

# Trends in the SHS Market



*Christopher Baker-Brian, CTIO,  
BBOXX*



# Overview

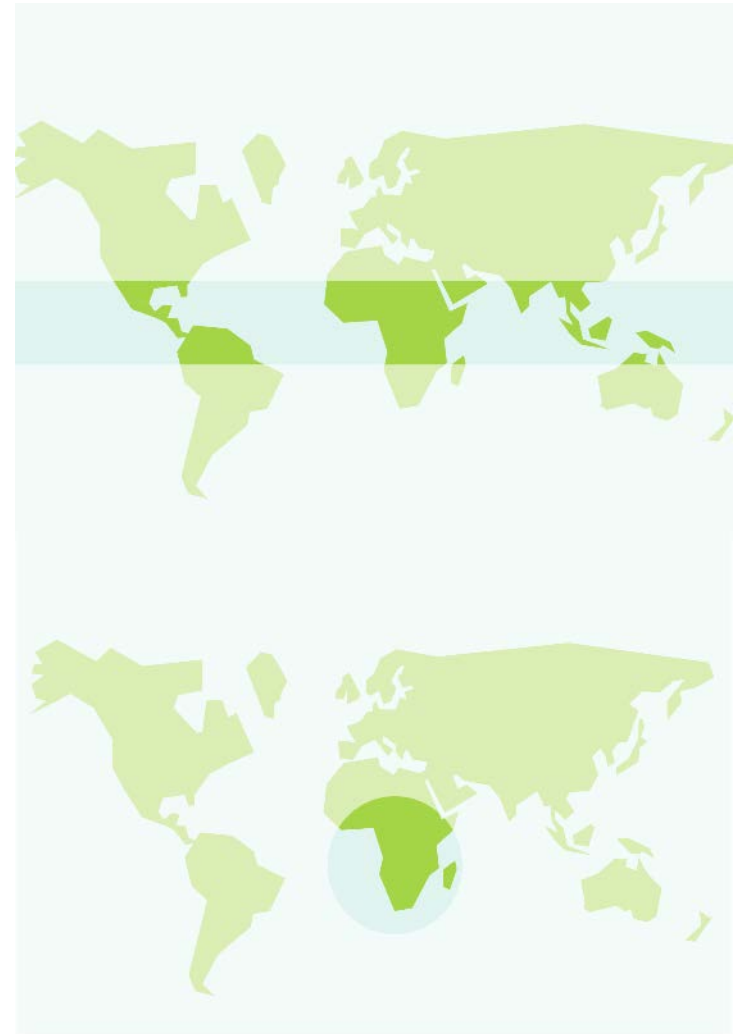
- The Off-Grid Challenge
- BBOXX's work in Solar Home Systems (SHS)
- Increased uptake of SHS globally
- Ongoing Challenges for the Sector

## THE INITIAL PROBLEM: A NEED FOR LIGHT

**1.1 billion people** live without access to electricity<sup>1</sup>. This is 16% of the global population<sup>1</sup>.

**53%** of these people are living in Sub Saharan Africa. This equates to **632 million people**.

An additional **1 billion people** are connected to the grid but suffer from unreliable grid connections<sup>2</sup>.





**BBOXX**

the solar revolution





**BBOXX**

the solar revolution

## Our Background

- Founded BBOXX in 2010 with two University Colleagues after two years running a charity
- Initially targeted Rwanda and then expanded across Africa
- Combining tech, finance and distribution innovation
- Developing “next generation” utility businesses globally
- Over 200,000 units deployed globally

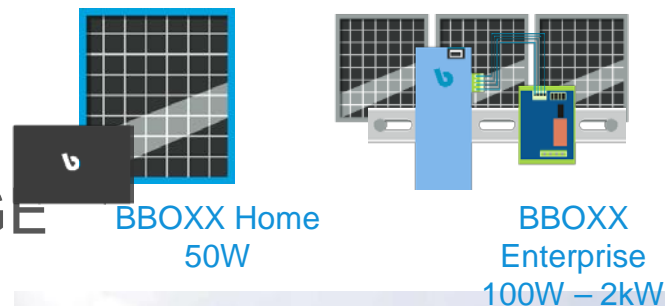
# THE VIRTUAL SOLAR GRID IS BBOXX'S ANSWER TO THE WORLD'S ELECTRICITY SHORTAGE

BBOXX aims to build the **largest virtual solar grid** in Africa, quickly followed by the rest of the world.

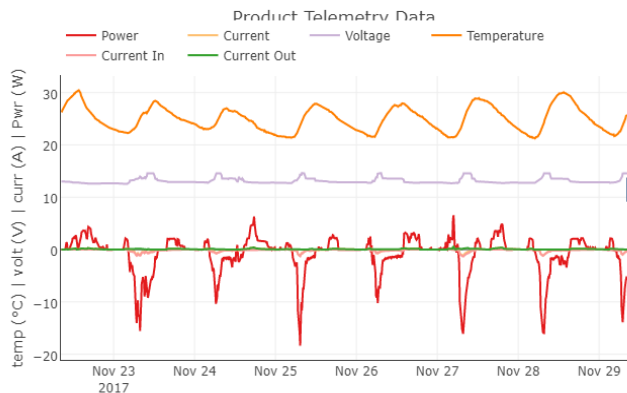
We employ a distributed grid so there are **no wires between each house.**

Each BBOXX unit is 'SMART' and has the capability to **send and receive data** over the mobile network.

BBOXX sells and installs the main energy storage unit in customers' homes, and then offers the additional accessories for purchase, including radios, televisions, fridges and extra lights.



# BBOXX's Pulse Platform allows data collection and automatic action generation to help manage a distributed fleet of systems



[Critical alert](#)

Low battery state-of-health

Alert ID: 119467

Created At: Nov 6, 2017 10:32:59 AM

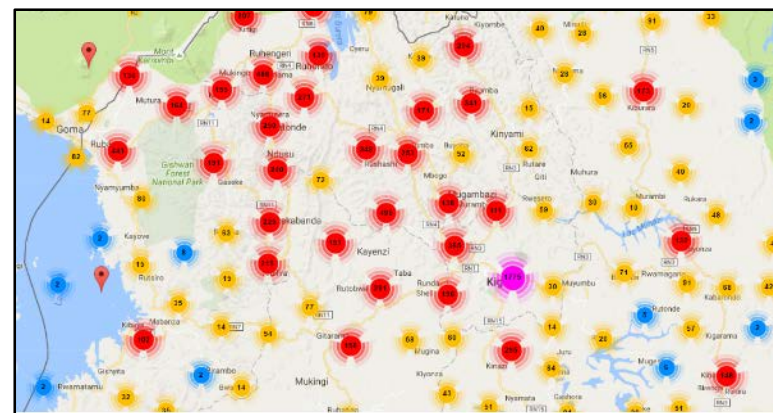
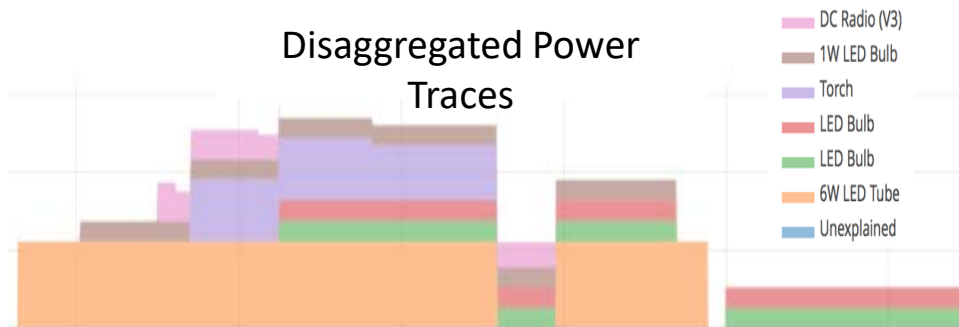
Start Time: Nov 2, 2017 10:08:29 AM

Description: The battery may need replacing. Ask the customer if they are having any problems with their system.

[LOG CUSTOMER CALL](#) [Dismiss](#)

Proactive service requests improve the customer experience (“an on-grid experience in an off-grid world”) and improve operational efficiency across a geographically distributed customer base

## Disaggregated Power Traces



## Current numbers



**21,000**

automated task management actions processed daily to sales, technician & call centre staff



**250,000+**

mobile payments processed monthly



**1000+**

Full and part time staff in 9 countries globally



**6 MWhrs**

of distributed energy monitored & controlled daily, both from SHSs and from larger installations



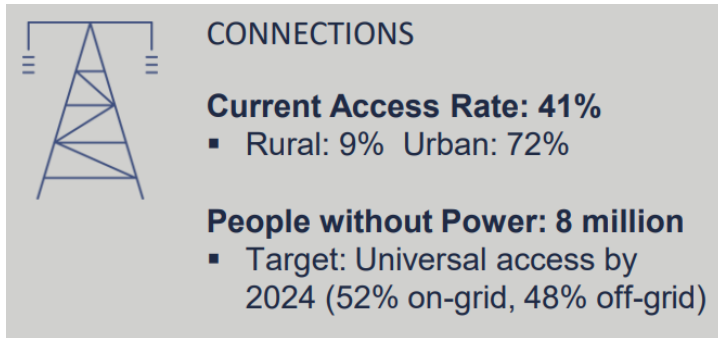
**\$65,000,000**

managed customer contract value



# LATEST SECTOR TRENDS AND CHALLENGES

# National governments are increasingly including off-grid and decentralised energy targets in their electrification plans



Source: Power Africa

- Traditional electrification methods struggle to deliver value fast enough with growing population
- Rwanda has a target of 48% of the population using off-grid by 2024.
- Togo has a target through its CIZO scheme to electrify 550,000 households using off-grid means by 2025.

## Togo: Government reveals its ambitious new electrification strategy

ENERGY

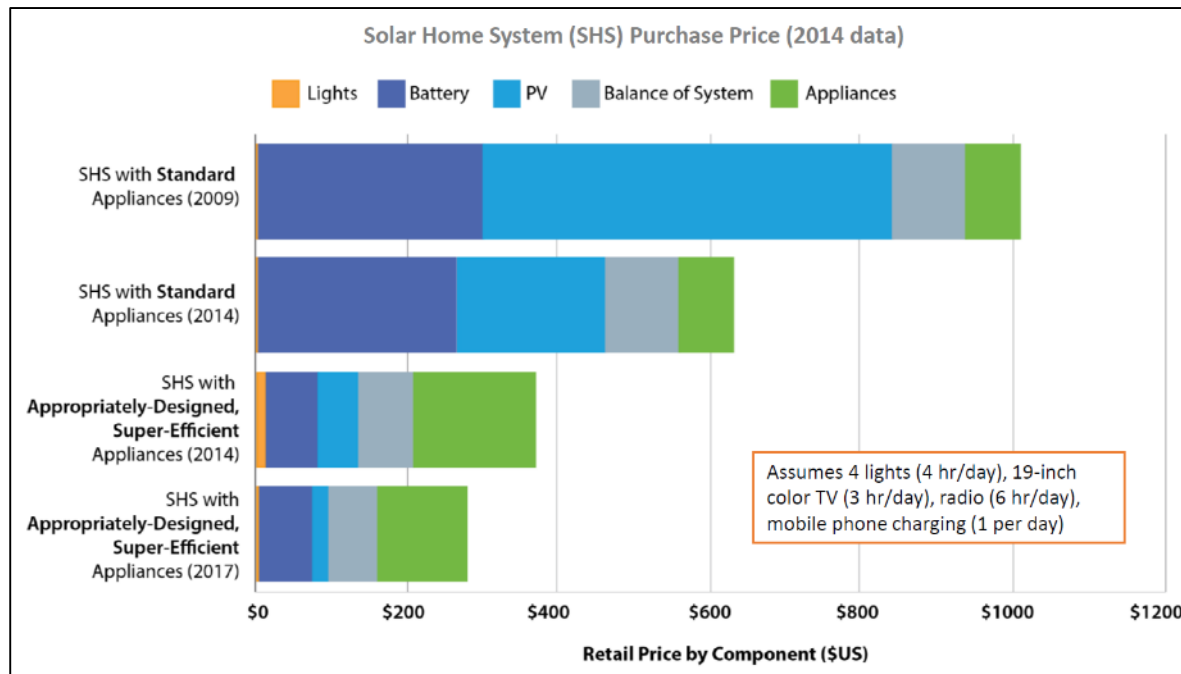
Wednesday, 27 June 2018 17:54



(Togo First) - Togo wants to achieve 50%, 75% and 100% electrification by 2020, 2025 and 2030 respectively.

Source: <https://www.togofirst.com/en/energy/2706-1119-togo-government-reveals-its-ambitious-new-electrification-strategy>

# Rapid reductions in SHS prices have opened up a much larger market over the last 10 years



Source: "A Home Energy System in just 25 Watts" ([1.usa.gov/1K6yfyn](http://1.usa.gov/1K6yfyn))

- Rapid reduction in PV and Battery components has made larger SHS's more viable for consumers.
- PAYG/Energy as a Service plans have also increased the size of the addressable market
- Next sector focus is on ensuring super-efficient appliances are developed for this sector.

# Lighting Global Quality Assurance program aims to reduce market spoilage and ensure consistent quality standards



## Lighting Global QA Framework

Slide reproduced with permission of Arne Jacobson, Lighting Global

### Test methods and standards

### Testing, Verification, & Surveillance

### Communicating Quality to Market

### Stakeholder Engagement



Off-Grid Solar



Development Agencies



Governments



Technical Specification  
62257-9-5, Ed. 3.0

ISO 17025 accredited labs for QTM testing

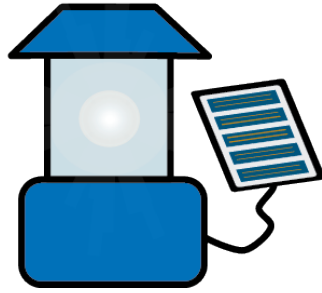
[www.lightingglobal.org/products](http://www.lightingglobal.org/products)

Consumer Awareness Campaigns



# LG Test Methods and Standards exist for Pico and SHS products and over 26m quality verified units have been sold to date

## Lighting Global Pico-Solar Quality Standards



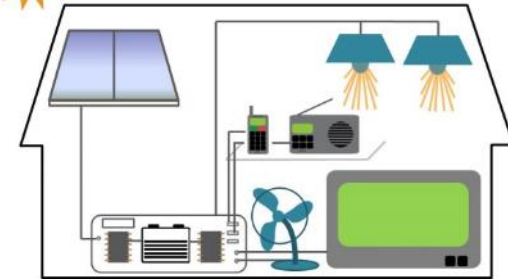
( $\leq 10-15 W_p$ )

Table 1. Lighting Global Quality Standards

Category*	Metric	Quality Standard
Tech to Advertise*	Manufacture, Model # and Product Name	Accurately specified
	Light Output and Safety Best Time	Accurately reported on packaging for the highest setting. For other settings, if reported, accurately specified. If there are both pre-approval (PAVG) and non-PAVG versions of a product, each must be truthfully advertised with regard to energy savings provided. If reported, claims must state verifiably specified (e.g. PV power in standard charge state).
	Charge Rating	If reported, accurately specified.
Health and Safety	Long Life	Support of mobile phone charging, or product performance verifiably specified on packaging.
	Mobile phone charging	The PAVG system should be capable of providing maximum service to customers on the 1000, per the version that is sold for.
	Performance or Pre-approval (PAVG) marking	Other claims
Lumen Maintenance	Lighting Maintenance at 2,000 hours	Average relative light output 2-3% of actual light output at 2,000 hours with only one sample allowed to fall below 95% Cb. All 6 samples must be 2-3% of actual light output at 2,000 hours. If an individual lighting appliance provides < 15 lumens, it is subject to the lumen maintenance standard.
	AC/DC Charge Safety	After initial AC/DC charge causes approval from a recognized consumer electronics safety certification organization.
Health and Safety	Heat/Flame	No battery may contain substance or assembly at levels greater than those specified in IEC 60085-1 Pg. 14 and IEC 60085-2 Pg. 14 by weight as determined from the cell. Battery Chemistry.
	Substance Ban	Prohibited by an appropriate charge controller that packages battery size and powers the input of the use. Low cost of 6 samples must meet the requirements outlined below. Batteries of certified appliances must also meet this standard.
Battery Performance	Heat/Flame	The PAVG system, appropriate battery protection must operate across regardless of whether the system is in an unlit or dimmed state. To avoid damage to a battery during long run periods of non-powered standard system, the solar module must be able to charge the battery even if the product is in a dimmed state.
	Substance Ban	The average capacity loss of 6 samples must not exceed 15% and only one sample may have a capacity loss greater than 20% following the battery discharge range was defined in IEC 62133-2 Annex B. If an individual lighting appliance provides < 15 lumens, it is subject to the battery capacity standard. All other appliances are not required to meet this standard.
Quality and Durability #2	Physical Impact Protection (the component must be resistant to mechanical wear)	Flame Retardant: IEC60335-1 Other: IEC60335-2 ASTM Method: IP13

Slide reproduced with permission of Arne Jacobson, Lighting Global

## Lighting Global SHS Kits Quality Standards



( $11 W_p - 350 W_p$ )

Table 1. Solar Home System Kit Quality Standards

Category*	Metric	Quality Standard
Tech to Advertise*	Manufacture	Accurately specified
	Product Name or Model No.	Accurately specified
	Performance Claims: Light Output, Run Time, Appliance Power Consumption	If reported, accurately specified. If there are both pre-approval (PAVG) and non-PAVG versions of a product, each must be truthfully advertised with regard to energy savings provided.
Health and Safety	Long Life, PV Power, Battery Capacity, Charge Rating, Other Claims	PV power must be accurately reported on the product packaging. All other claims, if reported, must be accurately specified.
	Pre-approval or Pre-approval (PAVG) marking	The PAVG system should be capable of providing maximum service to customers on their standard per the version that is sold for.
	Post voltage and current specifications, if provided, must be accurate. Labeled appliances must function when connected to SHS kits. Power output of kits must be verifiable to prove operation. If an individual kit is not included. Specific guidelines for SHS and 12 V kits are below. Parts of individual appliances are not required to meet this standard.	
Lumen Maintenance	Lighting Maintenance at 2,000 hours	Average relative light output of 4 samples 2-3% of actual light output at 2,000 hours with only one sample allowed to fall below 95% Cb. All 6 samples must be 2-3% of actual light output at 2,000 hours. If an individual lighting appliance provides < 15 lumens, it is subject to the lumen maintenance standard.
	Health and Safety	The system must pass an environmental test in certified performance test. Products must include a manual labeling mechanism to prevent irreversible damage to the system. The mechanism must be easily accessible or replaceable by the user, or access automatically. If applicable from use used for certain protection, user must be labeled on the device and listed in the user manual, and, if from an replaceable by the user, at least one year from time be provided with the product. Labeled appliances are not required to meet this standard.
Quality and Durability #2	AC/DC Charge Safety	After initial AC/DC charge causes approval from a recognized consumer electronics safety certification organization.
	Weight and Component Safety	Wires, cables and accessories must be appropriately sized for the expected current and voltage.
Health and Safety	Heat/Flame	No battery may contain substance or assembly at levels greater than those specified in IEC 60085-1 Pg. 14 and IEC 60085-2 Pg. 14 by weight as determined from the cell. Battery Chemistry.
	Substance Ban	Prohibited by an appropriate charge controller that packages battery size and powers the input of the use. Low cost of 6 samples must meet the requirements outlined below. Batteries of certified appliances must also meet this standard.

# GOGLA and IEC are liaising to ensure quality standards are mainstreamed and adopted by national governments

## LIGHTING GLOBAL Solar Home System Kit Quality Assurance Protocols

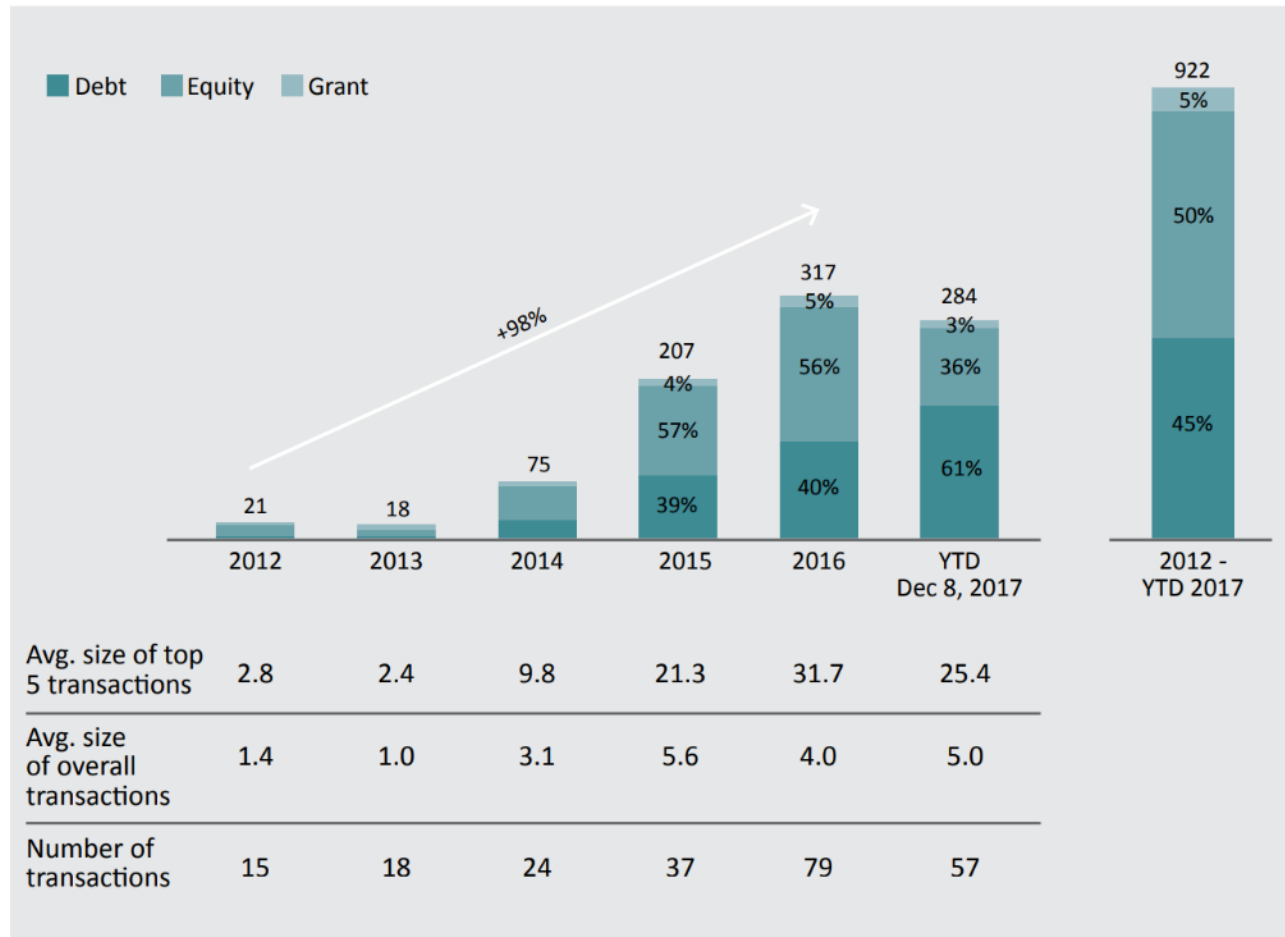
Version 2

December 2016



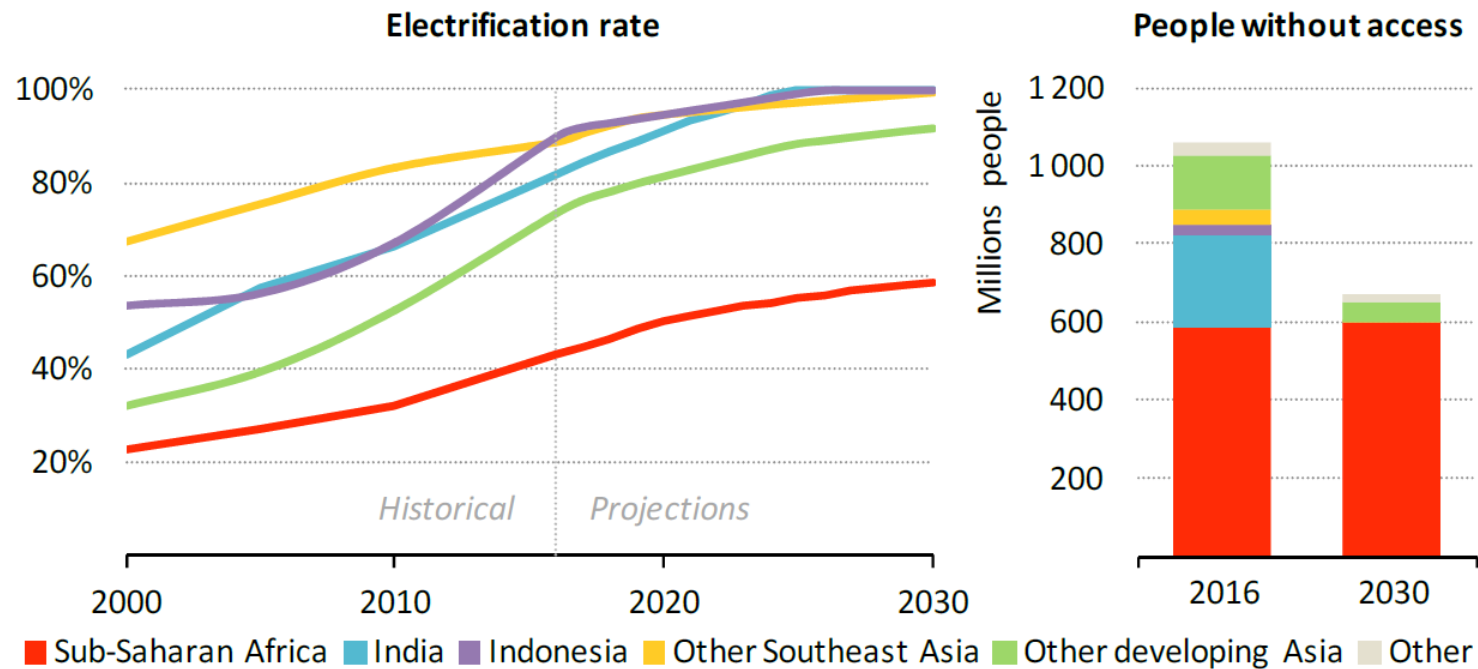
- SHS products must be:
  - tested to the latest edition of the Lighting Global Solar Home System Test Methods
  - by a test lab that is approved by Lighting Global to conduct the SHS tests
- SHS-QTM test results are required for Lighting Global's assessment to meet the SHS Quality Standards
- The Lighting Global SHS test methods can be obtained from the Lighting Global QA team upon request or from:  
<https://www.lightingglobal.org/quality-assurance-program/testing-process/>
- For more information please see  
<https://www.lightingglobal.org/resource/benefits-of-harmonizing-test-methods-and-quality-standards/>

The PAYG SHS sector has been very successful in the last 5 years at raising money to grow this market...



Source: GOGLA 2018 Market Report

...however with the IEA predictions for <60% of SSA (632m people) to be unelectrified by 2030 (based on current policy trends)...

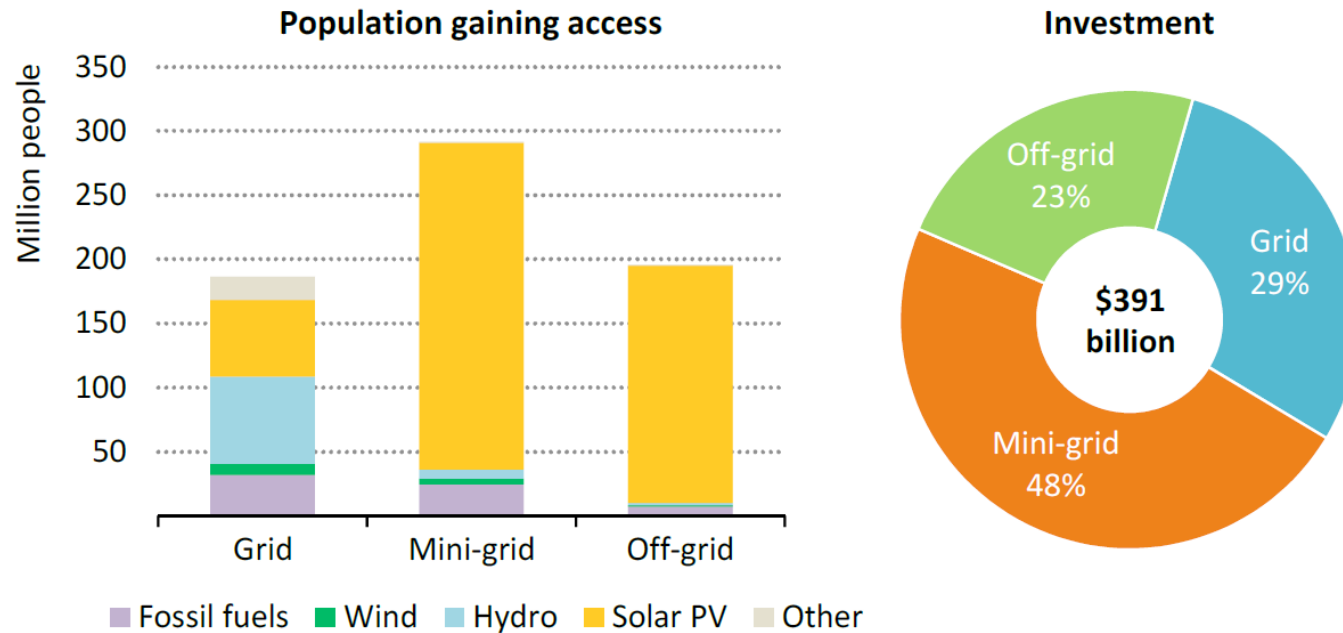


*By 2030, nine-out-of-ten people without access are in sub-Saharan Africa*

Source: IEA Energy Access Outlook



...an additional \$391bn is required to electrify everyone, with most investment coming through decentralised sources



*Decentralised systems make up nearly three-quarters of the additional connections to meet universal electricity access by 2030*

Source: IEA Energy Access Outlook

## Summary: Closer alignment of decentralised and traditional electricity distribution methods needed over the next decade

- “Next Generation” Utility companies in the developing world will need to **work with a range of grid, mini-grid and off-grid solutions** to provide the most suitable electrification solution in a given area.
- The most appropriate solution will be selected for an area **based on a range of data sets** including usage profiles, geography and customer income levels.
- Ensuring that systems do not become stranded by allowing **interconnections to happen between SHS and microgrids** should be actively investigated.
- Financial support to the sector should become **more consistent and cover a wide range of solutions** to ensure IEA universal electrifications targets are met by 2030.
- Quality standards need to be **harmonised with international organisations** to ensure adoption by national governments.