), AC/DC products are the cheapest on average, but there is no data available for AC products sold with an SHS kit, or DC TVs sold without an SHS.

## Warranty

As shown in Figure 4, warranties vary from four months to three years, with 10% of samples not offering any type of warranty. The majority (82%) of the TVs sold in Uganda have at least a one-year warranty. This figure is higher when compared to other countries surveyed by Efficiency for Access. For example, 76% of TVs sold in Nigeria and none of the TVs surveyed in Sierra Leone come with at least a one-year warranty.<sup>38,39</sup> The availability of these longer warranties suggests that manufacturers may be working to build brand loyalty but as with all other products, we cannot verify the percentage of these warranties that are being honoured.

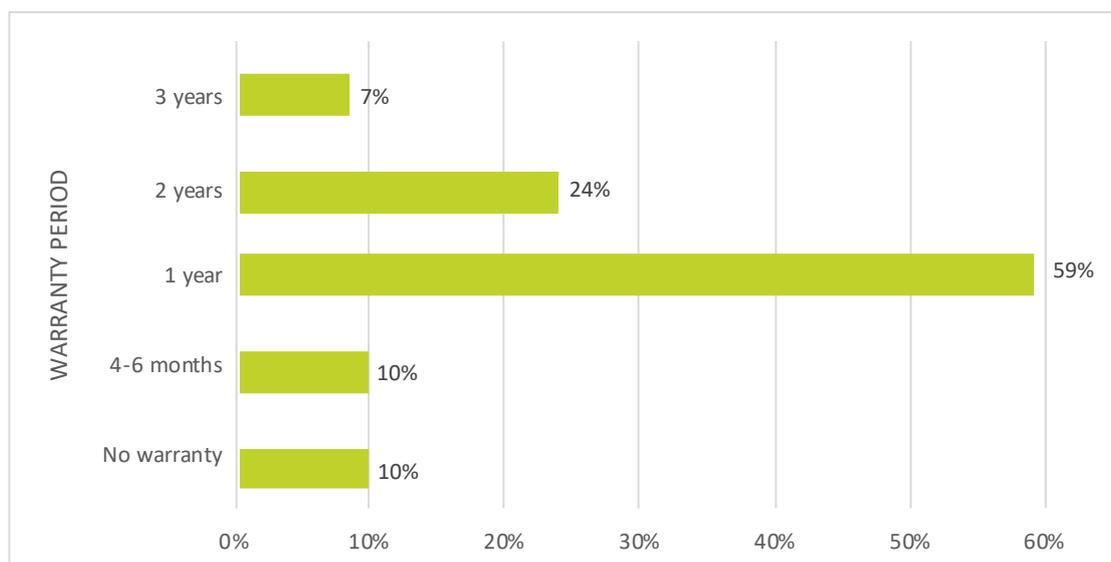
Table 1: Average retail price for TVs categorised by size

Size Category	Average Retail Price (USD)	
	TVs Sold Without an SHS	TVs Sold With an SHS
Small TVs <17"	217	476
Medium TVs 18" - 23"	218	518
Large TVs 24" - 32"	239	526
Extra-Large TVs > 32"	296	358

Table 2: Average retail price for TVs categorised by power source

Power Type	Average Retail Price (USD)	
	TVs Sold Without an SHS	TVs Sold With an SHS
AC	294	N/A
AC/DC	212	358
DC	N/A	520

Figure 4: Warranty period offered for TVs



38. Efficiency for Access, Off- and Weak-Grid Appliance Market: Nigeria, 2021, <https://efficiencyforaccess.org/publications/off-and-weak-grid-appliance-market-nigeria>

39. Efficiency for Access, Off- and Weak-Grid Appliance Market: Sierra Leone, 2020, [https://storage.googleapis.com/e4a-website-assets/EForA\\_CountryProfile\\_SierraLeone.pdf](https://storage.googleapis.com/e4a-website-assets/EForA_CountryProfile_SierraLeone.pdf)

## Power Consumption

### The Efficiency for Access team procured 17 of the TVs identified during market surveys in Uganda to conduct laboratory performance testing.

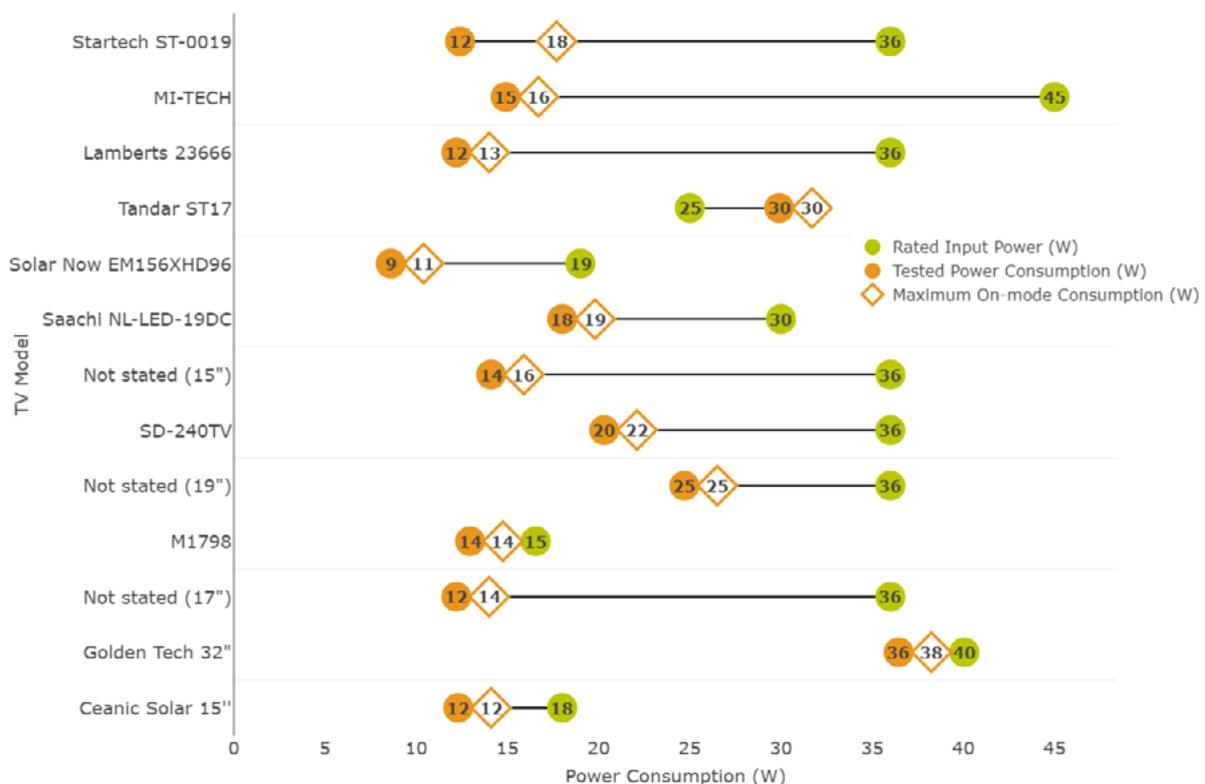
During initial analysis of the surveyed data, we found a wide variance of power consumption ratings. In the most common size category of 32 inches, for example, power consumption ranged from 15 – 75W! To identify differences between tested and rated data, we compared the lab-tested power consumption (both average and maximum) with the power rating included on the product’s packaging (Figure 5).

The results show that in all but one case, both the average tested power and maximum tested power is lower than the rated power. This is consistent with other analysis from Efficiency for Access which found that manufacturers typically overstate the power consumption of their products to ensure that they don’t under-report the energy requirements.

However, if a buyer uses the rated energy consumption to size their system, it would likely result in an oversized SHS. In addition, two of the TV samples had power ratings within a 5% deviation of the maximum tested values. This suggests that these manufacturers are well-informed on their product’s performance. For comparison, the average deviation between the actual power and rated power of TVs from Uganda was 39%, and the maximum deviation was 64%.

Although the sample size is relatively small, the results show that the 17 TVs tested from Uganda are mainly less efficient compared to the global average. When looking at power consumption relative to size, the Ugandan samples are 12% less efficient than the average TV included on the VeraSol Product Database.<sup>40</sup> However, one particular AC/DC TV from a local Ugandan brand, Lamberts, performed particularly well in terms of power consumption. It was the ninth best TV for power consumption (12.2W) compared to 24 other 23.5 inch TVs tested through VeraSol.

Figure 5: Rated and tested TV power consumption



40. VeraSol Product Database. Data taken in July 2021. <https://data.verasol.org/>

## FAN MARKET INSIGHTS

The demand for fans in Uganda is very low<sup>41</sup>, with approximately 3% of households owning a fan in 2018.<sup>42</sup>

This is likely to be linked to the climate in Uganda being milder compared to other Sub-Saharan African countries. This low demand is also consistent with GOGLA sales data in 2020, which found that not enough manufacturers reported their fan sales data in Uganda to allow for publication.<sup>43</sup>



### Data was collected for 40 fan models in Arua and Kampala

Efficiency for Access field consultants found that although fans are widely available, sales are very low. They also noted that fans are easier to find at larger electronic shops and small retailers, but only 12.5% of distributors surveyed sell fans. The retailers and distributors attributed this low demand to seasonality and the fact that fans are considered a less urgent luxury compared to TVs and refrigerators. In Arua, the demand for fans is higher in the dry seasons, but reduces significantly during rainy seasons.

It’s also worth noting that Arua had a significant number of unbranded fans, with many lacking information on the product packaging and thus could not be included in the survey data. All unbranded fans in Arua were found in general electrical shops selling other equipment such as cables, builds, switches, and wiring equipment.

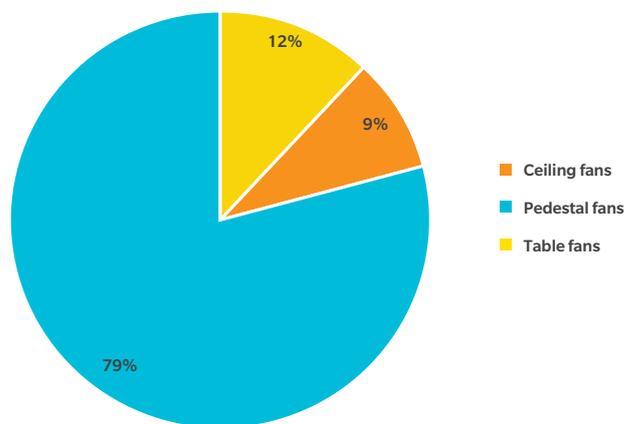
### Power Type

76% of the fans sold on the Ugandan market are AC-compatible, 17% are DC-compatible, and 5% are AC/DC-compatible. This is inconsistent with TVs sold in Uganda, in which more than a third of products are AC/DC.

### Product Type and Size

The most common type of fans are pedestal fans, representing 79% of the surveyed models, followed by table fans and ceiling fans. Retailers interviewed during the market surveys observed that pedestal fans could be more popular than wall fans or ceiling fans because they did not require installation. In addition, several retailers stated that pedestal fans are more common than table fans because most households don’t have space for a table fan. It is important to note that while wall fans were not included in this analysis, they account for 17% of the total number of fans sampled.

Figure 6: Distribution of fans by type



41. Efficiency for Access, The State of the Off-Grid Appliance Market Report. 2019. <https://efficiencyforaccess.org/publications/2019-state-of-the-off-grid-appliance-market-report>

42. Uganda Bureau of Statistics (UBOS), 2018. Energy for Rural Transformation (ERT III) Survey -Uganda Report. Kampala, Uganda; UBOS. [http://www.energyandminerals.go.ug/site/assets/files/1081/memd\\_national\\_electrification\\_survey\\_-\\_2018\\_printed\\_2020.pdf](http://www.energyandminerals.go.ug/site/assets/files/1081/memd_national_electrification_survey_-_2018_printed_2020.pdf)

43. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data. H2 2020. <https://www.gogla.org/resources/global-off-grid-solar-market-report-h2-2020>

## Retail Price

As shown in Table 3, pedestal fans tend to be cheaper than ceiling and table fans. This is likely linked to pedestal fans being the most common type of fan available on the market, meaning that sales volumes are higher, which results in more competitive prices for end consumers. In terms of price by power source, AC, AC/DC and DC-compatible fans all have very similar price points of around USD 34.

Table 3: Average retail price for fans categorised by fan type

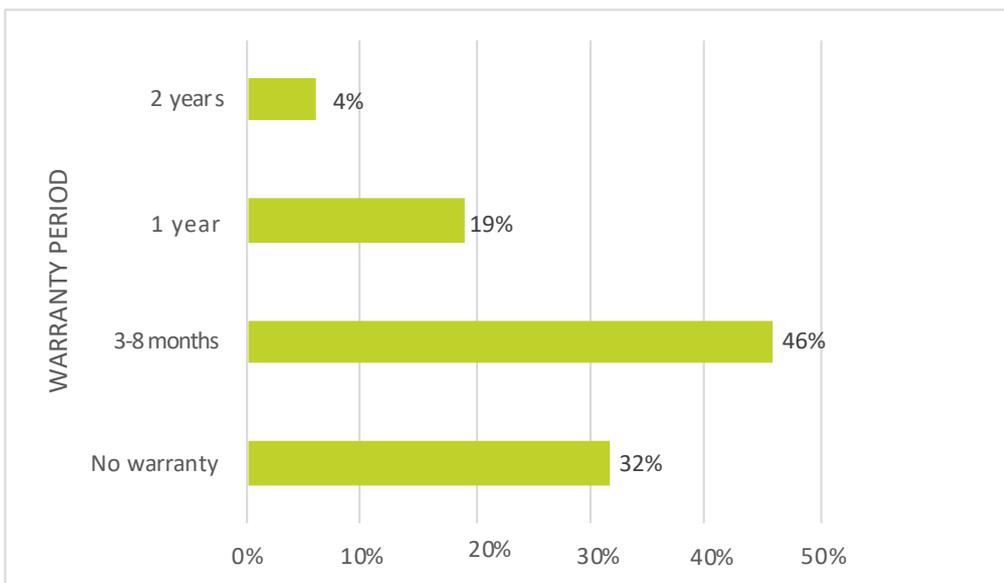
Fan Types	Average Retail Price (USD)
Ceiling fans	44
Pedestal fans	32
Table fans	34

## Warranty

Out of the appliance types surveyed, fans had the shortest length of warranty. Only 23% of the fans surveyed come with a warranty of more than 12 months, which is the minimum warranty duration for fans recommended by Efficiency for Access. The majority of fans (46%) were offered with a warranty of between three – eight months, which may be seasonal. The remaining 31% of fans came with no warranty at all. This is still better than some markets, such as Sierra Leone, where more than 66% of fans are sold without any warranty.



Figure 7: Warranty period offered for fans



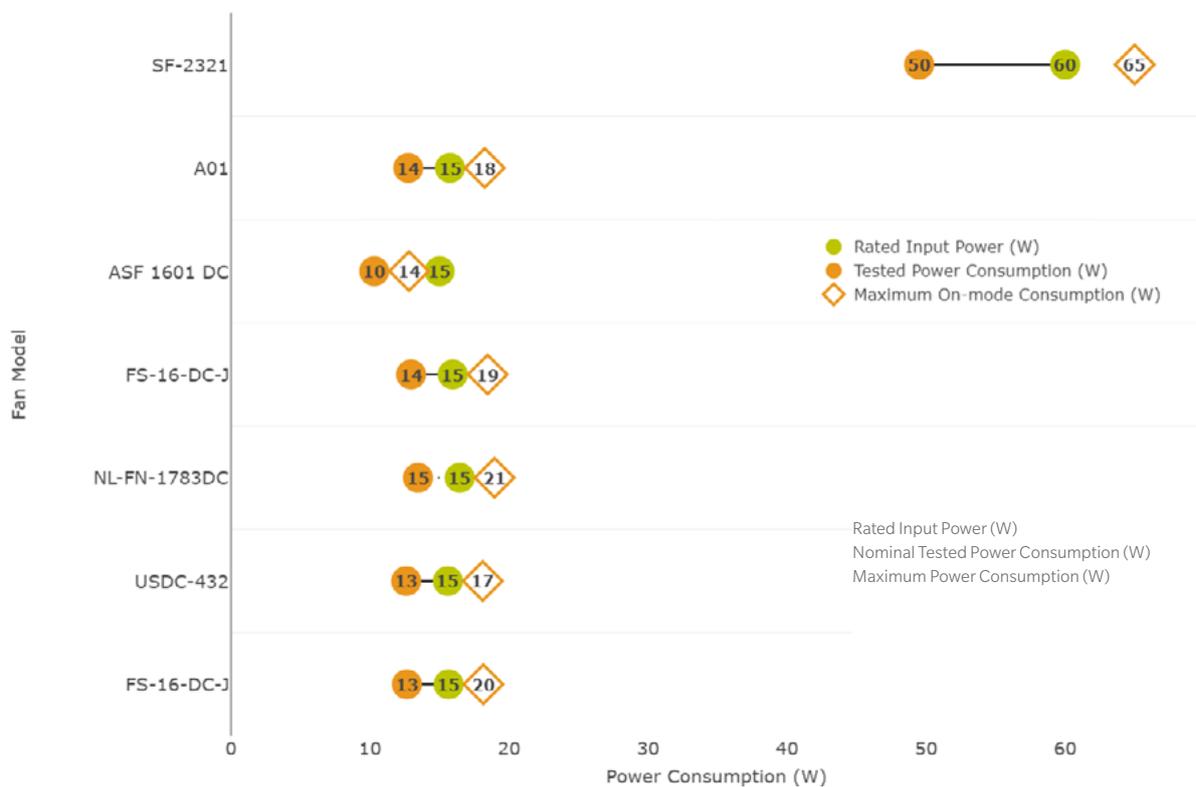
## Power Consumption

### Efficiency for Access procured seven pedestal fans and two table fans to conduct laboratory performance testing.

Similar to TVs, Efficiency for Access compared the lab-tested power consumption (both nominal and maximum) with the power rating included on the product’s packaging (Figure 8). Two fans were excluded from this analysis because they did not have a power rating. The results show that in all but one case, the power rating was higher than the nominal tested power consumption, but less than the maximum tested power consumption. In addition, the power rating was also closer aligned with the average power consumption rather than the maximum. This suggests that manufacturers base d their power rating on the average power rating instead of the maximum. This could present potential problems for some off-grid users if they use this rating to design their system, thus have an undersized system. In addition, it is interesting to note that all of the DC fans had power ratings of 15W.

All of the tested fans were DC, except for one AC pedestal fan which had significantly higher power consumption (49.5W) compared to the DC fans and was removed from this analysis. The eight DC fans sampled from Uganda had an average power consumption of 12.7W, which is lower than the global average for table and pedestal fans (18.8W).<sup>44</sup> When looking at the energy efficiency value, or speed relative to power consumption, the Ugandan fans were 10% more efficient than other table and pedestal fans tested by VeraSol. However, it is important to note that the sample size is relatively small.

Figure 8: Rated and tested fan power consumption

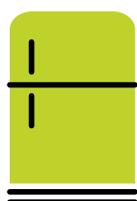


44. VeraSol Product Database. Data taken in July 2021. <https://data.verasol.org/>

## REFRIGERATOR MARKET INSIGHTS

**The off-grid refrigerator market in Uganda is still relatively new, with only 2% of the rural population in Uganda owning a refrigerator in 2016.**<sup>45</sup> This is also highlighted by GOGLA sales data, which found that affiliates sold around 1,100 refrigeration units in Uganda in 2020.<sup>46</sup> Refrigerator sales are largely constrained by high prices despite a demand from the rural population.<sup>47</sup> For example, one study from Efficiency for Access and Energy4Impact on refrigerator use cases in rural Uganda found that while penetration of off-grid refrigerators is still low due to high prices, there is a strong case for using off-grid refrigerators in small business settings (e.g., to sell drinks).<sup>48</sup>

Consultants found that refrigerators were relatively rare across shops in the surveyed markets. They noted that most vendors selling refrigerators specialise only in these products, and very rarely offer other types of appliances. The field consultants also noted that during interviews with solar distributors, they found that Western Uganda has higher demand for refrigerators given the more developed animal and crop production value chains. In addition, one study by Open Capital Advisors (OCA) indicated that communities in South West Uganda were one of the most likely populations to benefit from the increase of solar refrigerators and cold chain due to high numbers of dairy farms and agriculture.<sup>49</sup>



31

Data was collected on 31 unique refrigerator models

### Power Type

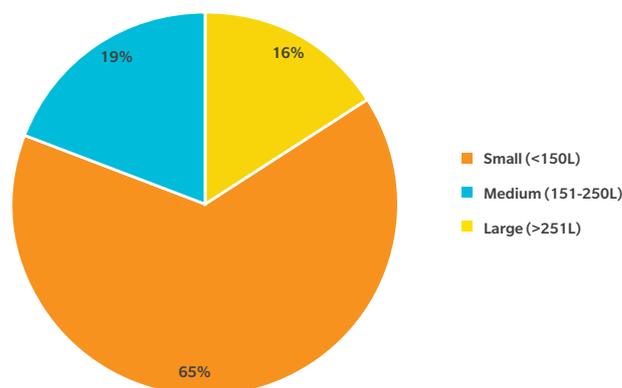
**The majority (59%) of refrigerators surveyed are DC-powered, with the remaining models being AC refrigerators.** The percentage of DC refrigerators surveyed is relatively high compared to other African markets where Efficiency for Access performed market scoping surveys. For example, only one DC refrigerator was identified in Nigeria, and only 7% of refrigerators surveyed were DC. This may be partially due to the [Global LEAP results based financing \(LEAP-RBF\)](#), which supports the sales of high quality off-grid refrigerators in several countries including Uganda.

### Product Size

**When looking at refrigerator sizes, small refrigerators (below 150L) dominate the Ugandan market (Figure 9).**

This is likely due to the fact that smaller refrigerators are more affordable for rural, low-income population. They are also more energy-efficient, which means that they can be used more easily with a solar energy system. This is also consistent with the abovementioned study by Efficiency for Access and Energy 4 Impact, which found that in interviews with 172 business owners in rural Uganda, the typical refrigerator used by these small businesses was a 100 – 50L refrigerator costing around USD 250.<sup>50</sup> The remaining 35% of refrigerators surveyed were almost equally split between medium refrigerators (151 – 250L) and large refrigerators (above 200L).

Figure 9: Size categories of surveyed refrigerators



45. Efficiency for Access, The State of the Off-Grid Appliance Market Report. 2019. <https://efficiencyforaccess.org/publications/2019-state-of-the-off-grid-appliance-market-report>

46. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data. H2 2020. <https://www.gogla.org/resources/global-off-grid-solar-market-report-h2-2020>

47. Ibid.

48. Energy4Impact, Grid Powered Refrigeration for Productive Use, 2017, <https://energy4impact.org/file/1946/download?token=2Li0aJN0>

49. UOMA, MAPPING THE UGANDAN OFF-GRID MARKET- 2020 EDITION, 2020. <https://uoma.ug/mapping-the-ugandan-off-grid-market-2020-edition/>

50. Energy4Impact, Grid Powered Refrigeration for Productive Use, 2017, <https://energy4impact.org/file/1946/download?token=2Li0aJN0>

51. Efficiency for Access, 2021 Appliance Data Trends Report, 2021. <https://efficiencyforaccess.org/publications/2021-appliance-data-trends> UOMA, LESSONS FROM THE UGANDA OFF-GRID

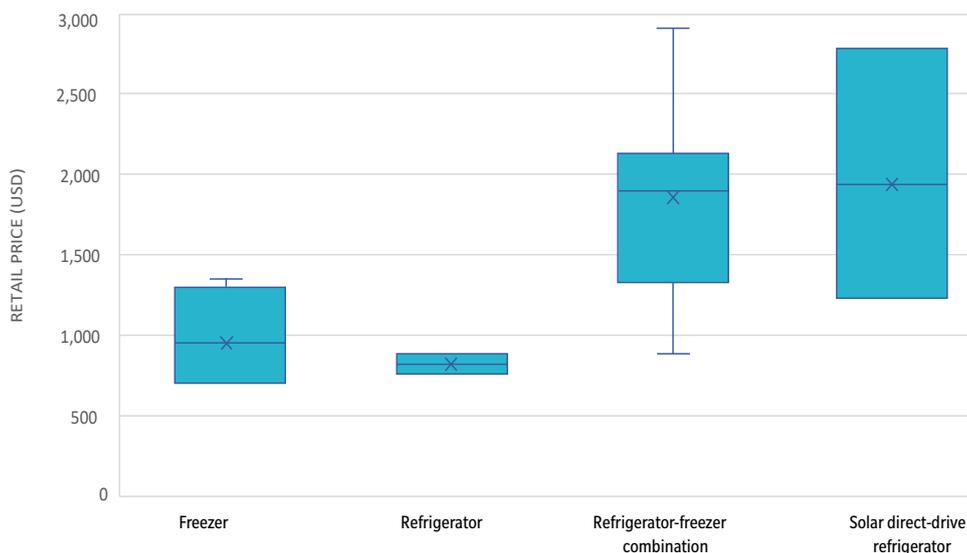
52. Efficiency for Access, Country Profile, Off- and Weak-grid Solar Appliance Market, Sierra Leone, 2020, [https://storage.googleapis.com/e4a-website-assets/EForA\\_CountryProfile\\_SierraLeone.pdf](https://storage.googleapis.com/e4a-website-assets/EForA_CountryProfile_SierraLeone.pdf)

## Retail Price

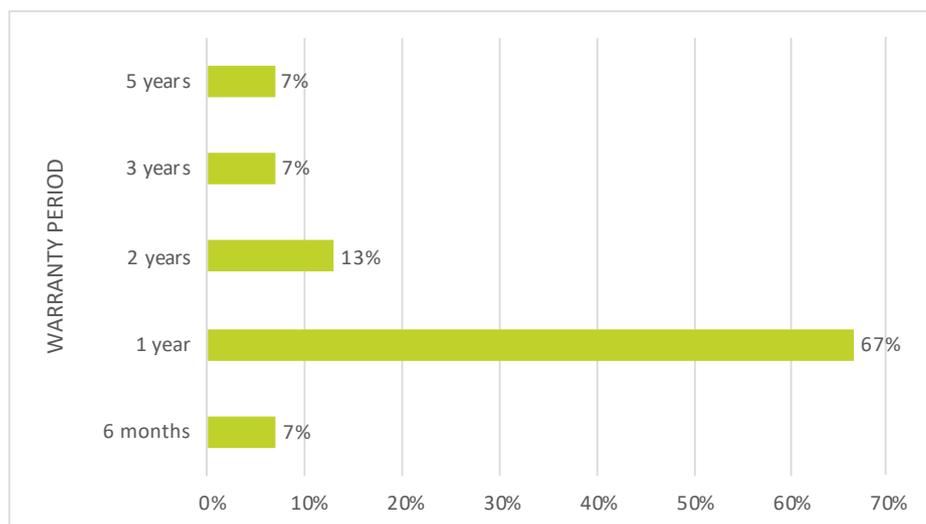
**Refrigerators sold on a standalone basis had a narrower price range than those sold with a solar system - between USD 112 and USD 392, with an average price of USD 258.** The two most expensive standalone refrigerators were a DC freezer and DC refrigerator from the same brand. It is also important to note that for standalone refrigerators, there is a correlation between refrigerator size and price, with larger volume products being more expensive.

For the price analysis in Figure 10, we analysed only refrigerators sold with a solar system since this made up the majority of products (59%). Solar direct drive refrigerators had the highest prices relative to size, followed by refrigerator-freezer combination, freezers, and refrigerators. As would be expected, refrigerators sold with a solar system were more expensive, given that the solar system can account for 35% to 88% of the total cost for a solar system and refrigerator.<sup>51</sup>

**Figure 10: Price by type of refrigerator bundled with SHS**



**Figure 11: Warranty period offered for refrigerators**

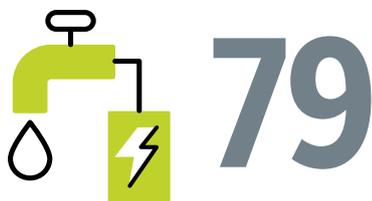


53. Efficiency for Access, 2019 Buyer's Guide for Outstanding Off-Grid Refrigerators, 2019, [https://storage.googleapis.com/e4a-website-assets/2019-Global-LEAP-Refrigerators-Buyers-Guide\\_final.pdf](https://storage.googleapis.com/e4a-website-assets/2019-Global-LEAP-Refrigerators-Buyers-Guide_final.pdf)

54. ENERGY MARKET ACCELERATOR (UOMA), 2020. <https://uoma.ug/1336-2/>

### SOLAR WATER PUMP MARKET INSIGHTS

**SWPs are among the most commercially viable productive use appliances in Uganda, but the market is still nascent.**<sup>54</sup> In 2020, GOGLA affiliates reported selling roughly 500 units of SWPs in Uganda, though these are likely only a fraction of SWPs sales in the country due to low reporting from companies.<sup>55</sup> Though under-developed, SWP demand is growing and there is a strong business case for horticultural crop farmers using SWPs for irrigation.<sup>56</sup> According to field consultants, this growth has been influenced by awareness campaigns run by the government and the private sector. Field consultants also noted that farmers are the main users of SWPs, followed by residential homes and community institutions in rural areas.



**Data was collected on 79 SWPs in Kampala and Arua in 2019 and 2021**

SWPs proved to be difficult to source, with only 9% of the sampled vendors stocking them. The consultants noted that demand for water pumps is seasonal, and customers bought more during the dry seasons from July until August. They also found that pump retailers did not have the proper technical knowledge to determine the quality of appliances being sold, and there is a growing number of counterfeit SWPs in the market.

#### Power Type

**The market surveys showed that the majority (66%) of pumps sold in the Ugandan retail markets were DC SWPs followed by AC pumps and AC/DC-compatible pumps.**

The share of DC SWPs was higher in comparison to other markets where Efficiency for Access has performed market surveys, with only 12% of pumps in Sierra Leone and 39% of pumps in Nigeria being DC. In Uganda, the survey showed that 51% of the SWPs were sold with a solar system and 17% were sold standalone, while the remaining pumps do not specify whether they are sold with or without a system.



#### DEFINITIONS

##### SUBMERSIBLE PUMPS

For underwater installation, such as in boreholes and wells. Whilst they are generally less accessible, they do not need to be primed and are not constrained by some of the physical limitations of surface pumps, such as suction lift limits (i.e. the maximum vertical distance the pump can pull water in before pumping it out).

##### SURFACE PUMPS

Draw water from surface sources, such as streams and ponds. The pump itself is designed to be situated outside of the water source. As surface pumps are more accessible, they can present a trade-off between convenience of installation and maintenance, as they are more exposed to the elements and potential theft. Some surface pumps are now designed to be mobile to address these concerns.

#### Product Size and Type

**Submersible pumps are the main pump type in Uganda compared to surface pumps.** The overall range of input power for SWPs in Uganda is 0.1 – 4.2kW, while the maximum capacity of pump system found in the Uganda in 2019 was 2.2kW. This indicates that larger models are now selling in the Ugandan market.

55. GOGLA, Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data. H2 2020. <https://www.gogla.org/resources/global-off-grid-solar-market-report-h2-2020>

56. UOMA, LESSONS FROM THE UGANDA OFF-GRID ENERGY MARKET ACCELERATOR (UOMA), 2020. <https://uoma.ug/1336-2/>

## Retail Price

**Efficiency for Access field consultants noted that affordability is a major constraint for both farmers and residential users in obtaining SWPs.** They stated that wealthier farmers would be quick to buy a SWP if they understood the value-add potential, but they represent the minority of customers. The majority are rural farmers with limited spending ability, and as such are only able to purchase SWPs if financing is made available. According to the consultants, most of the established companies allow payments in instalments.

The price range of pumps varies significantly. As shown in Table 4, pumps sold without a solar energy system range from USD 168 to USD 6,580 depending on the pump capacity, with the lowest being a 150W pump and highest being a 4kW pump.

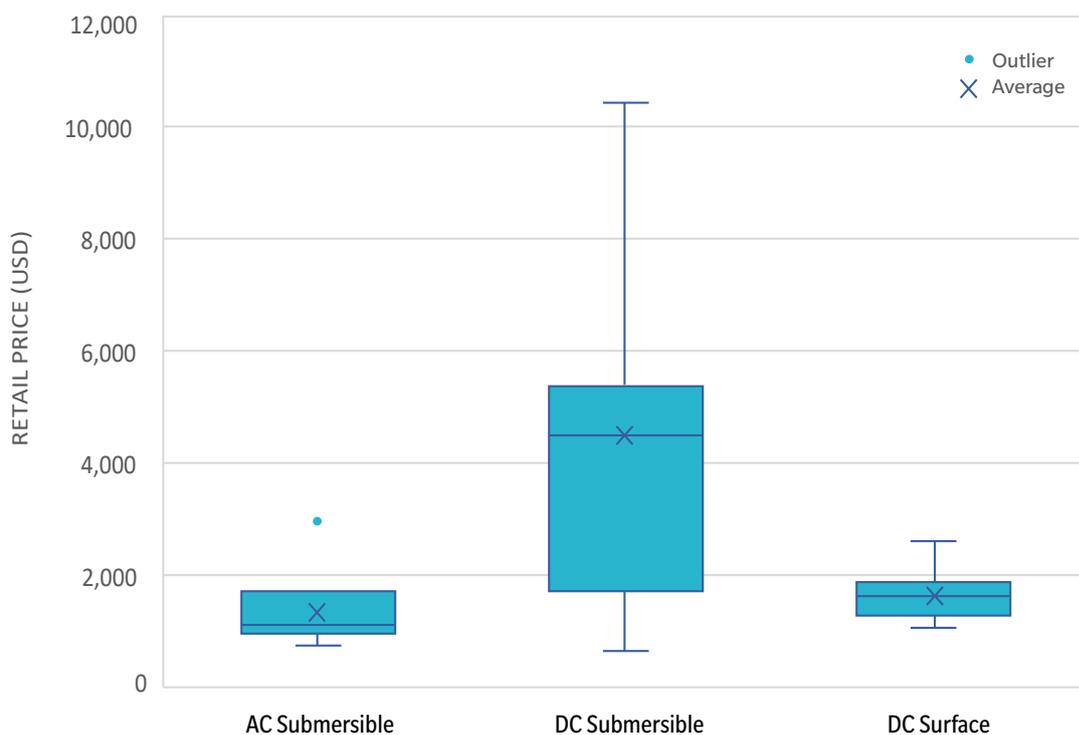
For pumps sold without a solar system, submersible pumps are two times more expensive compared to surface pumps. This is primarily driven by the power requirements for submersible pumps, which are also two times higher than surface pumps. This could also be attributed to the setup required for submersible pumps, which requires more components so that the pumps are submerged in water at all times.

To compare the price of pumps, we analysed the retail prices of pumps sold with a solar system only, considering that they accounted for 64% of products surveyed. The data showed that the AC submersible pumps were the least expensive, averaging at USD 1,160. DC submersible pumps are four times more expensive on average (Figure 12).

**Table 4 Average power rating and retail price for SWPs**

	Average Power Rating (W)	Average Retail Price of Pumps Alone (USD)	Average Retail Price of Pumps Sold With a Solar System (USD)
Submersible Pumps	893	1250	4033
Surface Pumps	375	544	1570

**Figure 12: Cost by pump and power supply type for pumps sold with a solar system**



## Warranty

**Our research showed that SWPs had one of the best warranties compared to other appliances surveyed in the country. Of the sampled water pumps, only 2% did not offer a warranty and only 1% offer less than a one-year warranty.** The majority of pumps offered a one-year warranty, followed by a two-year warranty, and several pumps even offer a five-year warranty (Figure 13). Warranties act as a mark of reassurance to customers and given the high cost of these products, an adequate warranty could attract and retain customer investment in these water pumps. As of August 2021, Futurepump, one of the leading SWP brands in Uganda, now offers a 10-year warranty, covering both parts and labour. This sets a new benchmark for consumer protection in the SWP market and shows that there is potential to improve warranty offerings for other pump brands.<sup>57</sup>

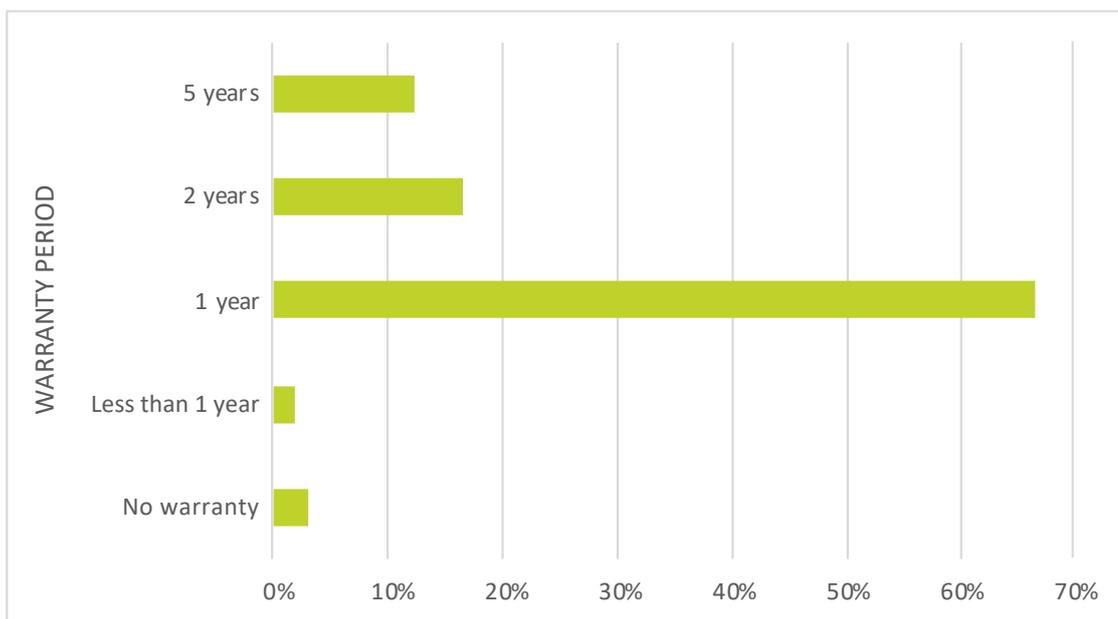
## OTHER APPLIANCES

**During the 2021 market survey, the consultants identified and gathered information on several additional products available in surveyed shops, including four electric rice cookers, one microwave, and six solar water heaters.**

All the electric rice cookers were AC-powered and had very high power ratings, of between 400-900 W. Although the sample size is small, this is consistent with findings from the [Global LEAP Awards Competition for Electric Pressure Cookers](#), where the average power rating of AC EPCs was 958 W. For comparison, the input power rating of a typical large refrigerator ranges from 50 W to 130 W. This suggests that many of these EPCs are primarily designed for use in weak-grid conditions and might not be appropriately designed to be used with a solar home system. The surveyed rice cookers ranged between USD 23 to USD 32.

The rooftop solar water heater is another common appliance in the Uganda market, and all of the surveyed solar water heaters were AC/DC. These products are used in the grid-connected area to help reduce electricity use in household and commercial buildings during peak hours.<sup>58</sup> The water heaters ranged between USD 560 to USD 3,382 and came with warranties of 12 or 60 months.

**Figure 13: Warranty periods for water pumps**



57. Futurepump, Our 10-Year Warranty Means It's Built to Last, <https://futurepump.com/our-10-year-warranty-built-to-last/>

58. <https://www.reeep.org/projects/promotion-solar-water-heating-uganda>

## CONNECTORS & PLUGS

To increase the availability of market intelligence related to the interoperability of systems, consultants also gathered information on the types of connectors and plugs that came with the appliances.<sup>59</sup> The standard plug type for the national grid in Uganda is Type G and 240V. As shown Table 5, Type G or bare plug types were commonly seen for the appliances surveyed in Uganda. Overall, we found that the plug type was consistent dependent on appliance type, with all TVs and refrigerators having a Type G plug, and all but two SWPs having bare plugs. While the plugs seem fairly standardised for appliances in Uganda, there is a wide range of voltages provided for pumps, especially for pumps with bare plugs. While pumps are typically installed by distributors or professional installers, the various voltage ranges add to the complexity of selecting different components for the pump systems and increase the risks of damaging pumps if the voltage does not match with its voltage requirements.

The five different types of connectors that are provided with the appliances are displayed in Table 6. When examining the different products by input power supply, the majority of AC and AC/DC products (77%) use alligator clip connectors, but other connectors such as MC4 (for pumps only) and breakers are also used. For DC products, there are a wide range of connector types sold with products. For DC TVs and refrigerators, these include alligator clip connectors, cigarette lighter connectors, and 5 mm (for TVs) or 5.5 mm (for refrigerators) barrel connectors. The types of connectors sold with DC pumps are highly variable, with 45% of SWPs using bare wires (without a plug or connector). Other types of connectors sold with SWPs are RS232 connectors and MC4.

While the data on plugs suggests that the majority of appliances use type G plug, the voltage is highly variable, especially for water pumps. The different combinations with voltages and plugs are likely making it difficult for consumers to find and match the connectors available with appliances to their existing energy systems and can cause a safety concern. This is especially risky for component-based SHSs users because these systems are typically unlocked and so there is no mechanism to prevent end-users plugging additional appliances into the system. While component-based systems offer the flexibility to connect to different types of appliances, end-users need to have some level of technical knowledge to select the right connectors and appliances within the correct voltage range for their system. Without standardisation, component-based systems could expose consumers to the risks of using incompatible products and damaging the appliances.

Table 6: Types of connectors available with appliances

TYPES OF CONNECTORS		
<b>Alligator Clip Connector</b>	<b>MC4 Connector</b>	<b>Cigarette Lighter</b>
		
<a href="#">Image credit</a>	<a href="#">Image credit</a>	<a href="#">Image credit</a>
<b>5mm or 5.5mm Barrel Connector</b>	<b>RS232 Connector</b>	
		
<a href="#">Image credit</a>	<a href="#">Image credit</a>	

Table 5: Count of different plugs with products by power supply type, product type and voltage

	Type G Plug  <a href="#">Image credit</a>			Bare Plug (Or no plug, just wires)		
	Types of appliances and number of each that include specified plug type	TVs (49), Refrigerators (12), and Pumps (2)			Pumps (85)	
Power supply of products and number of each that include specified plug type	AC/DC (25)	AC (35)	DC (3)	AC/DC (10)	AC (17)	DC (56)
Voltage by power supply type	100-240/12V	100 - 240V, 220 - 240V, or 240V	12 V	Variable <sup>60</sup>	Variable <sup>61</sup>	Variable <sup>62</sup>

59. Data was gathered for all products except fans, which is due to a data discrepancy.

60. Voltage/voltage range ratings include: 230 V, 240 V, 220-240 V, 300 V, and 70-1000 V.

61. Voltage/voltage range ratings include: 48 V, 50 V, 200 V, 30-300 V, and 90-400 V.

62. Voltage ratings for DC pumps were highly variable, with 24 different types of voltages/voltage ranges. The most common rating was 24 V, followed by 48 V.

## CONCLUSIONS AND TAKEAWAYS

**Uganda is a high potential off-grid appliance market with a large off- and weak-grid population. The country's market is still nascent as appliance ownership remains low, mainly due to affordability constraints.** In addition, the COVID-19 pandemic has severely impacted the Ugandan economy, and it will likely take some time to rebuild consumers' purchasing power, especially for more expensive products like refrigerators and SWPs.



**Despite these challenges, recent government supported initiatives have contributed to growth in the off-grid sector.** Additionally, Uganda benefits from high and fast-growing bank account ownership and mobile money penetration relative to other Sub-Saharan countries. This is a key enabler to PAYGo business models, which may be key to overcoming affordability barriers.



**The surveys conducted show that DC-compatible products are more commonly available on the Ugandan market compared to other markets where Efficiency for Access has performed surveys.** Out

of the products surveyed, DC refrigerators have the strongest presence. This is promising for consumers as DC appliances are directly compatible with solar power, therefore bypassing the usage of an inverter and reducing the overall cost of the energy system required. In addition, many of these DC-compatible products are from well-known solar brands, suggesting that Ugandan consumers are demanding and have access to higher quality products. However, field consultants also noted that many counterfeits and generic products are available in the market, suggesting that education is needed to help consumers and retailers distinguish the quality of products.



**The market scoping also highlighted that most products in Uganda are sold with long warranty periods.** Out of the products surveyed, 82% of the TVs, 93% of the refrigerators and 67% of SWPs came with at least a one-year warranty. While only 23% of fans surveyed came with a one-year warranty,

the demand for these products is lower in Uganda as they are only used seasonally. Consumer services and warranties are key to inspire consumer confidence and trust in solar products, and the longer warranty durations in Uganda not only provide better user experience, but also potentially signal that the average product quality in Uganda is improving.

**The analysis of plugs and connectors sold with products shows that there is an inconsistent range of connectors available, making it challenging for consumers to connect appliances to their existing solar systems.**

Particularly in Uganda, where approximately 60% of SHSs are component-based<sup>63</sup>, the emergence of an interoperable market is key to seeing growth in appliance sales. The importance of interoperability in the off-grid solar market has become a recently highlighted issue and is documented in publications such as [Compatibility and Interoperability Technology Roadmap](#) and Projects like [Solaris OffGrid's development of OpenPAYGo Link](#) or Angaza's development of Nexus Channel, both of which are supported by the Efficiency for Access Research and Development Fund.

If you have any insights about the appliance market in Uganda or questions about how these surveys were conducted, which shops were visited, or which models were surveyed, please contact [info@efficiencyforaccess.org](mailto:info@efficiencyforaccess.org).



Photo: Dan Odera

63. Rural Electrification Agency, 2018. <https://www.rea.or.ug/index.php/ecp-policy/>

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-  [efficiencyforaccess.org](http://efficiencyforaccess.org)
-  [info@efficiencyforaccess.org](mailto:info@efficiencyforaccess.org)
-  [@EforA\\_Coalition](https://twitter.com/EforA_Coalition)