



# Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data

July-December 2018, Public Report



## Authors' Note

**Today, more people have access to solar power in their homes and businesses than ever before. This is something that GOGLA, Lighting Global, our affiliates and those in our sector who manufacture, distribute and install off-grid solar products can celebrate as we approach the middle of 2019.**

Our sector is growing and adapting, and as a result, the way we track and collect data is also broadening. Thanks to the partnership GOGLA has established with the Efficiency for Access Coalition, this latest report has expanded to include sales data for off-grid solar appliances such as televisions (TVs), fans, refrigeration units and solar water pumps, all of which are driving demand for the energy access solutions being provided by our affiliates. Moreover, due to the effort in expanding the number of reporting affiliates reaching a new record of 84 companies, this report provides sales data for solar lanterns, multi-light systems and solar home systems (SHS) in 46 countries, six more than those featured in previous reports.

Although the International Energy Agency reports that there are still nearly 1 billion people with no access to modern energy, the 2018 Off-Grid Solar Market Trends report shows that off-grid solar lighting devices are estimated to have reached between 17% - 20% of the global potential market. While impressive in itself, this leaves a large untapped market and great potential for further growth.

Through our impact analysis we know that access to off-grid solar energy is life changing. It means school children can study and do their homework after dark. It means that income is unlocked for people previously living in energy poverty. It means that millions of people no longer have to walk for hours to charge their mobile phones, freeing up time for social and economic activities. It means that women are empowered to become entrepreneurs. In terms of development, improving access to modern energy across the globe has positive impacts not only in economics, but for health, gender equality, education, and touches on every one of the 17 United Nations' Sustainable Development Goals.

Our affiliates are working to achieve these goals by mainstreaming the use of solar products. In the last few years, our sector has seen a significant shift towards higher levels of energy services,

through the provision of larger systems. SHS sales have increased 77% compared to 2017 and 133% compared to 2016. This means that not only has the number of SHS increased globally, but the rate of installation also shows no sign of slowing down. Most of these SHS are sold via Pay-as-you-go (PAYGo) business models, which have registered in this reporting period a 30% increase compared to the first half of 2018, reaching almost 1 million units. The speed of uptake and adoption of SHS gives a sense that there is a greater awareness of the benefits of off-grid solar. Our affiliates are working hard to ensure that this awareness is matched with the affordability of these systems.

The growing use of SHS means that more households across the developing world can not only turn on their lights and charge their mobile phone, but can now also run energy efficient off-grid appliances such as TVs and fans. We estimate that through sales of affiliates SHS nearly 5 million people now have access to this level of energy service (classified as Tier 2 by the Sustainable Energy for All Global Tracking Framework). Technological innovations and new business models have expanded people's access to solar powered water pumps and various types of refrigeration units for domestic and commercial use. This is a new and challenging frontier for our sector, as evidenced by the preliminary results included in this report. At times few results for a specific region, country or product category could be available due to insufficient current data to pass our three data point rule. Encouraged by the number of companies involved in this new data collection process for off-grid solar appliances, we hope that increasing participation and collecting data from more companies will see this analysis blossom in the coming months and years.

One of the strengths of this report is highlighting estimated impact generated by these products in countries, households and lives of those who adopt off-grid solar. We estimate that, as of December 2018, 108 million people are currently living in a household with improved energy access through

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off-grid solar lighting products, of which 59.5 million people have Tier 1, and 4.9 million have Tier 2 energy services. This is encouraging progress towards achieving Sustainable Development Goal 7: affordable, reliable, sustainable and modern energy access for all. Moreover, new impact estimates highlight the benefits unlocked, as the number of people using their system to support an enterprise has risen from 2.4 million to 2.7 million between June and December 2018. In the same period of time, the additional income generated as a result of off-grid system ownership increased from \$3.5 billion to \$4.2 billion. Moreover, the positive environmental impact has risen to 58.4 million metric tonnes of CO<sub>2</sub>e that we have avoided releasing into the atmosphere. That's equal to taking 15 coal-fired power plants off-line for a year. And these impacts are just what we know from our affiliates. Now more than ever we can see the potential impact that products and services in the off-grid solar sector are having in the lives of customers.

Yet, as a sector, we still face a unique set of challenges to accomplish our goal of providing affordable, reliable modern energy for all. Some of these key challenges and drivers, such as policy changes, developments in technology and seasonal trends are highlighted in the Market Dynamics section of this report to help us acknowledge and overcome these barriers. In compiling this report we have had certain limitations given by the type of products considered eligible and the companies participating, but we are proud to present the world's most comprehensive and reliable source of primary data on sales of off-grid solar lighting products and appliances. Our goal is to offer an honest reflection of the growth of our industry to investors, manufacturers, donors and policymakers and we welcome any recommendations to improve our work. We remain focused on playing an agile and evolving role in support of the off-grid solar sector. A key element of this is to continue and expand our engagement with governments to improve the policy environment for the market. We

are encouraged by the data in this report and feel confident that together we can go further, faster to bring modern energy to the 1 billion people still living without it around the globe.


Sincerely,



**Koen Peters**  
Executive Director, GOGLA



**Itotia Njagi**  
Lighting Global Program Manager, International Finance Corporation



**Martin Hyland and Stephen Pantano**  
Efficiency for Access Coalition Secretariat  
(Energy Saving Trust and CLASP, respectively)

## Content Team

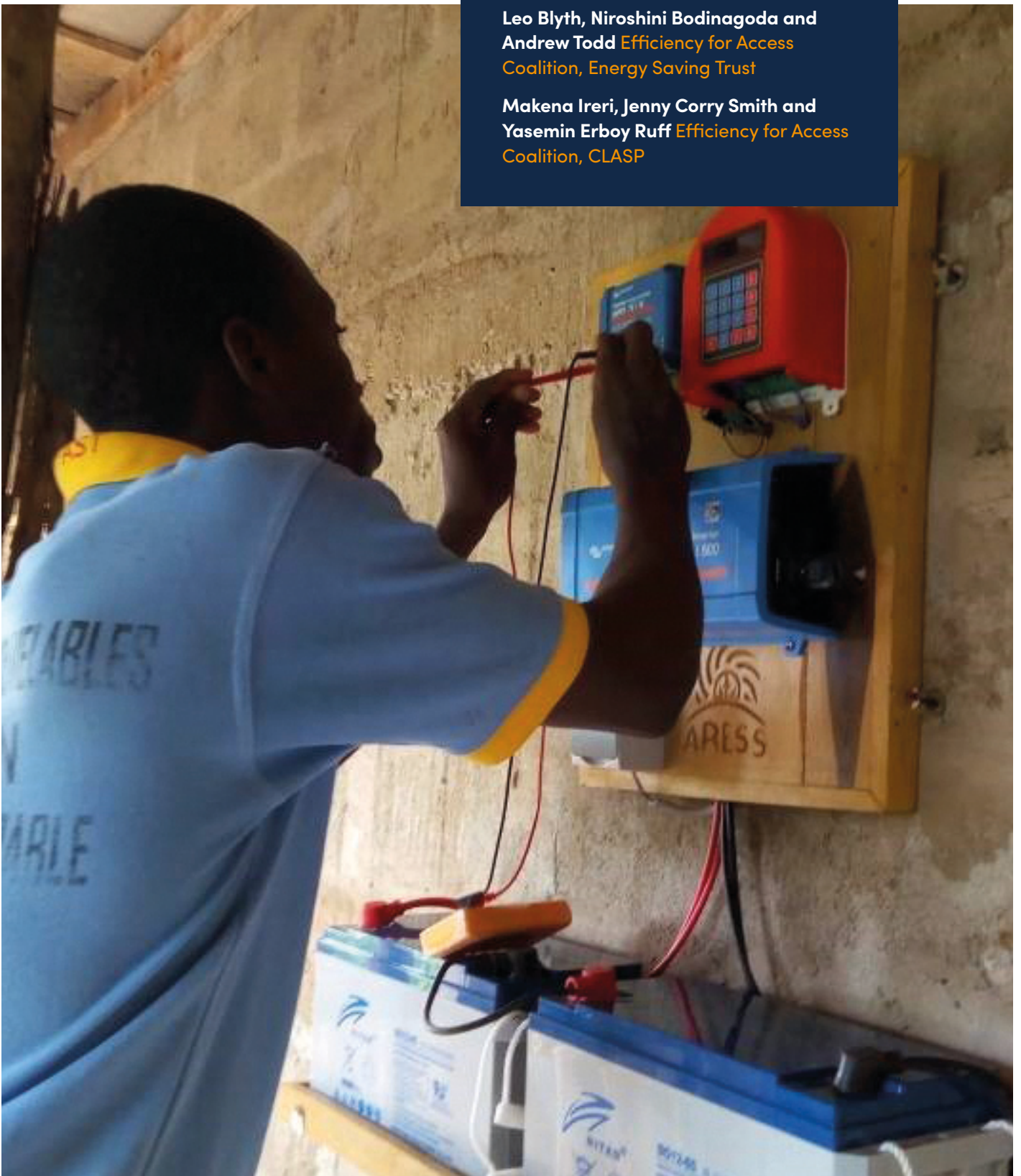
Silvia Francioso, Susie Wheeldon and  
Rebecca Cooke **GOGLA**

Leo Blyth, Salman Zahir and Itotia Njagi  
**Lighting Global, IFC**

Yael Aartsma, Ard Kot and Marlon Drent  
**Berenschot**

Leo Blyth, Niroshini Bodinagoda and  
Andrew Todd **Efficiency for Access  
Coalition, Energy Saving Trust**

Makena Ireri, Jenny Corry Smith and  
Yasemin Erboy Ruff **Efficiency for Access  
Coalition, CLASP**



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# About the Report

## Authors

### **GOGLA – The Voice of the Off-Grid Solar Energy Industry**

GOGLA is the global association for the off-grid solar energy industry. Established 2012, GOGLA represents over 150 members as the independent, not-for-profit voice of our industry association. Our purpose is to help our members build sustainable markets that deliver quality, affordable products and services to as many households, businesses and communities as possible across the developing world. The products and solutions that GOGLA members sell transform lives. They improve health and education, create jobs and income opportunities and help consumers save money. [To find out more about GOGLA, our work and our members head to www.gogla.org.](http://www.gogla.org)

### **Lighting Global**

Lighting Global is the World Bank Group's initiative to rapidly increase access to off-grid solar energy for the one billion people living without grid electricity around the world. Lighting Global works with manufacturers, distributors, governments, entrepreneurs, and other development partners to build and grow the modern off-grid solar energy market for household, productive, and commercial use. Our country programs provide market intelligence, quality assurance, consumer education, business support services, as well as support for access to finance. Lighting Global's activities now include support for the productive use of solar. These include solar irrigation and milling, community services for schools and health centers, super-efficient household appliances, and innovative Pay-as-you-go (PAYGo) business models that enable rural, low income populations to access modern, clean energy solutions.

Lighting Global is managed by the International Finance Corporation (IFC) and the World Bank, with support from the Energy Sector Management Assistant Program (ESMAP). [For more information, please visit www.lightingglobal.org.](http://www.lightingglobal.org)

### **Efficiency for Access Coalition**

Efficiency for Access first kicked off in 2015 as a year-long call to action and collaborative effort led by Global LEAP and Sustainable Energy for All. Now 13 donors have joined together under a scaled-up Efficiency for Access – a coalition promoting energy efficiency as a potent catalyst in global clean energy access efforts. Coalition programmes aim to scale up markets and reduce prices for super-efficient, off grid and weak-grid appropriate products, support technological innovation, and improve sector coordination. Current Efficiency for Access Coalition members have programmes and initiatives spanning three continents, 44 countries, and 19 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. [For more information, please visit www.encyforaccess.org.](http://www.encyforaccess.org)

The appliance section of this report has been funded by UK aid from the UK government. However, the views expressed do not necessarily reflect the UK government's official policies.

### **Berenschot**

Berenschot is a leading Dutch management consultancy firm with an extensive track record in supporting industry associations on market data collection. Berenschot has been elected by clients as one of the best management consultancy firm of the Netherlands. Berenschot maintains a high standard of confidentiality, as stated in the Berenschot Terms and Conditions.



# About the Report

## Participating Companies

**Table 1 - List of Participants reporting sales of Off-Grid Solar Lighting Products**

<b>Manufacturers</b>		
Anji DaSol	Lumos Global	Shanghai Easy Renewable Energy
Azuri Technologies	M-KOPA	Shenzen LEMI Technology Development
Barefoot Power Africa	Mibawa Suppliers	Shenzen Power Solutions
BBOXX	Mobisol	Shenzen Solar Run Energy
BioLite	Nadji-Bi	Signify Innovations
Bright Products AS	Namene Solar Light	Simpa Energy India
Cello Electronics	National Solar Power Authority (NASPA)	Sinoware Technology
Cygni Energy	Niwa	Smarter Grid International
d.light	Offgrid Sun	Solaris Offgrid
Devidayal Solar Solutions	OmniVoltaic Energy Solutions	SolarNow
EcoZoom Limited	Orb Energy	SolarWay
Fenix International	OvSolar	Suns Energy
Fosera	Phocos	Super Star Renewable Energy (SSG Solar)
Greenlight Planet	Poly Solar Technologies	The Solar Warehouse
Jua Energy	Qingdao LEFF International Trading	Village Boom
Lagazel	RAL Consumer Products	Village Power
Little Sun	Renewit Solar	Zola Electric (former Off-Grid Electric)
<b>Non-manufacturing distributors</b>		
ARESS Sarl	NewLight Africa (Heya!)	Sosai Renewables Energy
Azimuth	Oolu Solar	Sunna Moon
Baobab+	Pawame	Sunny Money (Solar Aid)
Bright Life by Finca	PEG Africa	Total
EcoEnergy	Solar Sister	UpOwa
Lumi	SolarHome	Vitalite
Mwezi Limited	SolarWorks!	Zonful Energy

**Table 2 - List of Participants reporting sales of Off-Grid Solar Appliances**

<b>Manufacturers</b>		
Azuri Technologies	M-KOPA	Simpa Energy India
Barefoot Power Africa	Nadji-Bi	Smarter Grid International
BBOXX	Niwa	Solageo
Cello Electronics	Offgrid Sun	Steca
d.light	OmniVoltaic Energy Solutions	SunCulture
Devidayal Solar Solutions	OvSolar	Sunna Moon
Fenix International	Palfridge LTD t/a The Fridge Factory	Tamoor Fan Company
Fosera	Phocos	The Sure Chill Company
Futurepump	RAL Consumer Products	Zola Electric (former Off-Grid Electric)
Jua Energy	Shenzen Power Solutions	
<b>Non-manufacturing distributors</b>		
Baobab+	SolarHome	Total
Oolu Solar	Solaris Offgrid	Village Power
Pawame	SolarWorks!	Vitalite
PEG Africa	Sosai Renewables Energy	Zonful Energy
Shenzen Solar Run Energy	Sunny Irrigation	
<b>Both Manufacturers and Non-manufacturing distributors (depending on the appliance)</b>		
ARESS Sarl	Shenzen LEMI Technology Development	Super Star Renewable Energy (SSG Solar)
Greenlight Planet	Simusolar	
Mobisol	SolarNow	

# Methodology Sales Data Collection

## Scope

### Eligible Products

Our sector is growing and adapting and as a result, the way that solar power is being used in households is diversifying. Off-grid solar products are increasingly used for more than lighting homes and powering mobile phones, offering access to a growing variety of off-grid solar appliances.

**Therefore, starting from this round, this report will present sales data for two separate product segments:**

- 1. Off-Grid Solar Lighting Products**, defined as systems that include a solar panel, a battery and at least one light point. This means that products, which are sold as components such as individual panels, batteries or mobile phone chargers, are not included.
- 2. Off-Grid Solar Appliances**, a range of energy-efficient electrical appliances that are appropriate for both off- or weak-grid areas<sup>1</sup> where low-capacity power systems are not suitable for use of conventional appliances. These devices are typically compatible with a DC-powered system and should be more energy efficient than traditional counterparts. For now, our focus will be on TVs, fans, refrigeration units and solar water pumps.

**The methodology detailed in the following paragraphs was applied to sales data for both off-grid solar lighting products and appliances.** For the time being these two segments are collected

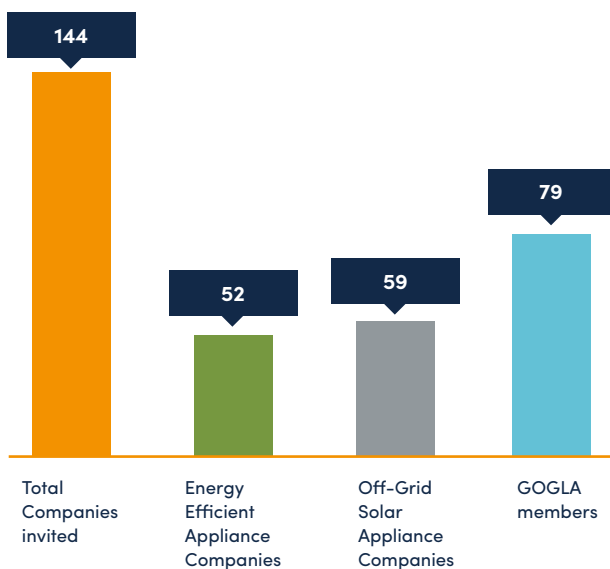
separately, without identifying whether off-grid solar appliances are sold bundled with SHS or standalone with their own panels. In future efforts will be made to link these two segments to identify key connections and trends in future rounds.

### Eligible Companies

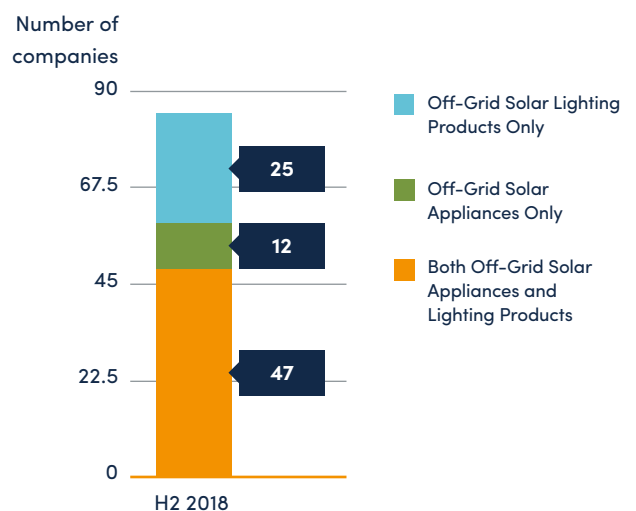
**This report solely includes data on products sold by affiliates.** Affiliates are companies that are connected to any of the partner organisations involved in the reporting process. This matrix of companies includes GOGLA members, companies selling Lighting Global quality-verified products, and appliance companies that participated in the Global LEAP Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme.

**Out of a pool of 144 eligible companies, 84 participated in this round of data collection covering the period July-December 2018.** A breakdown by affiliation of the number of companies invited to participate in the exercise is offered in the diagram below (Figure 1). Please note that a single company may relate to more than one affiliation. **Out of these 84 companies, 47 sell both off-grid solar lighting products and appliances.** This created the need for a single, streamlined data collection process to avoid all these companies reporting twice.

**Figure 1 - Diagram Companies Affiliation**



**Figure 2 - Breakdown Company per section**



<sup>1</sup> "Off-grid" refers to populations that live beyond the reach of the national grid; "weak-grid" refers to populations that have unreliable grid connectivity and suffer frequent and sometimes lengthy outages.



# Methodology Sales Data Collection

## Market Share Represented

**For Off-Grid Solar Appliances, the proportion of the total market that is represented by our affiliates has not yet been estimated.** This is partly due to the lack of data on the total size and number of players in this market. Continuous efforts will be made to estimate such coverage as well as in engaging a larger amount of companies in following rounds.

**For Off-Grid Solar Lighting Products, based on a previous analysis by Dalberg Advisors for the Off-Grid Solar Market Trends Report 2018, we estimate that the sales data reported here represents around 30% of all solar lanterns and multi-light systems sold globally and 60-80% of off-grid SHS with panel larger than 11 Wp.** This proportion varies dramatically from country to country; the market share estimates for non-affiliate devices globally and across nine key national markets are shown in the table below.

**Table 3 – Market share estimates of affiliate off-grid solar lighting products against the whole market<sup>2</sup>**

**Share represented by affiliates selling off grid solar lighting products against the whole market**

Country	Solar Lanterns and Multi-light Systems (<11 Wp)	Solar Home Systems (>11Wp)
Global	29% <sup>3</sup>	60-80%
Kenya	65%	61%
Tanzania	28%	43%
Ethiopia	43%	79%
Uganda	45%	60%
Nigeria	30%	70%
India	25%	29%
Myanmar	10%	25%
Ghana	30%	70%
Bangladesh	5%	75%

## Countries and Regions

The regional groupings in this report follow those outlined by the World Bank country and lending groups<sup>4</sup>. For sub-regional groupings in Sub-Saharan Africa, the United Nations categorisation of geographical sub-regions is used<sup>5</sup>.

Sales data is represented in this report for all countries in which at least three companies reported sales. For Off-Grid Solar Lighting Products, this amounted to 46 countries. For Off-Grid Solar Appliances, 20 country market sales are reported here, and no country breakdown is offered for less established technologies such as refrigeration units and solar water pumps, due to insufficient data.

## Data Collection

### Partner Organizations

In line with previous reports, data collection and affiliate reporting was overseen by Berenschot, a Dutch management consultancy firm. Specialised industry knowledge and insight was provided by a research team comprised of GOGLA, Lighting Global, the Energy Saving Trust, and CLASP. The online questionnaire and results platform were programmed by Outfox, a Dutch web development company.

### Data Collection Process

This data collection is run semi-annually, collecting sales for either January-June or July-December. Affiliates are requested to provide their product- and country-level sales through an online questionnaire in a three-weeks time window every January and July. Great effort is placed to ensure the maximum participation by all partners, with GOGLA offering one-on-one support to the companies throughout the reporting process. The data is then checked for accuracy, aggregated with strict confidentiality rules and analyzed to compile the Global Off-Grid Solar Market Report. Each participating company receives access to a dashboard and a personalized Individual Report providing them with their market share in each geography and product segment for which they have reported sales.

2 Adapted from: Lighting Global/Dalberg, Off-Grid Solar Market Trends Report 2018. Full report here: [https://www.gogla.org/sites/default/files/resource\\_docs/2018\\_mtr\\_full\\_report\\_low-res\\_2018.01.15\\_final.pdf](https://www.gogla.org/sites/default/files/resource_docs/2018_mtr_full_report_low-res_2018.01.15_final.pdf)

3 Based on weighted average of final non-affiliate estimates from 16 countries.

4 For more information, please visit: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>.

5 For more information, please visit: <http://unstats.un.org/unsd/methods/m49/m49regin.htm#africa>.

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## Accuracy

All data is self-reported by the companies. **Although it is cross-checked for consistency**, the companies are ultimately responsible for accurate reporting of product specifications, pricing information, sales volumes and locations of sales. **It is also important to note that companies may choose to report sales volumes but not pricing information used to estimate the market value of such products.**

## Data Checks

The research team checked the data for consistency and logic with respect to previous data records. Based on these checks, some small adjustments have been made concerning product performance specifications and the 'quality verified' status of products where necessary. Companies were contacted in any instances where changes to their data were required.

## Data Aggregation and Segmentation

### Definition of Manufacturers/Distributors to Avoid Double-counting Sales

**Companies are classified as either distributors of other companies' branded products or as manufacturers if they are selling their own-brand products.** Only data compiled from companies categorised as manufacturers is presented here to avoid any duplicate figures.

For Off-Grid Solar Lighting Products, companies are classified as either manufacturers or distributors (see Table 1). For Off-Grid Solar Appliances, it was necessary for any information provided to be classified by product. This means there may be companies classified as both manufacturers and distributors (see Table 2). This is a necessary allowance, because companies in this segment often adopt this business model of selling a mixture of both their own branded appliances while also distributing other companies' products.

### Confidentiality and the Three-data Point Rule

**Data on a specific region, country or product category is only included when it has satisfied the three-data point rule.** This means that at least three separate product manufacturers need to have reported sales for any single data point to be shown in the figures shown throughout the report.

When there are fewer than three responses for a region, country or product category, no results are shown to protect the proprietary interests of the companies who have supplied data in support of this industry report. This will be signaled by an empty bar next to the name of the region, country or product category. To differentiate, if there are no companies reporting data at all, the graph will show a "0".

## Definition of Cash / PAYGo

**Sales are split into two categories**, based on whether the products are sold to a customer either:

- As a **cash sale**, in a single transaction to the end-customer.
- On a **Pay-as-you-go (PAYGo)** basis, classified as when the customer pays for the product in installments over time or pays for use of the product as a service.

Following the confidentiality rule, the split in sales volumes will be shown for any single data point where at least three separate manufacturers have reported data for **both** cash and PAYGo products. Otherwise, when only one of the two payment categories passes this confidentiality rule, only the combined total is shown.

## Computations

For both off-grid solar appliances and lighting products, the **sales volumes (in units)** are given by the sum of all the products sold by companies classified as manufacturers (no product sales by distributors are included to avoid double-counting as noted above). These volumes are further segmented in region/countries, in cash/PAYGo and in product categories shown in the following section.

Only for the off-grid solar lighting products, the report presents the **newly installed capacity (in MW)**; this represents the total peak power output of solar panels deployed during this reporting round. This metric provides further insight and enables calculation of the average size of systems sold in a region or country.

Another indicator presented in this report is the **market value of the products (in USD)**, currently reported only for off-grid solar lighting products. In

# Methodology Sales Data Collection

future rounds of data collection, the research team will evaluate the best methodology to measure the market value of off-grid solar appliances.

Given the difference in the nature of cash and PAYGo segments, two different proxies are used to compute their market value; therefore, the total value of all the products sold in each round cannot be calculated by combining the two values reported.

- a. **The value of cash products is determined by** multiplying the sales volume by a wholesale per unit price reported by the product manufacturer and a multiplying factor to capture the costs incurred in getting the product to end-customers. This includes transport, duties, taxes, clearance costs, sales channel overhead, and markups. The **wholesale Free-on-board (FOB)** price is defined as the united states dollar (USD) per unit price for a 1,000-unit minimum order quantity, at the point of supply.
- b. Using the FOB price as a proxy for the value of PAYGo products would not be accurate because the time frame of payment is projected to the future in line with the business model, allowing end-customers to pay for their products over several months or years. **The value of PAYGo products sold is calculated here by** multiplying the sales volumes by the **Estimated Total Cost of Ownership (TCO)** in USD reported by the PAYGo company and applying a standard estimated loss rate to account for cases where end-customers do not pay back for the product in full (e.g. products lost or destroyed or customer default). The TCO represents the average amount received from a customer repaying the product in full and on time, including deposit payment and all regular daily, weekly, or monthly payments, without applying a financial discount rate to this value.

## Product Categorisation

### Off-Grid Solar Lighting Products

**This segment consists of systems that include a solar panel, a battery and at least one light source.** This means that products which are sold as components such as individual panels, batteries or mobile phone chargers, are not included.




Data has been grouped into product categories to present sales in a segmented manner that provides the most value and information to the market.

**The categories of all products with less than 11 Wp solar module capacity are determined by the services provided by the product in question.** An example of this would be the number of light points and the possibility of mobile charging. Each of these categories is represented by an indicative wattage range of PV module that is typical for most products providing these services. **Panel wattage (in watt-peak) was used to categorise off-grid solar lighting products with solar modules of 11 Wp and above.** The definitions of these categories are presented in Table 4.

The level of energy access these off-grid solar lighting products provide is shown using the multi-tier framework for measuring energy access. This framework was developed by the World Bank's Energy Sector Management Assistance Program (ESMAP)<sup>6</sup> under the Sustainable Energy for All initiative.

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**Table 4 - Product Categories - Off-Grid Solar Lighting Products**

Overall category	Solar module capacity, Watt Peak (Wp)	Categorization by services provided by product	Corresponding level of Multi-Tier Framework energy access enabled by use of product
 Portable Lanterns	0 – 1.499 Wp (indicative)	Single Light only	Enables <b>partial Tier 1 Electricity Access to an individual person</b>
	1.5 – 2.999 Wp (indicative)	Single Light & Mobile Charging	Enables <b>full Tier 1 Electricity Access to at least one person and contributes to a full household</b>
 Multi-light Systems	3 – 10.999 Wp (indicative)	Multiple Light & Mobile Charging	Enables <b>full Tier 1 Electricity Access to at least one person up to a full household</b>
 Solar Home Systems	<b>11 – 20.999 Wp</b>	SHS, Entry Level (3-4 lights, phone charging, powering radio, fan etc.)	Enables <b>full Tier 1 Electricity Access to a household</b>
	<b>21 – 49.999 Wp</b>	SHS, Basic capacity (as above plus power for TV, additional lights, appliances & extended capacity)	Enables <b>full Tier 2 Electricity Access to a household when coupled with high-efficiency appliances</b>
	<b>50 – 99.999 Wp</b>	SHS, Medium capacity (as above but with extended capacities)	Enables <b>full Tier 2 Electricity Access to a household even using conventional appliances</b>
	<b>100 Wp +</b>	SHS, Higher capacity (as above but with extended capacities)	

## Off-Grid Solar Appliances

**This segment of the report features a range of off-grid solar appliances (TVs, fans, refrigeration units and water pumps) sold targeting customers living in off- or weak-grid areas.**

Companies and other key experts in the sector assessed how best to segment and present the findings in a way to allow the greatest insight into each appliance type as well as their sub-categories. The Global LEAP Awards' categorisation for refrigerators and Solar Water Pumps was adopted, as it was designed to recognise high standards of technical performance, energy efficiency, and innovation specifically for off-grid appropriate appliances. Using this product categorisation means the data in this report are presented as clearly and consistently as possible across the sector. In future rounds, we may review the solar water pumps categorisation and the terminology of the refrigeration units' section, due to the continued growth and evolution in these appliance areas.

Two out of four appliance types were segmented not only by their size (e.g. the diameter in inches for the fans), but also by the typology of products (e.g. table fans vs. ceiling fans). **The categorisation below was adopted as a way of future-proofing** and we accept that for now, most of these single categories won't be shown, as the three data point rule hides all the data points where less than three responses have been collected.

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**Table 5 - Product Categories – Off-Grid Solar Appliances**

Appliance Type	Categorization (in orange) and definition (in blue bold)	
	<b>TVs</b> <b>Screen Size (diagonal, inches)</b>	
	Small	12–17”
	Medium	18–23”
	Large	24–29”
	Extra large	30+”
	<b>Fans</b> <b>Diameter (inches)</b>	
	<b>Table Fan</b>	<b>A smaller-diameter propeller-bladed fan having two or more blades and intended for use with free inlet and outlet of air. It may be a table fan or bracket-mounted fan for wall or ceiling mounting.</b>
	Small	<12”
	Large	12+”
	<b>Pedestal Fan</b>	<b>A propeller-bladed fan having two or more blades mounted on a pedestal of fixed or variable height and intended for use with free inlet and outlet of air.</b>
	<b>Ceiling Fan</b>	<b>A propeller-bladed fan having two or more blades and provided with a device for suspension from the ceiling of a room so that the blades rotate in a horizontal plane.</b>
	Small	<48”
	Large	48+”
		<b>Refrigeration Units</b> <b>Size (liters)</b>
		<b>Refrigerator</b>
Small		5–50 L
Medium		51–100 L
Large		101+ L
<b>Refrigerator-Freezer Combination Unit</b>		<b>At least one fresh food compartment and at least one freezer compartment</b>
Small		5–100 L
Medium		101–150 L
Large		151–200+ L
Extra Large		201+ L
<b>Multi-temperature Refrigerator</b>		<b>One or more compartments that can be operated either as a refrigerator or freezer by adjusting the thermostat control.</b>
Small	5–50 L	
Medium	51–100 L	
Large	101+ L	
	<b>Solar Water Pumps</b> <b>No breakdown was possible due to limited variety of data reported</b>	



# Off-Grid Solar Lighting Products



## Behind the numbers: sales data collection

The Global Off-Grid Solar Market data collection for solar lanterns, multi-light systems and SHS has undergone profound changes since it was started in 2010 by Lighting Global, who deserve to be recognised for initiating this crucial data gathering exercise. GOGLA became part of this process in 2014 and, since 2016, it has been the lead partner on the reporting process

The number of countries included in the data gathering and analysis has grown rapidly. Initially, only countries under the Lighting Global programme were reported, but since 2014, every country in the world is included. Similarly, the number of companies involved has dramatically increased from a handful of companies to a record-breaking number of 84 companies reporting in this round. The report has evolved from solely reporting sales units to including an estimate of the impact generated by the sales using the formulation of the Standardised Impact Metrics for the Off-Grid Solar Energy Sector.

Another important step in the evolution of this data collection was undertaken in 2018 with the revision of the data collection to separate PAYGo and cash sales. This proved necessary to reflect the growth and development of the sector since PAYGo has become a significant part of the off-grid solar lighting sector. By analysing the cash sales and PAYGo data individually we are able to estimate the market value of PAYGo off-grid solar lighting products deployed, which was not possible in previous reporting.

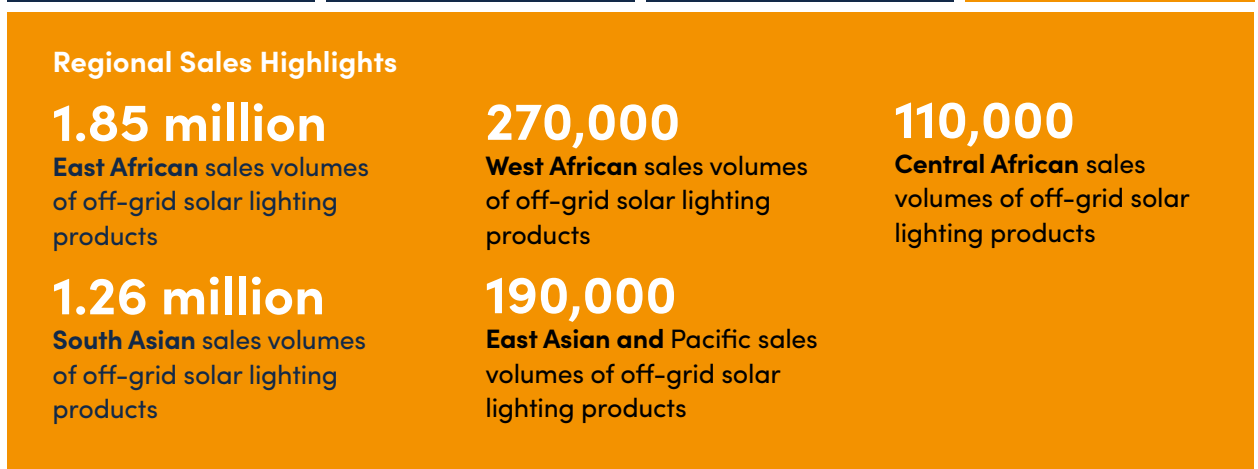
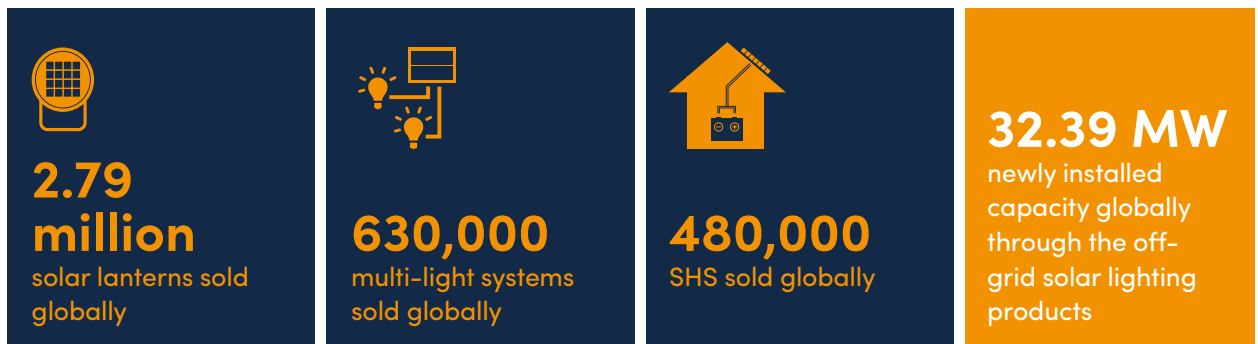
**This report is a work in progress and offers a snapshot of our diverse and eclectic industry working across many countries.** We welcome any suggestions or recommendations to improve it, so we can better support our industry to contribute to the achievement of Sustainable Development Goal 7: affordable, reliable, sustainable and modern energy access for all.



# Off-Grid Solar Lighting Highlights

## Key Figures

Sales refer to all off-grid solar lighting product sales reported by participating affiliates<sup>7</sup> in the period between July 1st–December 31st, 2018



<sup>7</sup> Affiliates include GOGLA members, companies selling Lighting Global quality-verified products, and appliance companies that participated in the Global LEAP Energy Efficient Appliance Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme.



# Off-Grid Solar Lighting Highlights

Impact estimates relate to all off-grid solar lighting product sales reported to date by participating affiliates (as of December 2018)

**245.9 million**

people who have ever lived in a household with improved energy access<sup>8</sup> as a direct result of off-grid solar lighting products sold since July 2010



**108 million**

people with improved energy access currently, considering only the off-grid solar lighting products still within their estimated lifetime

**59.5 million**

people currently accessing Tier 1 energy services, based on the Sustainable Energy for All Global Tracking Framework, considering only the off-grid solar lighting products still within their estimated lifetime

**4.9 million**

people currently accessing Tier 2 energy services based on the Sustainable Energy for All Global Tracking Framework, considering only the off-grid solar lighting products still within their estimated lifetime

**2.7 million**

people using their SHS to support an enterprise (e.g. charging phones for a fee or operating a bar, restaurant or shop/stall at night), considering only the off-grid solar lighting products still within their estimated lifetime



**\$4.2 billion**

additional income generated as a result of off-grid system ownership, over the expected lifetime of all off-grid solar lighting products sold since July 2010



**\$9.1 billion**

savings on energy expenditure, over the expected lifetimes of all solar lanterns or multi-light systems sold since July 2010

**58.4 million**

metric tons of CO<sub>2</sub>e emissions avoided, over the estimated lifetime of all off-grid solar lighting products sold since July 2010



## NOTE:

The estimated lifetime of products is based on the GOGLA Impact Metrics and is based on an average of 1 and a half times the manufacturer's warranty. For further details on the impact created, please refer to the "Impact Metrics" section found on page 74.

<sup>8</sup> In this context, 'improved' is used to reflect lighting and energy provided by appropriate (less expensive, less dangerous, better quality) technologies such as solar, instead of baseline technologies such as kerosene lanterns, battery lights, candles, or even poor-quality solar products etc.

# Global Market Insights

**Globally we can report the sale of 3.9 million off-grid solar lighting products in the second half of 2018 with an installed stand-alone solar capacity of 32.39 MW worldwide.** Of these, 2.95 million were cash products with a value of around \$99.4 million. A smaller share of the sale volumes (950,000 units accounting for 24% of the global total) were PAYGo products with a value of \$164.78 million. It is notable that there is a relatively higher value for PAYGo despite the considerably smaller sales volume as this business model is predominantly used for larger products.

Comparing year on year sales activity within our sector from all corners of the globe, overall 2018 has been similar to 2017 in terms of unit volumes and cash market values but with a great increase in sales of larger systems leading to a large increase in newly installed capacity and households accessing Tier 1 and Tier 2 levels of energy access.

No year on year comparison can yet be offered for PAYGo-specific volumes and market values due to reliable PAYGo sales value data having been made available first only in the first half of 2018, but we can draw some comparisons with the first half of 2018. **While cash sales have not seen growth compared to the first half of the year, PAYGo units have registered a 30% increase reaching almost 1 million units (in the first half of 2018, only 730,000 units were reported sold through PAYGo). The value of such products has seen a 50% boost as well, driven by larger size of systems.**

It is notable that the product categories show significantly different trends. These are detailed in the sections below, with differing narratives for PAYGo and cash sales.



## Portable Lanterns

There were 2.79 million solar lanterns sold globally in the second half of 2018 totaling 71% of overall sales volumes. The clear majority of these products were sold on a cash basis, with only 7% sold using the PAYGo model. Larger and brighter solar lanterns with mobile charging (indicative wattage 1.5–2.999 Wp) remain the bestseller in terms of volume amongst all product categories. They make up around 40% of all product categories global sales volumes for this reporting period, at

almost 1.7 million units. This is 54% of the global cash sales value, with a dollar value of \$40.7 million and 14% of the newly installed capacity with around 4.5 MW.

The second best-performing category in terms of sales volumes globally is the solar lantern without mobile charging (indicative wattage 0–1.4999 Wp). 1.10 million of these solar lanterns were sold worldwide, for the first time representing less than 30% of the total sales volumes. The value of these products accounts only for 12% of the total at \$12.11 million and only 1% of the total newly installed capacity (0.45 MW). This is due to the lower retail price and small panel size of these products.

## Comparing 2018 to 2017, signs of stagnation in sales volumes of solar lanterns could be observed.

This could be a sign that in mature markets companies are beginning to reach saturation points of entry-level systems, or that entry-level products are no longer lanterns but rather systems that provide higher energy services such as multi-light systems or SHS. The significant volumes associated with lanterns in those geographies are bound to decline in time; growth in this particular segment will come from opening up new markets. Another factor hindering the growth for our affiliates' sales in this segment is that in an extremely price-sensitive market like rural areas, end-customers are naturally attracted by low-priced products, generating increased competition to our affiliates' lanterns. Lastly, a sizable portion of reported volumes are often connected to bulk purchases for humanitarian crisis mitigation, for example, off-grid solar lights for temporary use in refugee camps. The size of these orders is often significant and highly variable from one semester to the next, often causing fluctuations in overall sales volumes.

# Global Market Insights



## Multi-light Systems

A total of 630,000 multi-light system units were sold globally, comprising of 16% of the global total sales. 70% of these sales were by PAYGo business models, seeing 4.33 MW of new capacity installed. These sales amounted to a cash value of \$8.7 million and \$28.3 million PAYGo value.

Sales volumes from 2018 appear less strong than 2017, though this is based on a known spike in the period July–December 2017 figures caused by a considerable single bulk purchase. **If that outlier is removed, this segment indicates consistent growth.**



## Solar Home Systems (SHS)

The data on SHS present a similar but distinctly different picture for these larger higher-cost products. Similar to multi-light systems, PAYGo sales dominate the segment. Sales in the SHS segment make up 12% of the global total at 480,000 units. Over 85% of these were sold on PAYGo, associated with payment over time being preferable due to their higher-cost.

The top seller in the four product categories spanning 11–100+ Wp are, for the first time, products within the 11–20 Wp category at over

170,000 units. This is one product category has seen of the sharpest increases in growth the sector in this reporting period. It is followed by the 21–49 Wp range, which surpasses for the first time the milestone of 100,000 units sold. A 40% decrease in sales can be seen for the former top seller, the 50–100 Wp category. This may be due to the fact that this is the most popular size for component-based SHS which are not included in this reporting. Encouragingly, the systems of 100+ Wp are still increasing, reaching over 60,000 units sold globally; this segment is the only one in the SHS category with only 43% of units sold on PAYGo. This may be due to the fact that these products are sold as back-up systems to relatively wealthier end-customers who may not require the same level of financing.

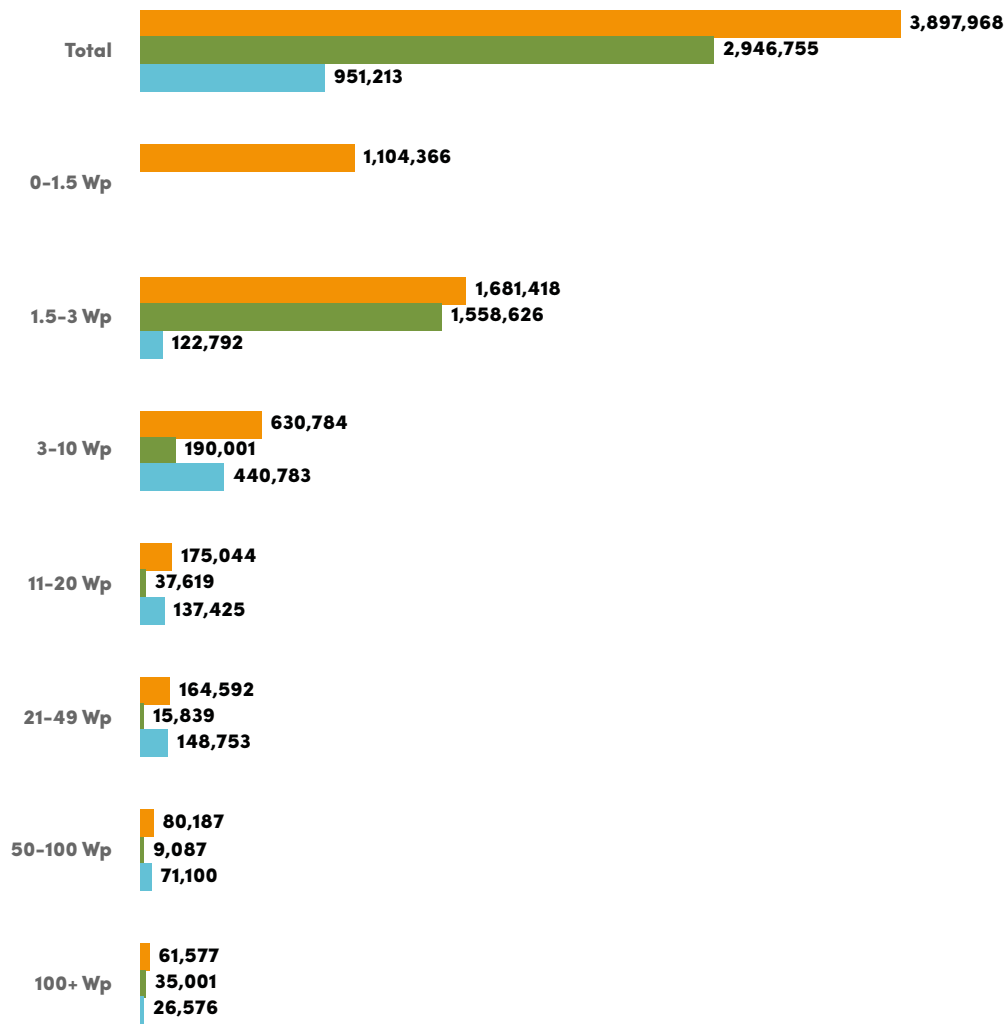
**Overall the SHS category sales for this period saw a 77% increase compared to the same time in 2017 and a 133% increase compared to 2016.**

These are significant percentage increases, while number of units is still relatively small compared to the lanterns segment; however this shows a consistent growth for this product segment. **This is largely due to the growing penetration of PAYGo, enabling end-customers financing.**



# Global Market Insights

Figure 3 - Volume of Products Sold Globally by Product Category



Not specified

● Affiliates - PAYGo    ● Affiliates - Cash    ● Affiliates - Total

**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The split Cash/PAYGo is shown only if both segments passed the three-data point control

# Global Market Insights

Figure 4 - Yearly Comparison: Global Sales Volumes

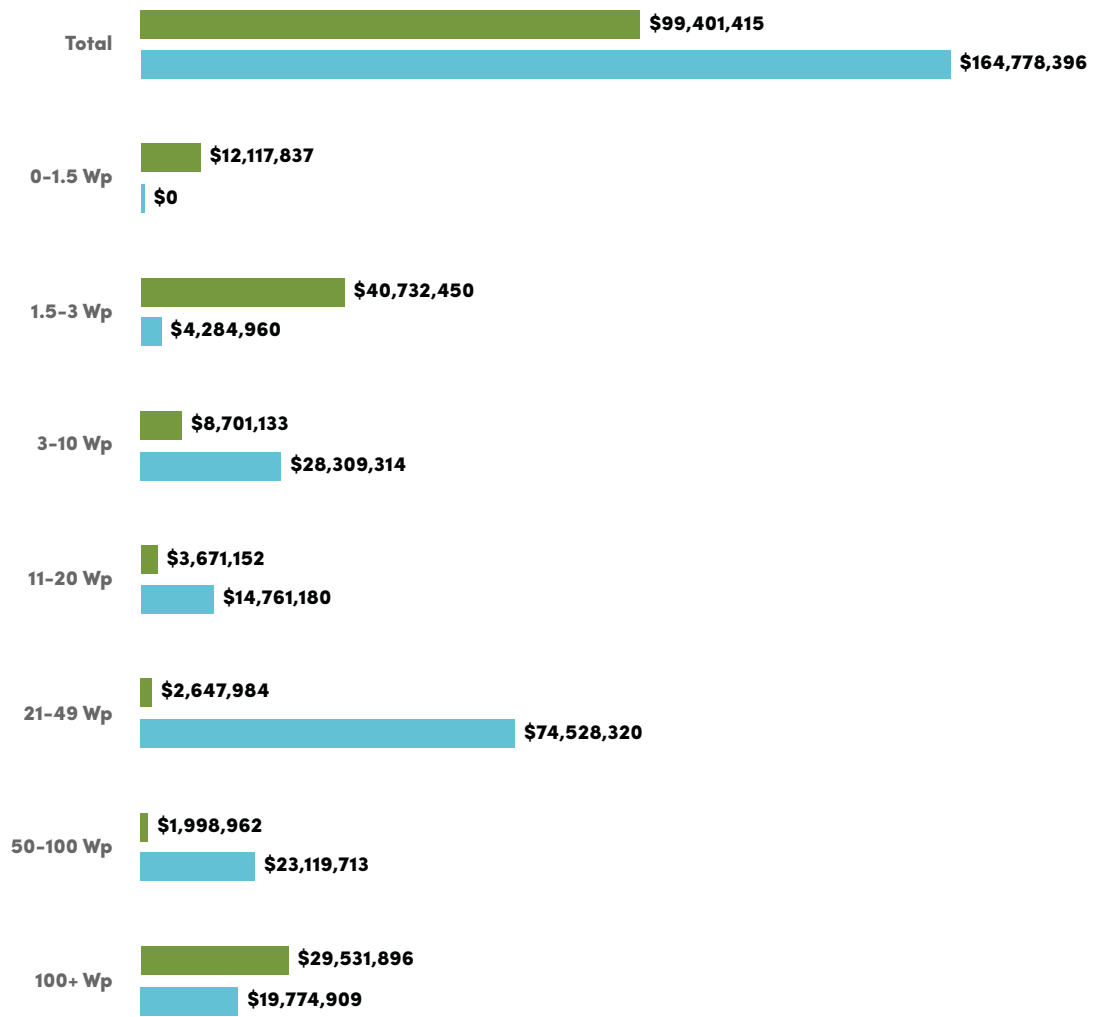


**NOTE:**

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2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.

# Global Market Insights

Figure 5 - Global Value of Products Sold by Product Category



Not specified

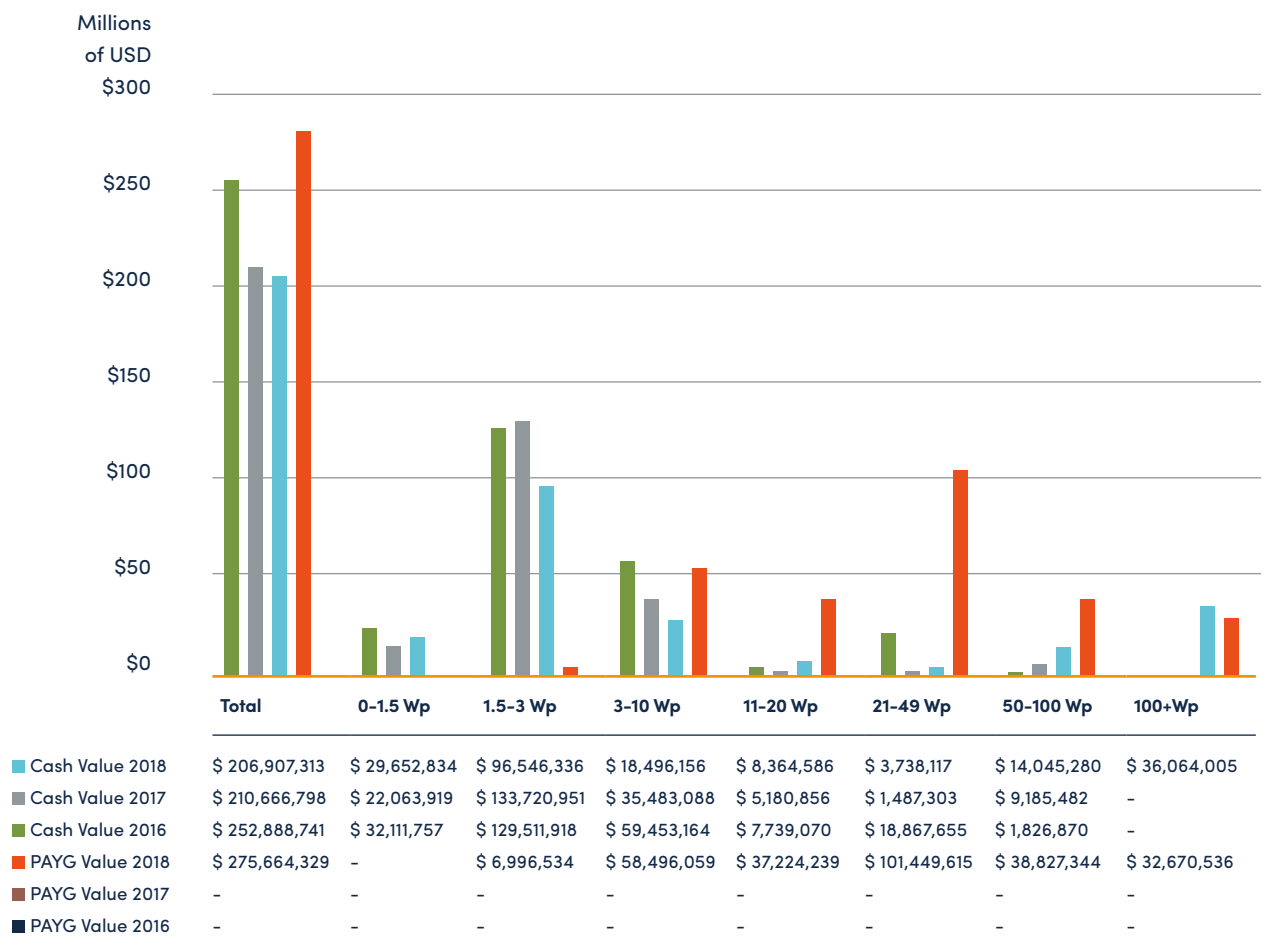
● Affiliates - PAYGo ● Affiliates - Cash

**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYGo products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYGo products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

# Global Market Insights

Figure 6 - Yearly Comparison: Global Cash and PAYGo Market Value

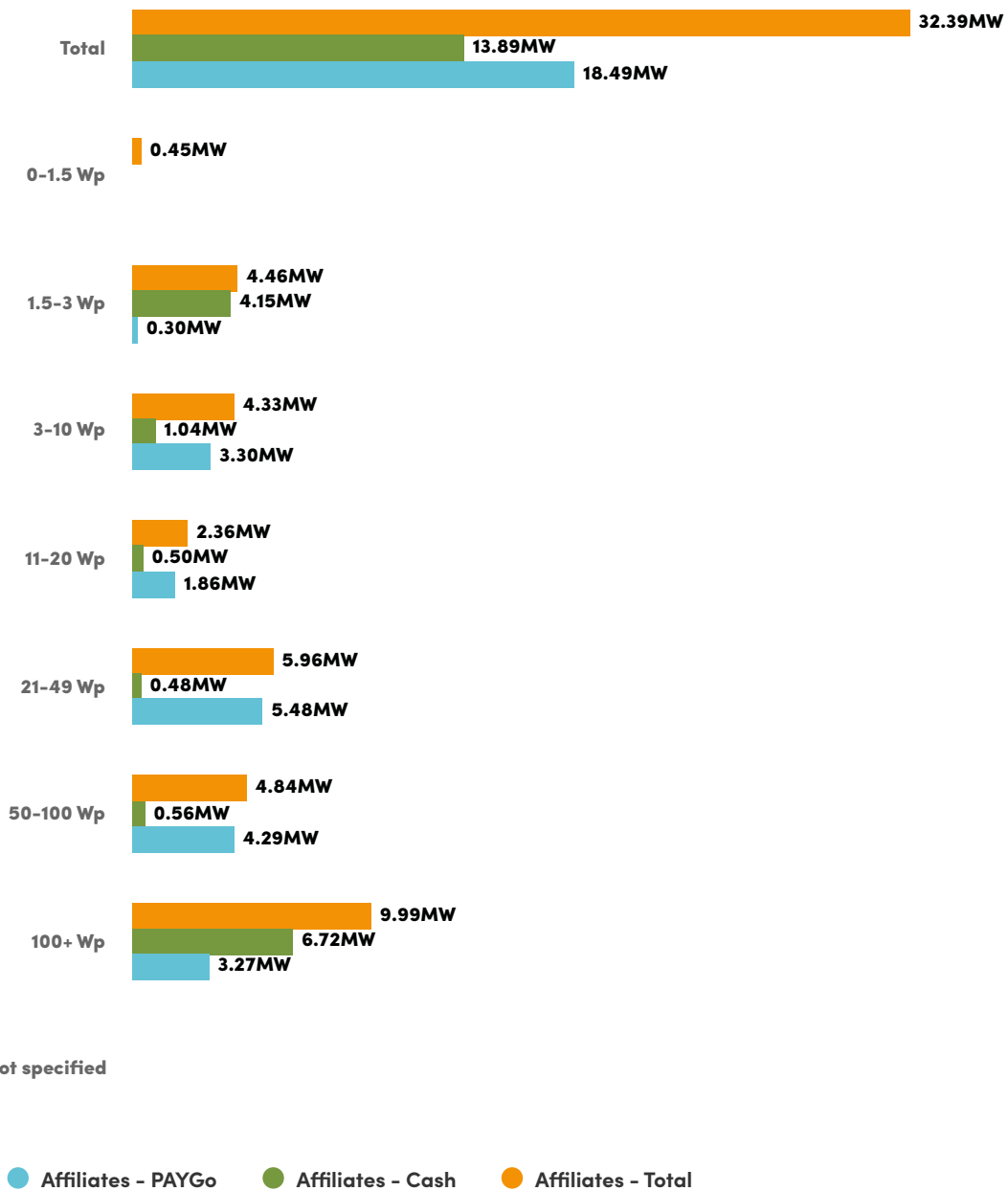


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYG products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYG products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

# Global Market Insights

Figure 7 – Global Newly Installed Capacity by Product Category



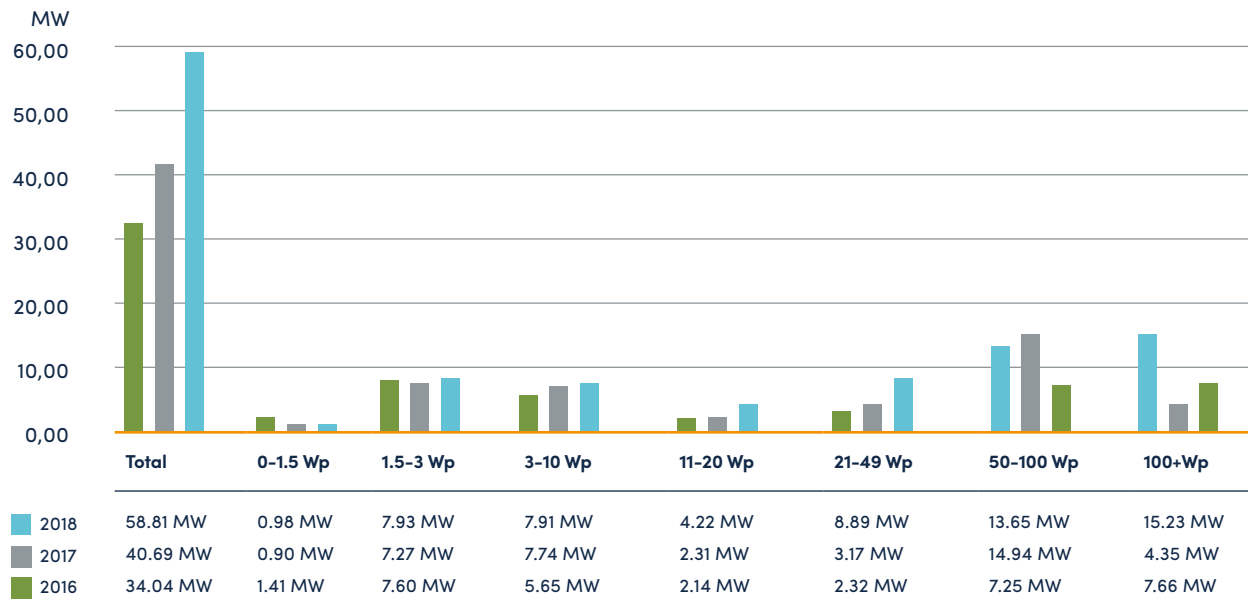
**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The installed capacity should be considered as newly installed capacity during the reporting period, computed using the reported panel size per product.
4. The split Cash/PAYGo is shown only if both segments passed the three-data point control



# Global Market Insights

**Figure 8 – Yearly Comparison: Newly Installed Capacity of Products sold in MW**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The installed capacity should be considered as newly installed capacity during the reporting period, computed using the reported panel size per product.



# Further Sales Data Trends and Analysis

## Global and Country Market Dynamics

It is important to emphasise that the reported sales volumes presented here are influenced by a range of market drivers. These include:

- Policy changes affecting duties, taxes, and the regulation of the off-grid sector
- Actions by development finance institutions, donor agencies and government market interventions
- Developments and price drops in technology
- Availability of finance, in particular working capital and local currency financing
- Macroeconomic factors, including general economic conditions, currency fluctuations, and other factors affecting the purchasing power of customers
- Seasonal trends as well as climate and other environmental factors
- Competitive dynamics. For several years now – and particularly in relation to portable lanterns – copycat and counterfeit products sold by non-affiliate companies have been creating intensified price competition. The design advantage held by affiliates' superior products in the early years of the thriving sector is now diminishing with increased competition and a surge in non-affiliate products, of variable quality, directly affecting the market narrative.

**During this reporting round (July–December 2018), we have identified the following country-specific dynamics that are likely to have affected the sales volumes.** Please note that in identifying these dynamics, we focused on eleven countries that have had the largest reported volumes or have seen the biggest fluctuations compared to the first half of 2018. The evolution of sales volumes for these eleven countries is reported in Figures 9 and 10.

**Bangladesh:** Notably in Bangladesh the donation streams that have funded bulk orders of off-grid solar lanterns to Rohingya camps is decreasing and influencing the overall market trends.

**Ethiopia:** The presence of Market Development for Renewable Energy and Energy Efficient Products Credit Line facility was an influencing factor for growth, however the line has already been somewhat depleted. Therefore, numerous challenges in accessing foreign exchange still exist, which continue to restrict the growth of the national sector.

**Kenya:** Companies have been expanding their outreach in different regions of the country, reporting positive outcomes for the time-being.

**India:** The Indian Government has officially declared having reaching 100% household electrification through grid extension under the Saubhagya Scheme; this is having a direct influence on the off-grid solar market. Moreover, the country faces uncertainty around new standards for importation of products, which have contributed to decreasing sales in the period.

**Myanmar:** In previous reporting periods, a large share of the sales were driven by government procurements that were not repeated in this second half of 2018. While this gives the impression of a large decrease, the PAYGo segment in the country has proven to be stable. The country's biggest challenge remains competition from low cost products as the customers are highly price-sensitive.

**Rwanda:** After a difficult 2017 and first half of 2018 due to challenges faced by several distributors in the country, the second half of 2018 shows a new increase of sales. The situation will be closely monitored across the following rounds.

**Somalia:** The overall increase in sales is due to both an increase in bulk purchases for refugee camps and several companies expanding their business in this country.

**Tanzania:** Companies have not made business shifts in any direction, due to an uncertain policy environment that has undermined commercial activities. This has led to a case of market stagnation.

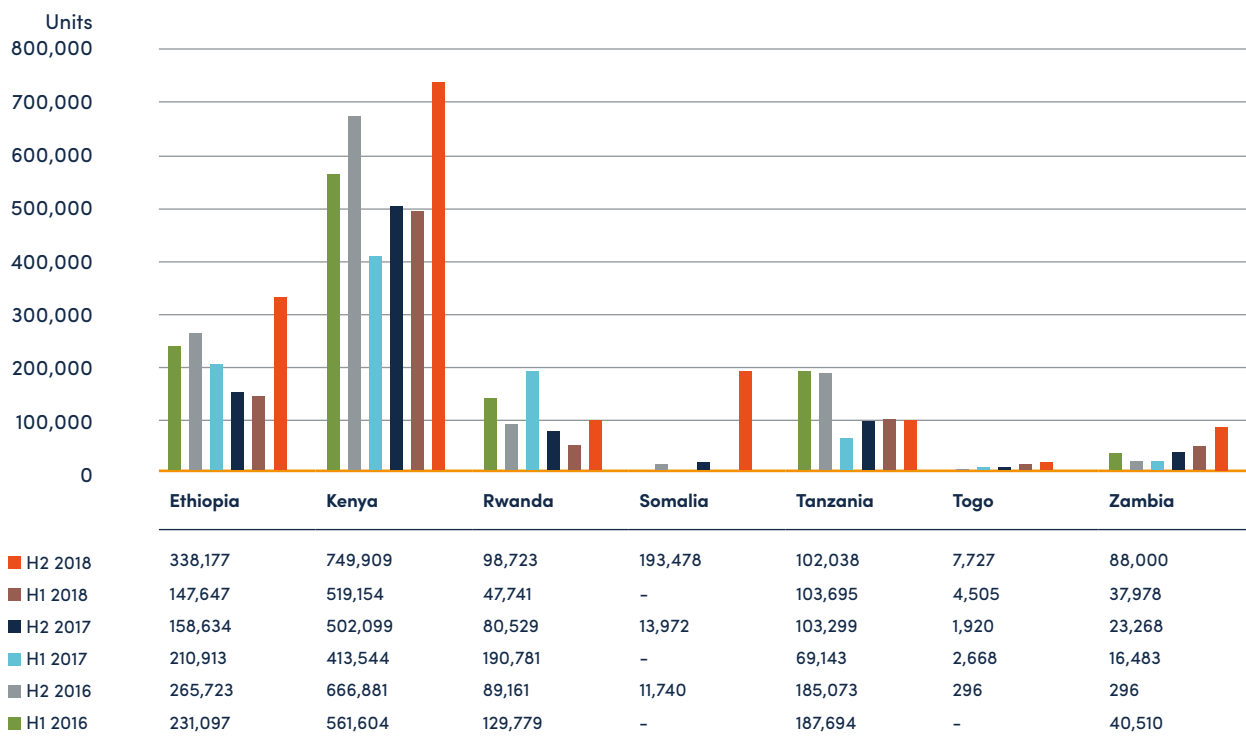
**Togo:** As part of the newly-released Togo Electrification strategy, the government began offering subsidies to all its citizens to cover the cost of off-grid solar power systems, which opened up finance and could have led to a direct increase in sales.

**Vanuatu:** The South Pacific nation records a big increase compared to previous reporting rounds, most likely due to large governmental tenders.

**Zambia:** New funding is available for electrification through off-grid solar lighting products, therefore boosting the sales of some of the players active in that market.

# Further Sales Data Trends and Analysis

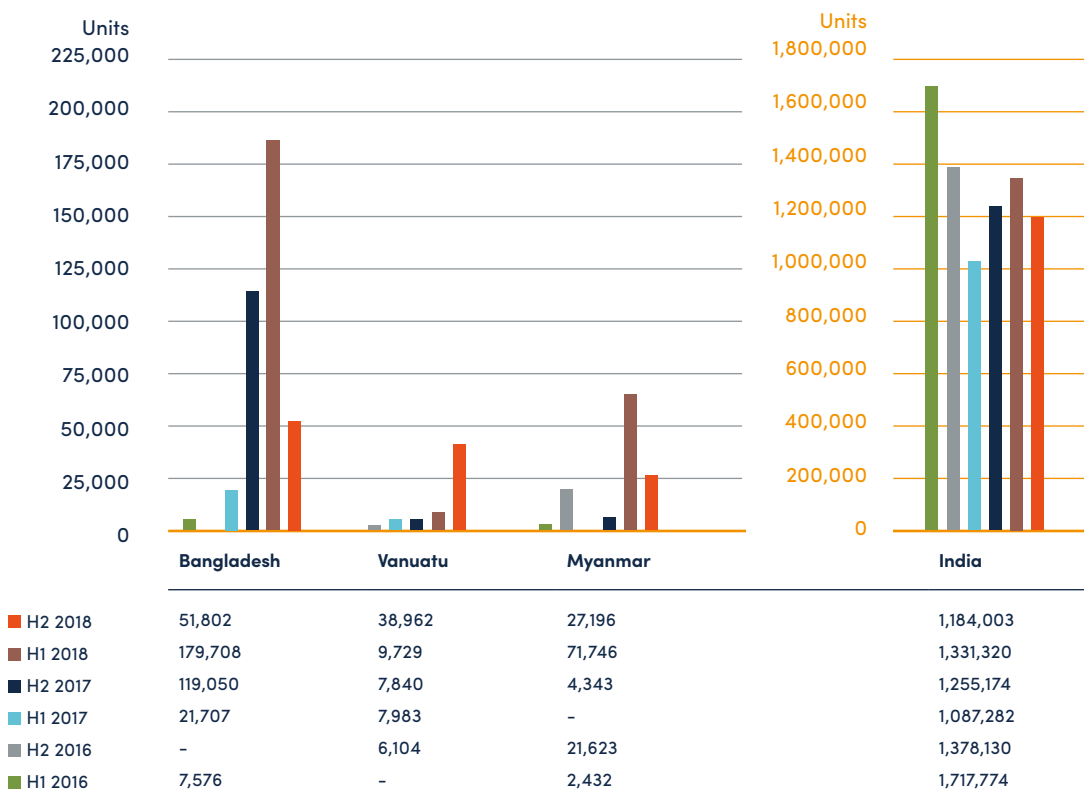
**Figure 9 – Volume of Products Sold in Selected African Countries (Historical)**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided

**Figure 10 – Volume of Products Sold in Selected Asian Countries (Historical)**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided

# Further Sales Data Trends and Analysis

## Regional Market Insights

### Why do some graphs have empty bars?

Data on a specific region, country or product category is only included when it has satisfied the three-data point rule. When there are fewer than three responses for a region, country or product category, no results are shown to protect the proprietary interests of the companies who have supplied data in support of this industry report. This will be signaled by an empty bar next to the name of the region, country or product category. While if there are no companies reporting data at all, the graph will show a "0".

This section offers an overview and narrative behind the regional sales volumes, market value and newly installed capacity reported for the period July–December 2018 (Figures 11–13). A yearly comparison of the sales volumes between 2016, 2017 and 2018 is presented in Figure 14. Nuanced insights by product category in each region are given in Figures 15–25, which also offer yearly comparisons. For more insights into the countries causing these regional trends, please refer to the “Market Insights by Country” section on page 48.

### Sub-Saharan Africa

Sub-Saharan Africa is again the largest region in terms of unit volumes sold, with our affiliates reporting 2.2 million individual sales. This is a 50% increase in this second half of 2018 compared to the first half of 2018 and an 18% increase compared to the second half of 2017. Overall, the region has had a good 2018 reaching almost 4 million units sold.

The 67% sales increase in East Africa compared to the first half of 2018 registered across almost all its countries’ markets explains this drive up. Results may also be affected by small seasonal fluctuations: an emerging pattern from past reporting periods demonstrates that the second half of the year generally shows stronger sales than the first in East Africa, specifically.

West Africa presents a huge area of opportunity with a sizable percentage of the population not connected to the grid. However, the region has not fared well in attracting the investment required to build a comparable market to what has been built in East Africa. As a result, the results in Figure 14 may point towards premature stagnation with 270,000 units sold, although we are reluctant in characterising this as such in view of the largely untapped market.

Sales in Central Africa are still fluctuating, registering a 70% increase compared to the first half of 2018, but still smaller compared to the exceptionally large sales registered in the period July–December 2017.

### South Asia

Affiliates across the South Asia region report 1.25 million sales for the period July–December, a result 17% lower than the first half of 2018.

However, we can observe in Figure 14 that overall 2018 shows an increase in momentum after a difficult 2017; this was due to the demonetisation of high value currency notes in India which for our affiliates represents the largest market of the region.

There is a significant difference between cash and PAYGo sales with almost no penetration of PAYGo in South Asia (Figure 11). This is due to the fact that the region is dominated by largely cash-based economies and, unlike the African market, mobile money – a key component to PAYGo – is not yet widely used. Aside from mobile money, industry experts have identified other barriers to upscaling PAYGo as being: dominance of agent-based networks, companies’ lack of capital required to scale, fluctuations in policy and legislation, and problems in on-the-ground operationalisation<sup>9</sup>.

9 GOGLA, “In Focus South Asia and the use of PAYGo”, Jan 2019. Full article here: <https://www.gogla.org/about-us/blogs/in-focus-south-asia-and-the-use-of-paygo?platform=hootsuite>

## Further Sales Data Trends and Analysis

### Other Markets

The East Asia and Pacific region has reconfirmed the sales volumes of last round, establishing itself as the third largest regional market (Figure 14). Overall, this region remains a market that is expanding, with new companies reporting sales in the region and sales volumes continuing to steadily increase over time. In the coming months and years we will be able to track whether this growth continues to determine if the current sales spikes are incidental.

The Middle East and North Africa registered a 81% decrease compared to last round, falling to being the fourth largest regional market. Much of these sales can be attributed to distribution hubs for humanitarian crisis mitigation, which leads to large fluctuations in sales due to one-off bulk purchases. Therefore, this percentage decrease isn't necessarily representative of commercial markets for off-grid products in these areas. The study conducted by Lighting Global on energy needs and willingness to pay of Syrian refugees in Lebanon<sup>10</sup> may be used to corroborate the results. The study demonstrates that solar lanterns are mostly known by Syrians living in camps (25%), most likely due to prior distributions by aid organisations.

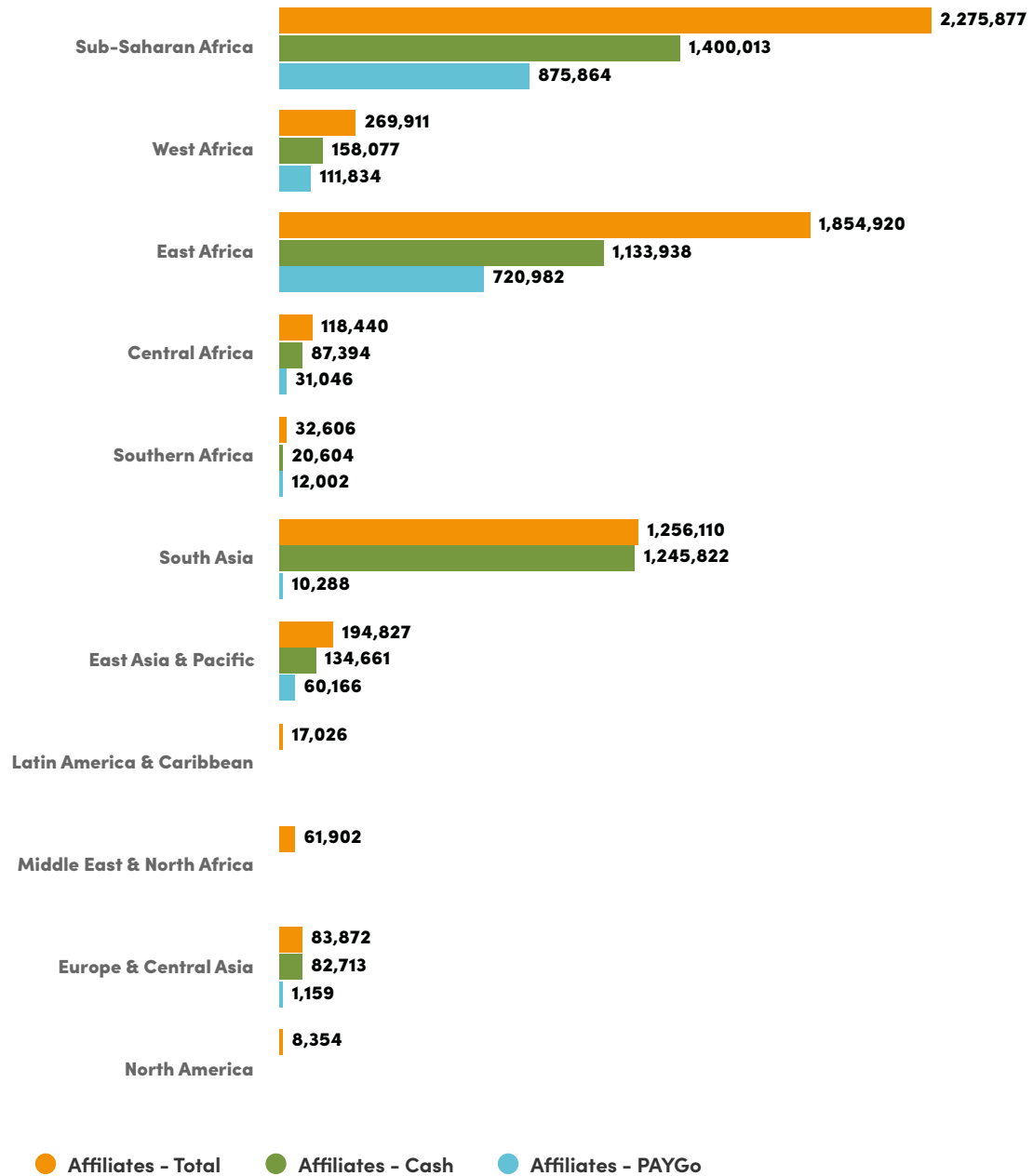


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10 Lighting Global, "Energy Access and the Syrian Refugee Crisis: A Situational Report on the Solar Energy Sector in Lebanon", March 2019. Full report here: <https://www.lightingglobal.org/wp-content/uploads/2019/02/Solar-Energy-in-the-Syrian-Refugee-Crisis-Updated-3.20.19.pdf>

# Further Sales Data Trends and Analysis

Figure 11 - Volume of Products Sold per region

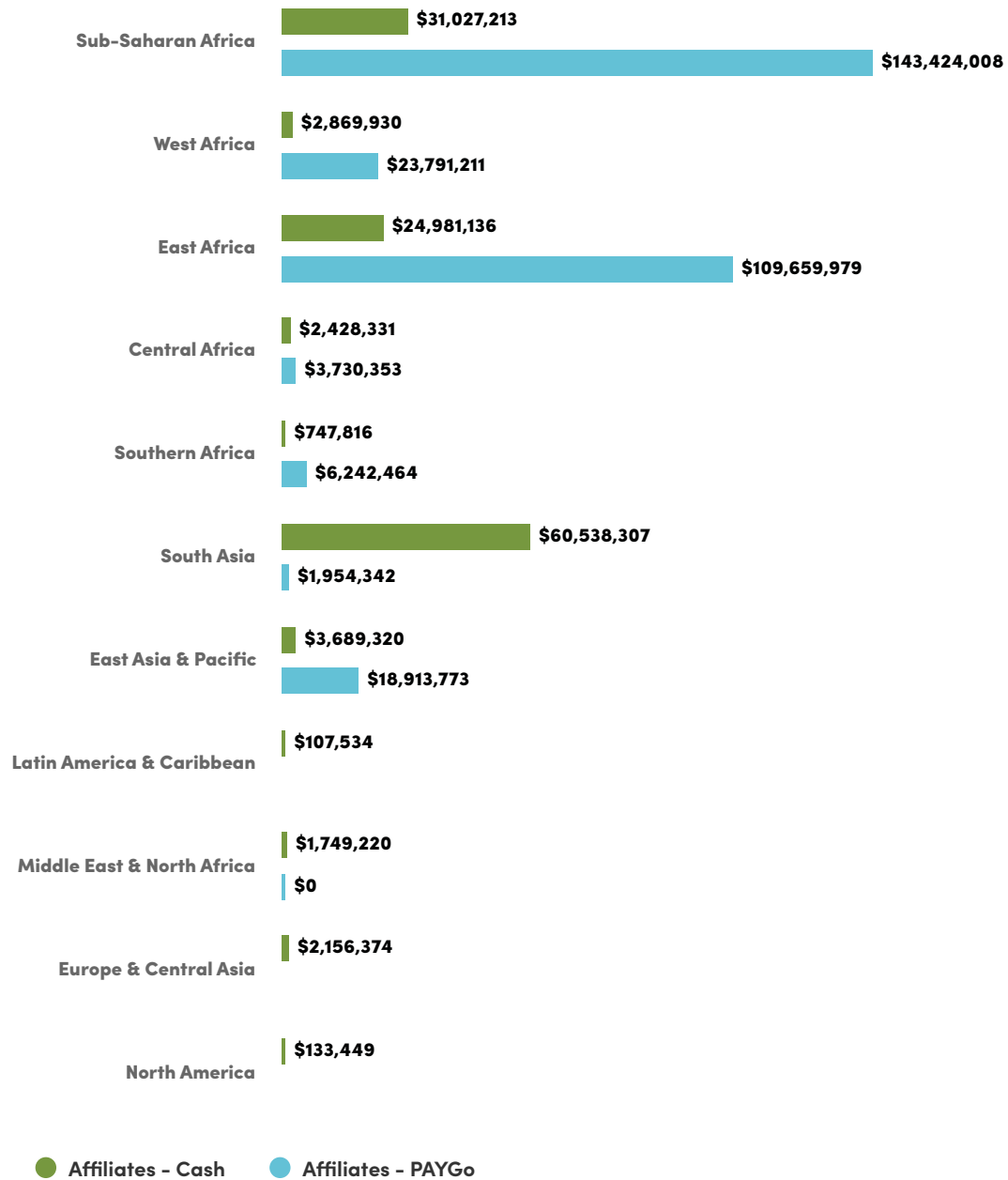


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYGo is shown only if both segments passed the three-data point control

# Further Sales Data Trends and Analysis

Figure 12 - Value of Products Sold per region

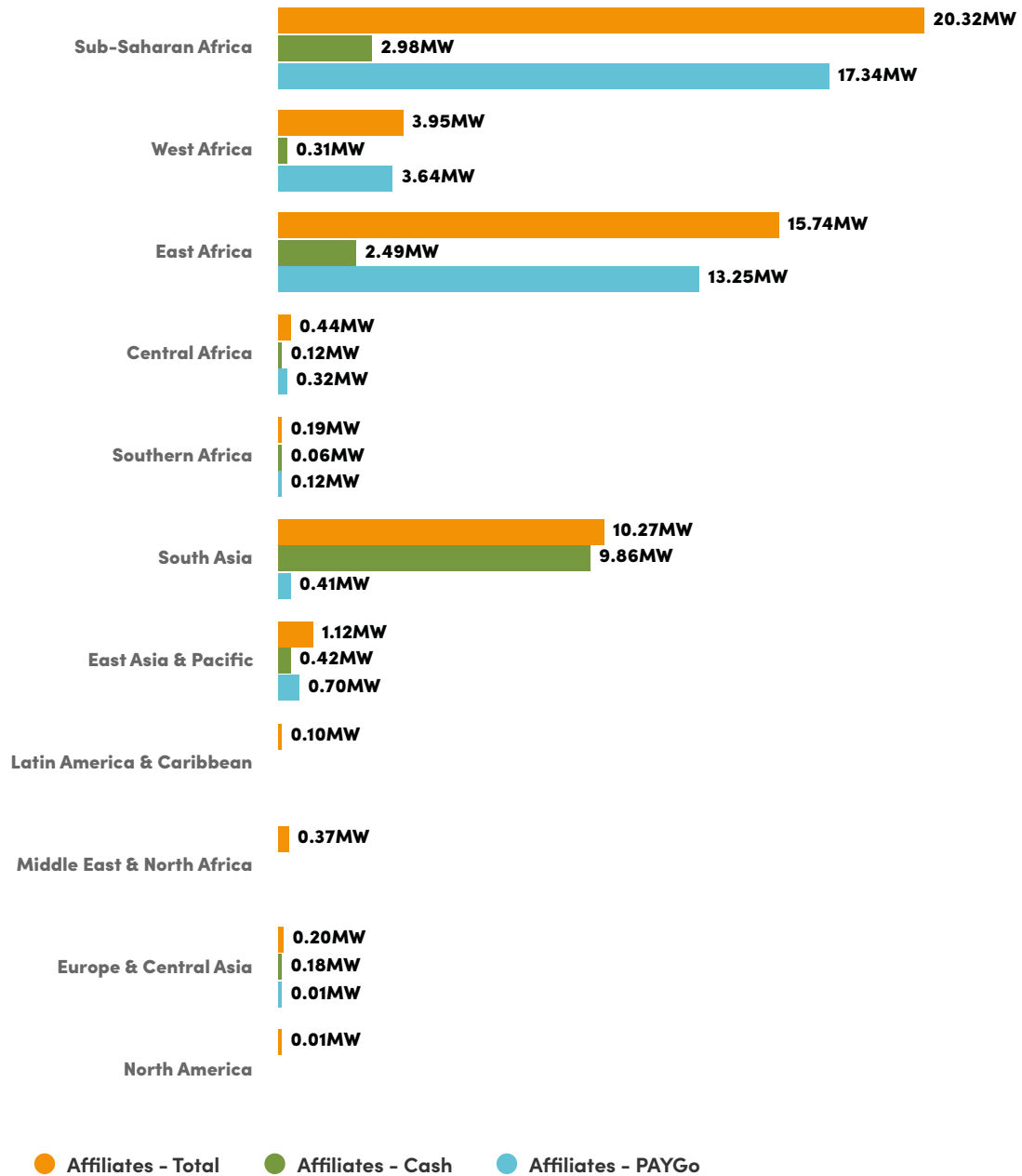


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# Further Sales Data Trends and Analysis

Figure 13 - Newly Installed Capacity per region



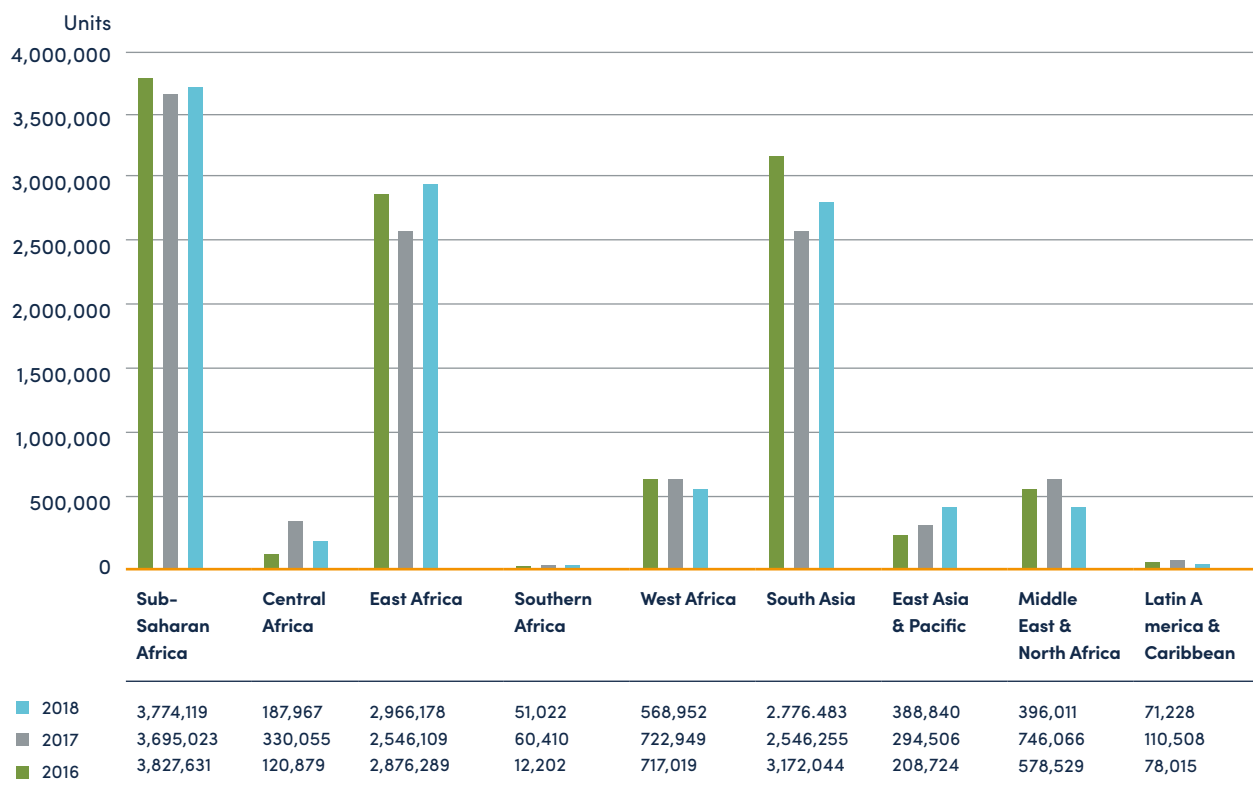
**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The installed capacity should be considered as newly installed capacity during the reporting period, computed using the reported panel size per product.
3. The split Cash/PAYGo is shown only if both segments passed the three-data point control



# Further Sales Data Trends and Analysis

**Figure 14 – Yearly Comparison: Volume of Products Sold Regionally**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.



## Portable lanterns

**Lanterns are still the largest category sold worldwide. Sub-Saharan Africa accounted for 51% of the global sales** with 1.4 million units of the total 2.8 million units sold in the second half of 2018. **South Asia covers another 41% of the global sales** with 1.14 million lanterns sold in the same period. While in the first region the sales are still increasing especially for lanterns with mobile charging, South Asia has noted a decrease compared to the first half of 2018.

**East Africa and East Asia and Pacific are the only regions that saw an increase in both categories of lanterns compared to the first half of 2018.** East Africa registered a 35% increase in the lanterns not offering mobile charging, while East Asia and Pacific had a 66% increase. Both regions reported even larger increases in the portable lanterns with mobile charging segments with a 162% increase in the African sub-region (reaching almost 600,00 units sold) and a 179% increase in the Pacific region (with a bit less than 40,000 units). It has to be noted that portable lanterns accounted for a bit

less than 60% of total sales in both regions. Central Africa also saw an impressive 420% increase in solar lanterns with mobile charging, with sales jumping to almost 75,000 units from a very low basis. Meanwhile lanterns without mobile charging registered a 27% decrease. On the other hand, West Africa saw some market stagnation compared to the first half of 2018 registering around 80,000 units sold in each lanterns segment, with 2018 overall reporting less sales than in 2017 in this segment.



## Multi-light systems

**Multi-light systems are seeing a consistent growth compared to the last round across almost all Sub-Saharan Africa,** registering a 47% expansion in East Africa with 430,000 units sold (now 24% of all the products sold in the region) and an over 50% increase in Central Africa reaching almost 10,000 units sold, which are only 7% of the total sales

## Further Sales Data Trends and Analysis

in the region though. The only sub-region that witnessed a decrease of this product category is West Africa with a decline of 32% but still with over 45,000 units sold.

In South Asia 50,000 units were sold which was a smaller volume than in 2016, but consistent with 2017. Meanwhile sales consolidated in East Asia and Pacific at 60,000 units.



### Solar Home Systems (SHS)

Sub-Saharan Africa is still the major market for these systems. East Africa leads the pack in terms of sales volume at 63% of the total – 300,000 units against 480,000 reported globally. This is a major increase in the region, setting new records compared to previous reporting rounds. The increase can be observed in all SHS categories besides the category 50–100 Wp. This may be due to the fact that this is the most popular size for component-based SHS which are not included in this reporting. The top seller was a close call between the 11–20 Wp and the 21–49 Wp systems, both surpassing the 100,000 units sold.

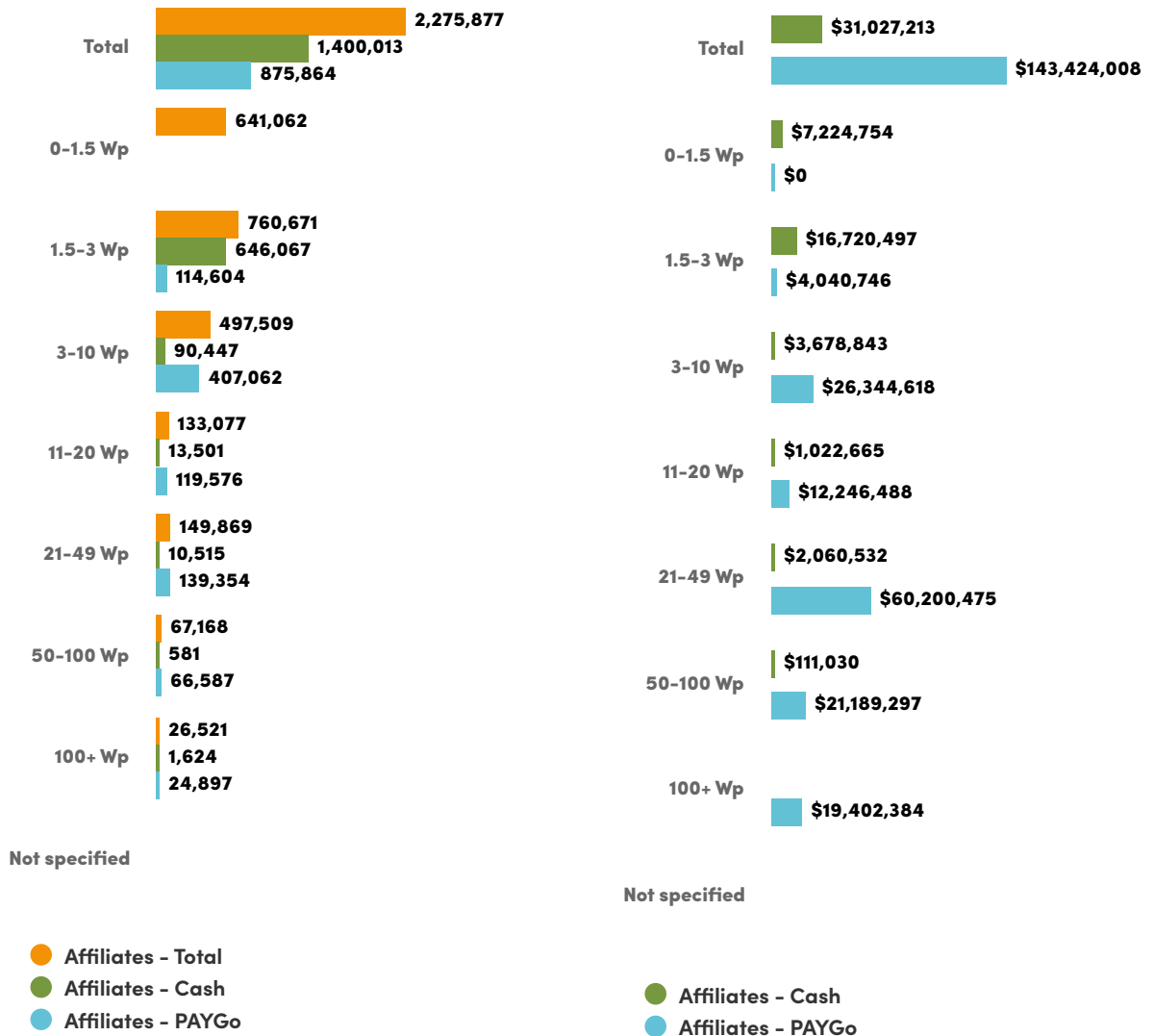
Over in West Africa, 50,000 unit sales have been reported and we see a slightly different picture. Sales of SHS are declining not only in the 50–100 Wp space but also in the 11–20 Wp category compared to the first half of the year. However for these systems, 2018 is still breaking sales records overall. Central Africa yet does not have enough companies reporting sales in the SHS segment for it to pass the three-data point control.

South Asia represented 13% of the global sales of SHS with 65,000 units reported for July–December 2018. We have seen an increase in reports of sales by more than three companies across multiple product categories, which has enabled more data to satisfy our three point reporting rule. This means that data across all the product categories in the region is becoming more visible, although it is still too early to identify trends. **Large increases have also been registered in the East Asia and Pacific region, although still representing only 7% of the total sales at 30,000 units.** Especially notable are the increases in the 11–20 Wp and 50–100 Wp categories.



# Further Sales Data Trends and Analysis

Figure 15 - Sales Volumes and Values by Product Category – Sub-Saharan Africa

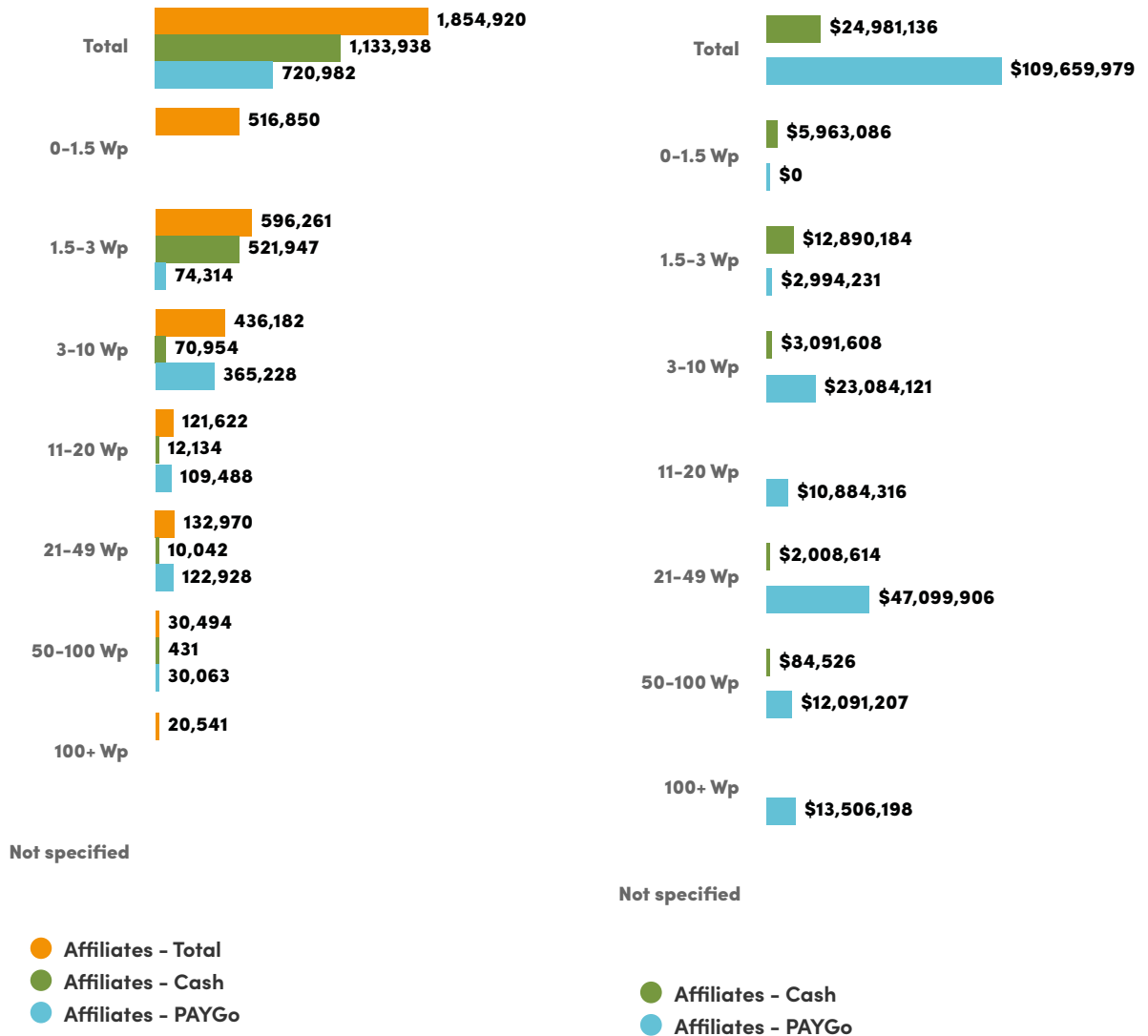


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# Further Sales Data Trends and Analysis

Figure 16 - Sales Volumes and Values by Product Category – East Africa

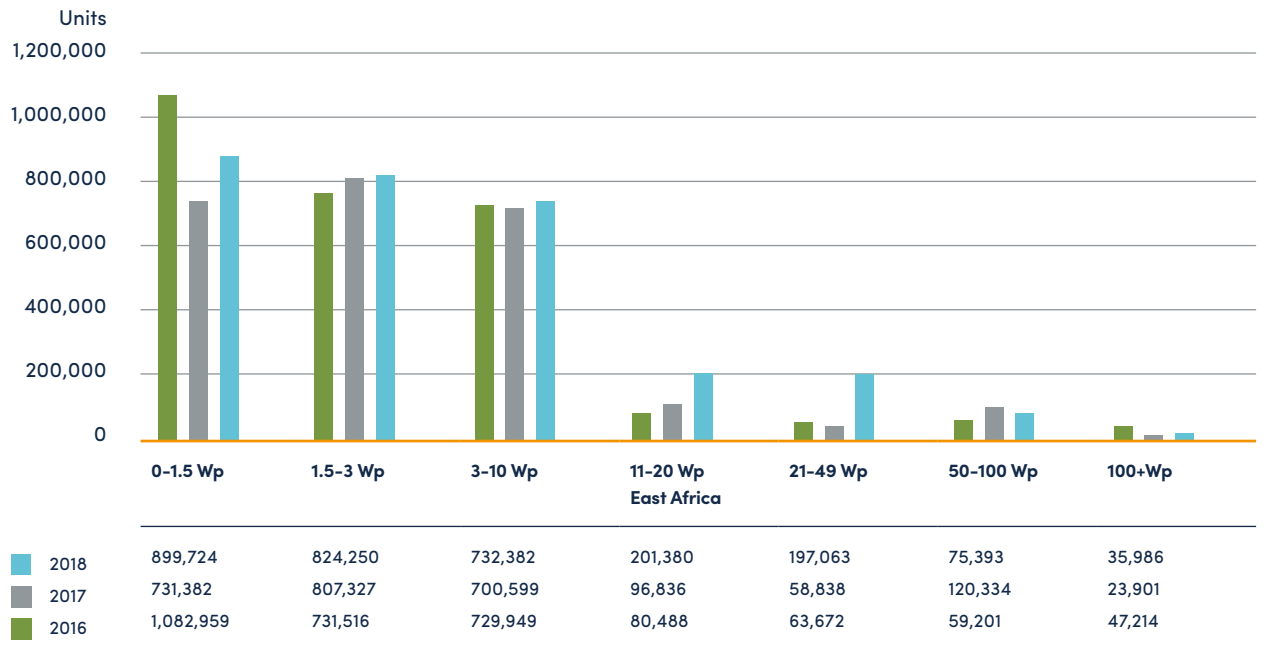


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYGo products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYGo products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

# Further Sales Data Trends and Analysis

**Figure 17 – Yearly Comparison: Volume of Products Sold by Product Category – East Africa**

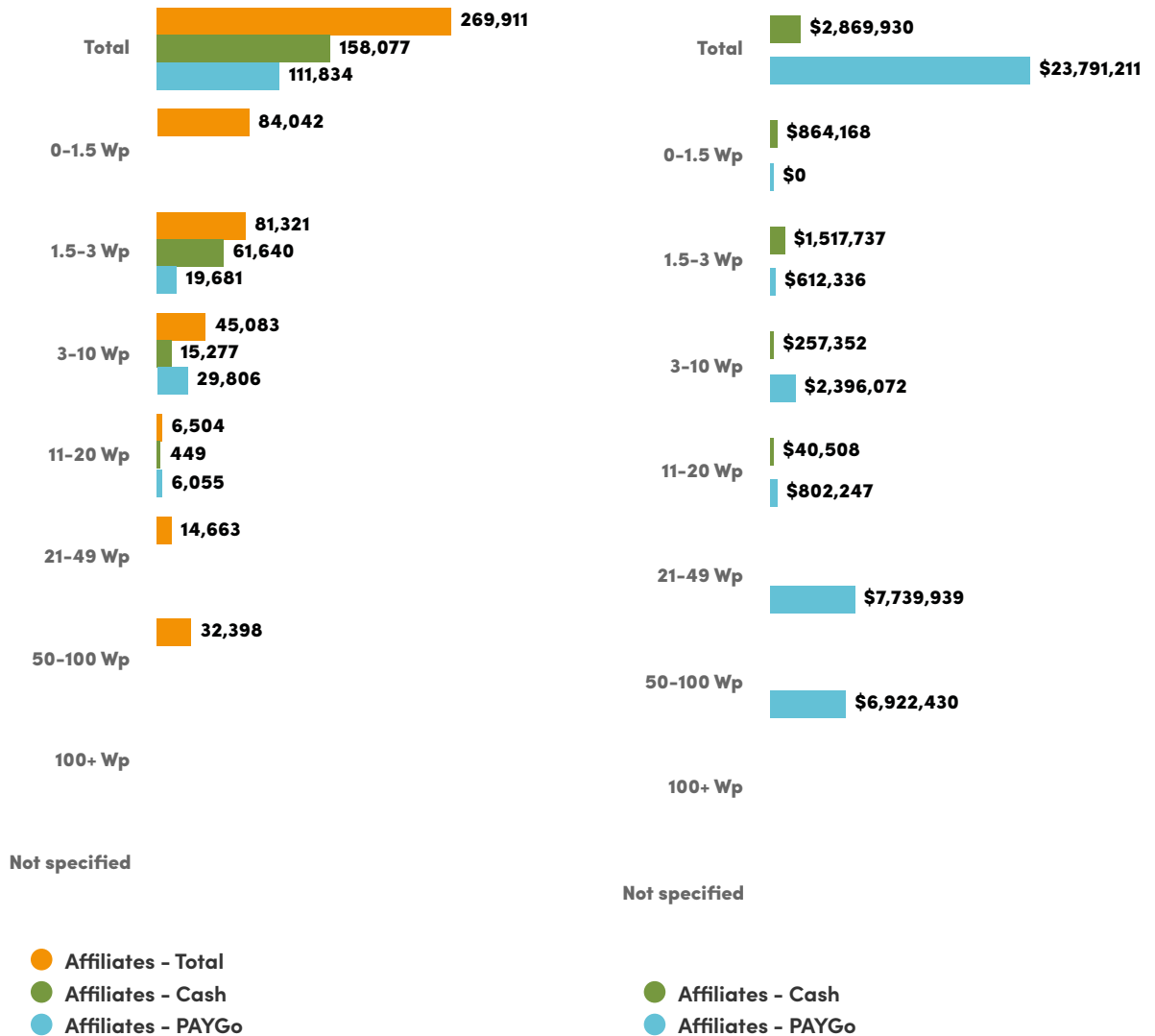


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.

# Further Sales Data Trends and Analysis

Figure 18 - Sales Volumes and Values by Product Category – West Africa

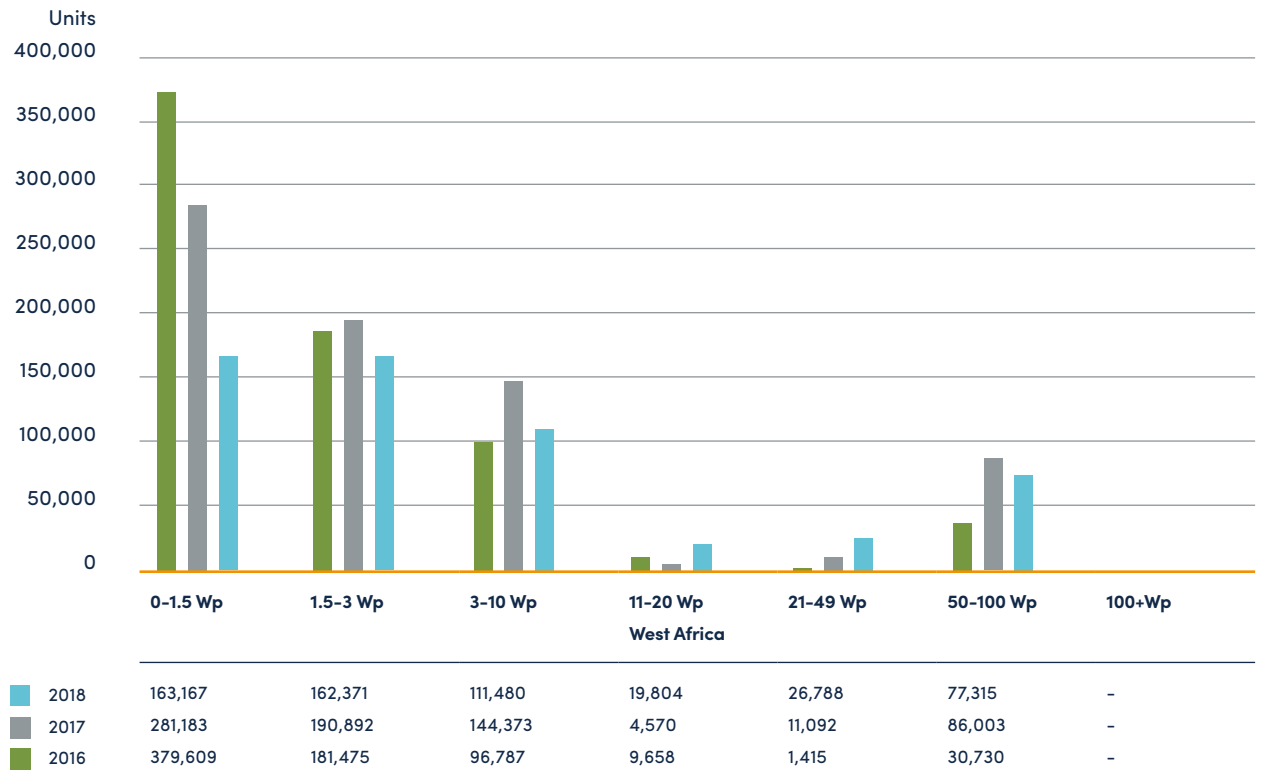


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYGo products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYGo products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

## Further Sales Data Trends and Analysis

**Figure 19 – Yearly Comparison: Volume of Products Sold by Product Category – West Africa**

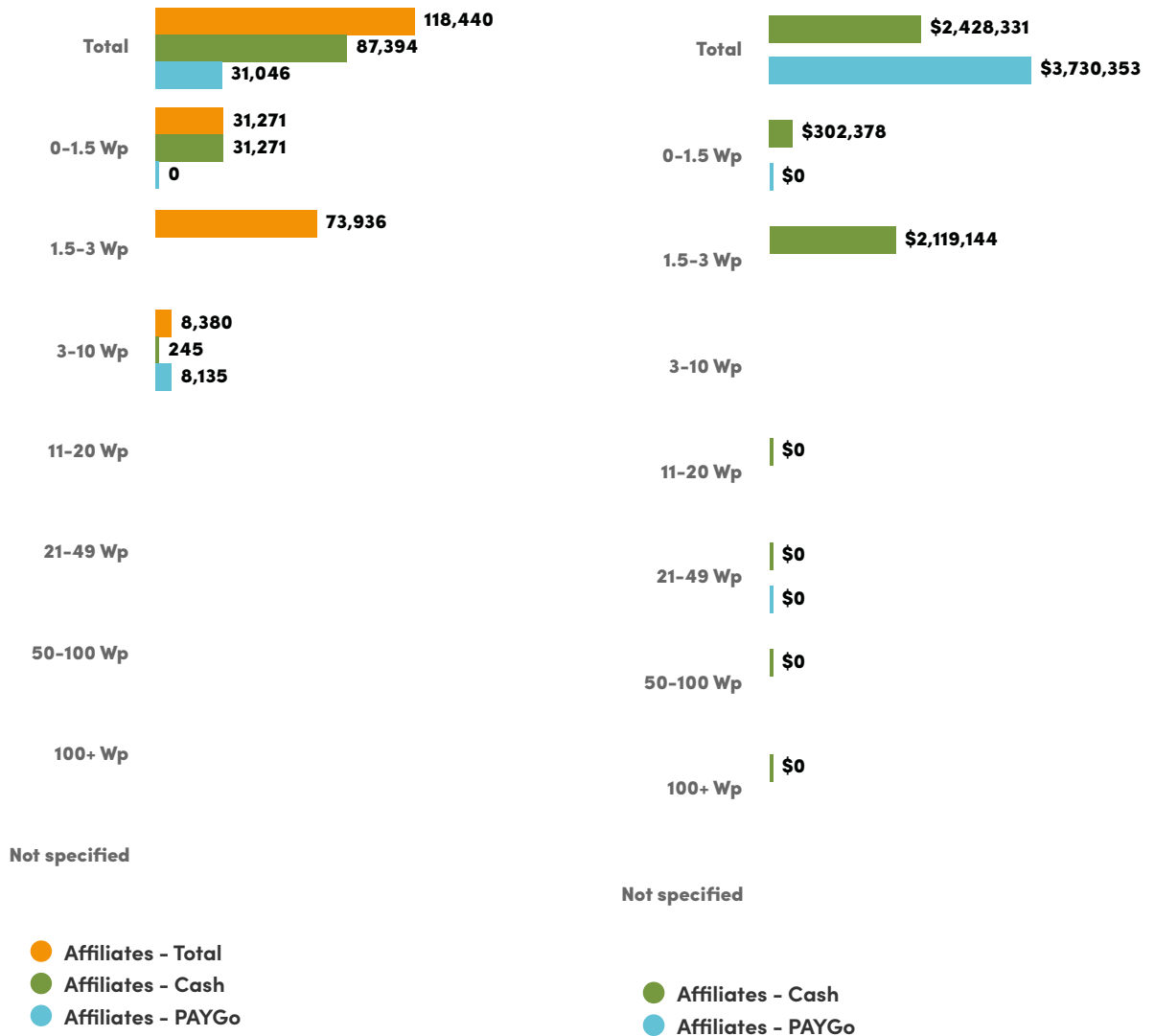


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.

# Further Sales Data Trends and Analysis

Figure 20 - Sales Volumes and Values by Product Category – Central Africa



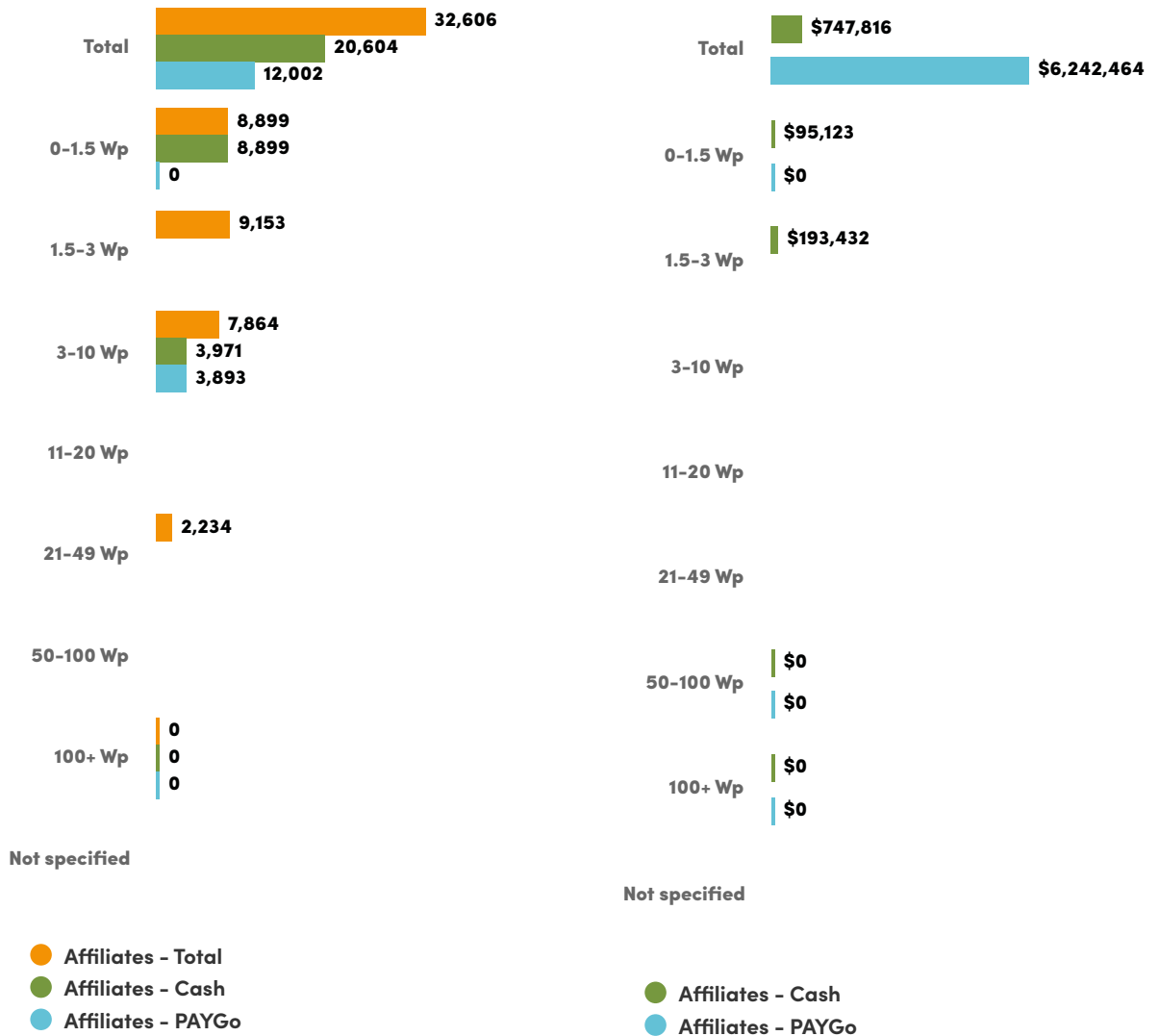
**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYGo products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYGo products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).



# Further Sales Data Trends and Analysis

Figure 21 - Sales Volumes and Values by Product Category – Southern Africa

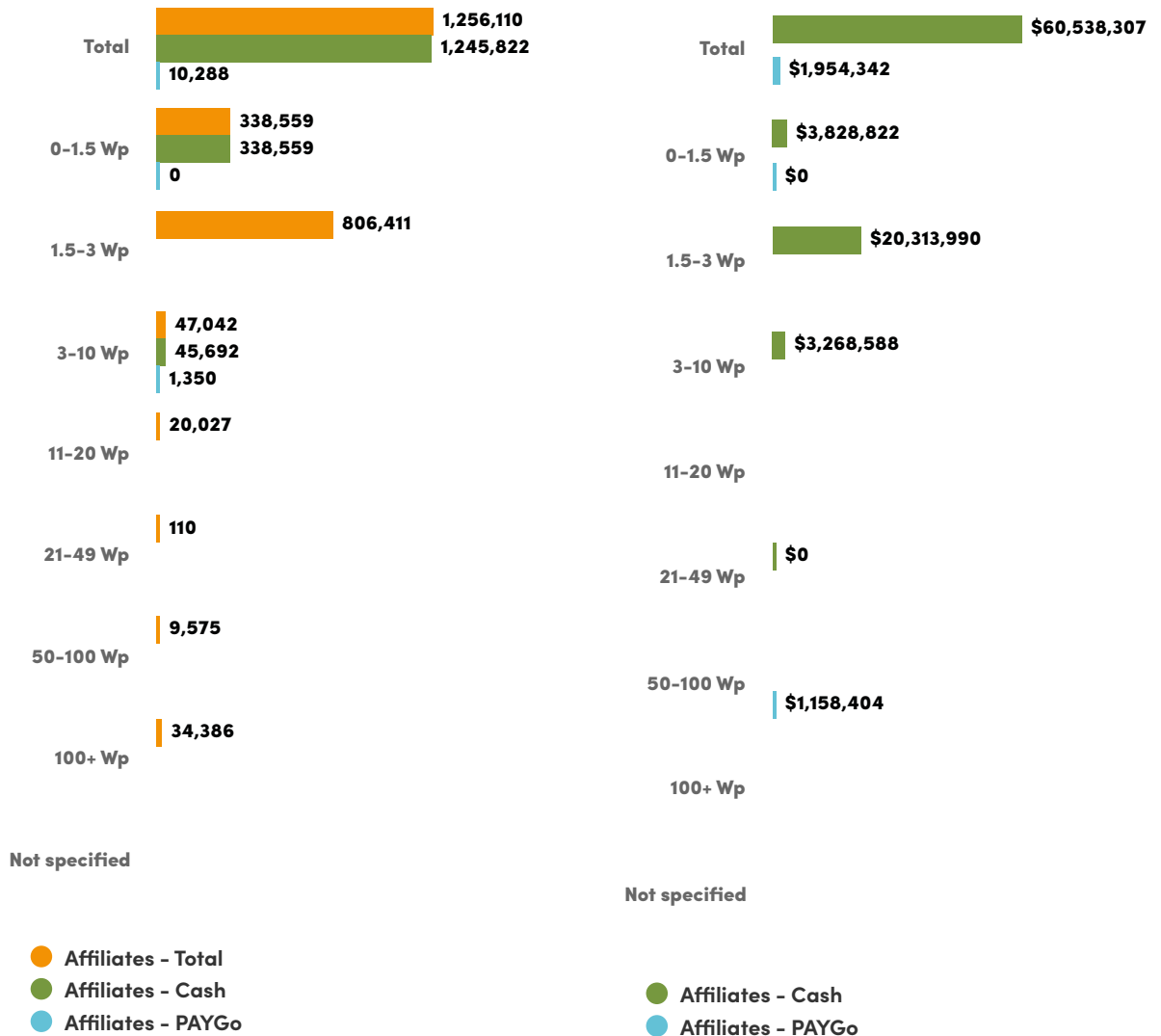


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYGo products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYGo products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

# Further Sales Data Trends and Analysis

Figure 22 - Sales Volumes and Values by Product Category – South Asia

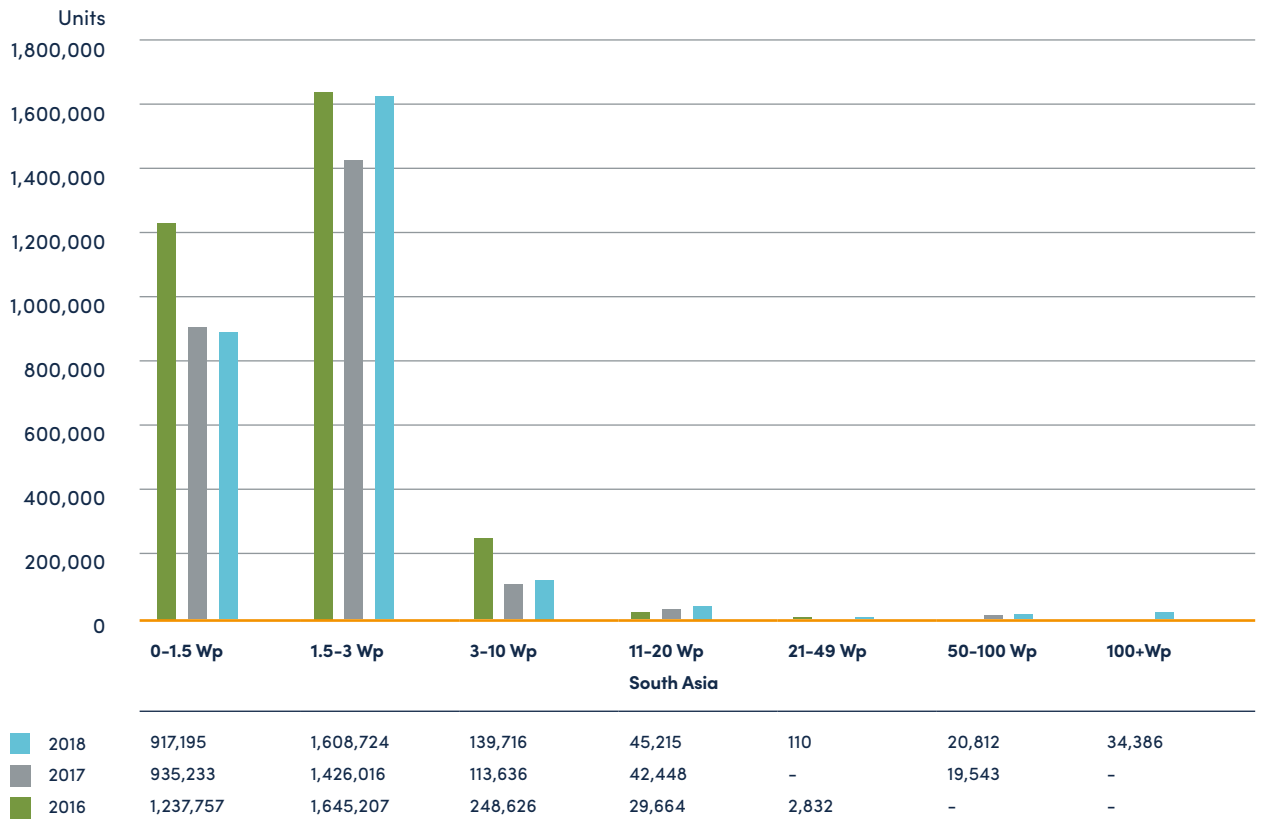


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYGo products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYGo products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

# Further Sales Data Trends and Analysis

**Figure 23 – Yearly Comparison: Volume of Products Sold by Product Category – South Asia**

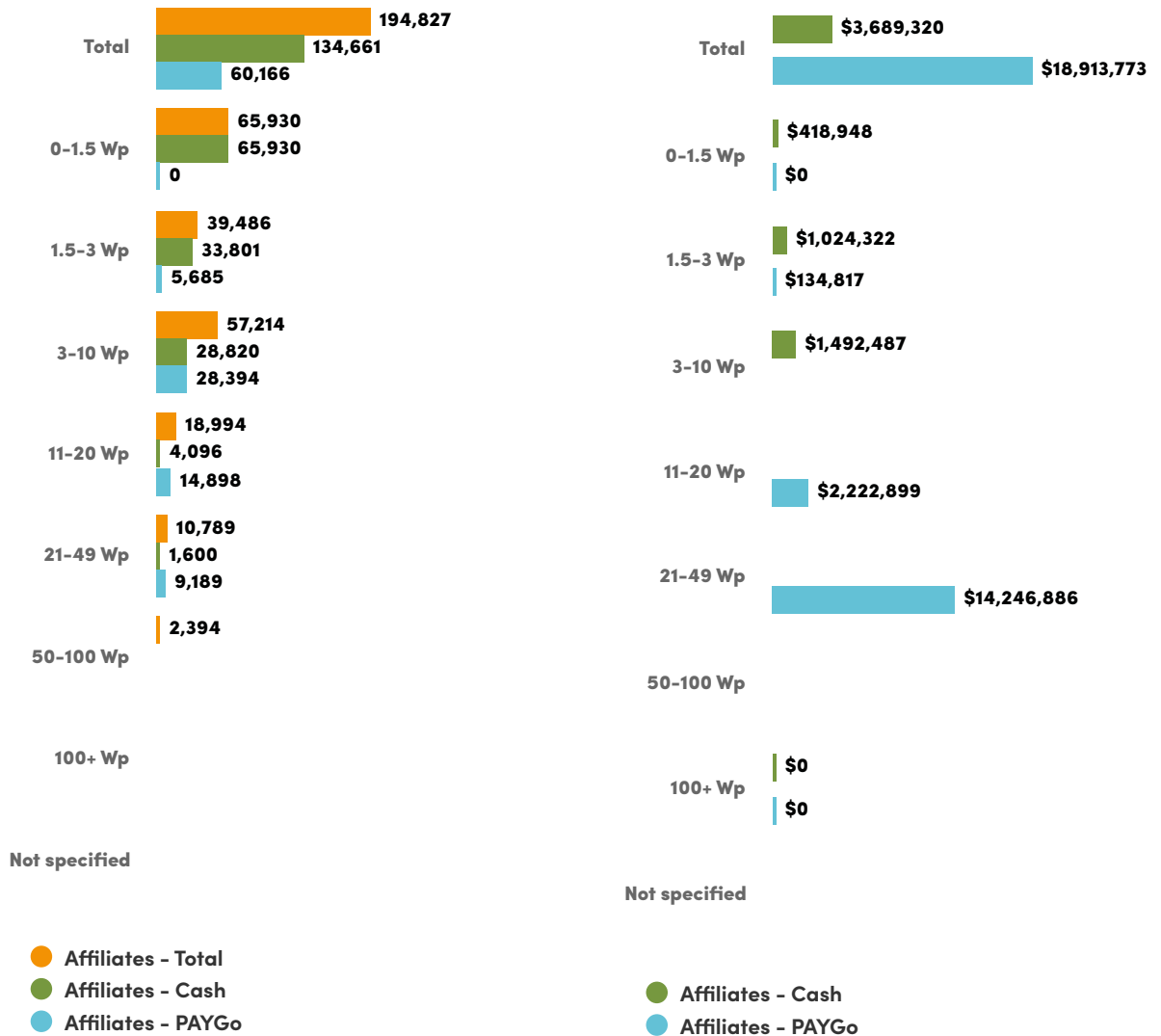


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.

# Further Sales Data Trends and Analysis

Figure 24 - Sales Volumes and Values by Product Category – East Asia and Pacific

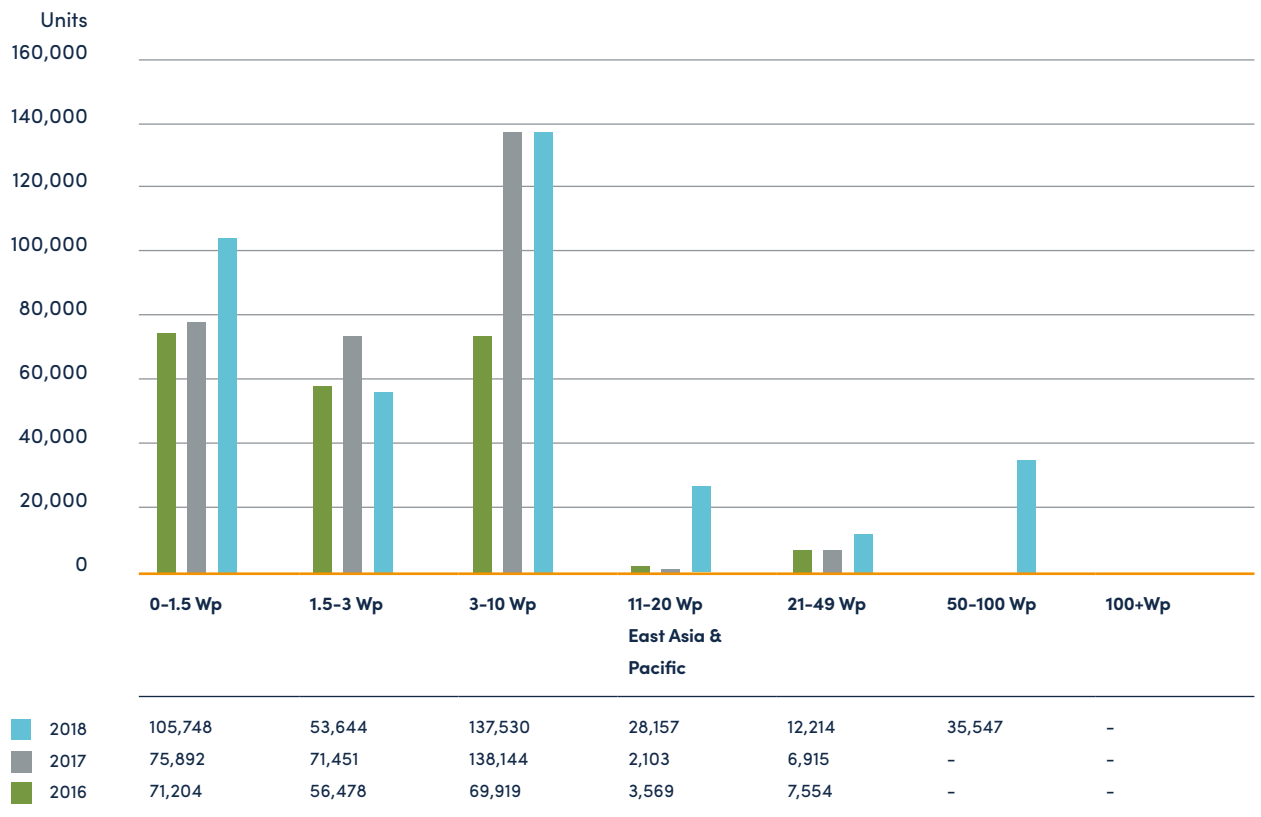


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.
3. The value of products is not presented as a total because it is computed differently for cash and PAYGo products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYGo products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

# Further Sales Data Trends and Analysis

**Figure 25 – Yearly Comparison: Volume of Products Sold by Product Category – East Asia and Pacific**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. Products with solar module capacity of less than 11 Wp are categorized based on services provided, while products with capacity of 11 Wp and over are categorized based on wattage of the solar module provided.

## Further Sales Data Trends and Analysis

### Market Insights by Country

This report only includes data for national markets where at least three manufacturers reported sales; which in this reporting round (July-December 2018), totalled 46 countries. An explanation of drivers affecting the sales volumes can be found in the “Market Dynamics” section on page 28.

When examining the data, it is broken down into Top 10 country markets by volume of products sold in cash and using the PAYGo model. Notably there are a number of new entries in the cash section while the list of top PAYGo countries remains stable. This is to be expected as the bulk government purchase of systems normally concern lanterns and those are mainly sold as cash products.

**In cash sales, India remains the largest cash market with 1.2 million units for \$58 million value** with Kenya catching up, edging a couple of point percentages closer to India than previous rounds, with 450,000 units. Ethiopia, Nigeria and Cameroon complete the Top 5. **Overall, portable lanterns with indicative wattage of under 3 Wp still represent the clear majority of products sold in the cash section.** This is visible by looking at the relatively small newly installed capacity installed by such systems. The exception seems to be India

with almost 10 MW installed – a very large increase compared to last reporting round when, with the same units, the country installed only 3 MW. This reflects the increasing number of products of larger capacities that have been sold on a cash basis in India in this reporting period.

On the PAYGo side there is a very different list of countries than in the cash chart, featuring only countries from East Asia and Pacific and none from South Asia. **Kenya is leading, for the first time topping 300,000 units sold on a PAYGo basis.** Zambia moved from seventh in the first half of 2018 to the third place, but still the small installed capacity highlights that these sales are probably lanterns or multi-light systems. The same can be highlighted for Vanuatu, featuring for the first time in a top 10 chart. Tanzania and Myanmar saw stable sales in the PAYGo segment, while a noticeable 86% increase has been registered in Ethiopia (26,000 reported in the first half of 2018 against the almost 50,000 units of this second half). Nigeria has slipped a couple of places in the top 10 with a 35% decrease in PAYGo sales compared to the first half of 2018. On the other hand, Cote d’Ivoire moved up the chart reaching position number seven. Overall, in both Nigeria and Cote d’Ivoire there is a much larger newly installed capacity and market value due to more SHS in these sales volumes.

**Table 6 – Top 10 Country Markets by Volume of Products Sold – Cash**

Country names	Volume of Products Sold - Cash	Global Volume Share - Cash	Value of Products Sold - Cash	Global Value Share - Cash	Newly Installed Capacity (MW) - Cash	Global Newly Installed Capacity Share - Cash
India	1,179,190	40.02%	\$57,665,868	58.01%	9.22MW	66.33%
Kenya	449,685	15.26%	\$12,869,561	12.95%	0.68MW	4.88%
Ethiopia	289,018	9.81%	\$6,332,538	6.37%	0.47MW	3.35%
Nigeria	101,362	3.44%	\$1,952,954	1.96%	0.18MW	1.31%
Cameroon	51,944	1.76%	\$1,373,139	1.38%	0.07MW	0.53%
Bangladesh	51,802	1.76%	-	-	0.59MW	4.27%
Uganda	46,479	1.58%	\$1,520,720	1.53%	0.16MW	1.15%
Tanzania	45,778	1.55%	\$1,449,036	1.46%	0.15MW	1.07%
Malawi	30,453	1.03%	\$481,619	0.48%	0.08MW	0.56%
Rwanda	26,751	0.91%	\$290,248	0.29%	0.16MW	1.13%

**NOTE:**

1. Only countries where more than three companies have provided data are included in this list.

## Further Sales Data Trends and Analysis

**Table 7 - Top 10 Country Markets by Volume of Products Sold - PAYGo**

Country names	Volume of Products Sold - PAYGo	Global Volume Share - PAYGo	Value of Products Sold - PAYGo	Global Value Share - PAYGo	Newly Installed Capacity (MW) - PAYGo	Global Newly Installed Capacity Share - PAYGo
Kenya	300,224	31.56%	\$58,649,180	35.59%	5.38MW	29.09%
Uganda	147,121	15.47%	\$8,483,040	5.15%	2.68MW	14.50%
Zambia	72,595	7.63%	\$3,373,068	2.05%	0.97MW	5.27%
Rwanda	71,972	7.57%	\$14,363,334	8.72%	1.29MW	6.95%
Tanzania	56,260	5.91%	\$21,734,584	13.19%	2.22MW	12.02%
Ethiopia	49,159	5.17%	\$507,705	0.31%	0.49MW	2.64%
Nigeria	32,439	3.41%	\$2,399,103	1.46%	1.42MW	7.69%
Cote d'Ivoire	21,425	2.25%	\$8,328,152	5.05%	1.17MW	6.32%
Myanmar	20,932	2.20%	-	-	0.18MW	0.95%
Vanuatu	18,642	1.96%	\$8,002,251	4.86%	0.34MW	1.82%

**NOTE:**

1. Only countries where more than three companies have provided data are included in this list.

### Sub-Saharan Africa

**Sales in the Sub-Saharan Africa region are strongest in East Africa followed by West Africa.**

**In East Africa, Kenya continues to be the dominant country and saw a large sales volume increase of over 45% reaching a new record of 750,000 units sold** - mainly driven by lanterns with mobile charging and 21-49 Wp SHS. Ethiopia also saw a large volume increase of 130% overall. Tanzania has reported stagnant sales volumes and Uganda saw a modest 12% increase, but with a dramatically different trajectories for cash and PAYGo sales with cash decreasing by 51% and PAYGo increasing by 87%. Somalia reported very high volumes of almost 200,000. Rwanda showed modest growth compared with the second half of 2017, being quite a large increase compared to the first half of 2018 and following the resolution of local market conditions that were challenging distributors. Zambia's market is steadily expanding as is Madagascar, with stable volumes around 25,000. Malawi demonstrated around 35,000 units stronger than the first half of 2018. Although Zimbabwe registered less strong sales than the first half of 2018, there is still a 70% increase compared to the second half of 2017, inline with a steadily growing market in the country.

**In West Africa, Nigeria still has the title of the largest national market, although sales volumes**

**stagnated compared to the first half of 2018 and showed modest growth compared to the second half of 2017, totaling 134,000 units.** Few other country markets in West Africa currently present anything near comparative volumes or sizes of revenue. Burkina Faso and Cote d'Ivoire continue with modest growth, with the former reporting 24,000 units and the latter surpassing 20,000 units. Mali has had a strong 2018 compared to the prior year, with a modest growth in this second half year compared to the first half of 2018. Both Senegal and Ghana show decreased sales of around 50%. Benin and Togo show significant growth paths each reaching almost 10,000 units sold. In Liberia, for the first time sales passed three point reporting, showing around 10,000 units as well.

**Central African countries showed overall a positive trajectory of growth.** The Democratic Republic of the Congo (DRC) shows a strong percentage increase in sales volumes compared to the first half of 2018 with over 50,000 units sold. Cameroon shows stable sales after the large increases registered in the last round, with a bit over 50,000 units and reaching the same volumes as DRC. Sales in Chad have surpassed the three point reporting threshold, showing around 10,000 units.

## Further Sales Data Trends and Analysis

### South Asia

**India, the largest market representing 94% sales of the South Asian region, is seeing stagnating sales compared to previous reports.** This may not be indicative of the whole region's trend as our reporting does not cover component-based SHS sales, which are known to be significant across South Asia and are not covered in this report. Bangladesh sales are winding down and falling back to 50,000 units. This does not cover much of the local commercial market and does not cover component-based sales. Pakistan is seeing a steady 100% increase reaching almost 20,000 units, the highest ever registered from affiliates. Nepal with only a few hundred systems sold, passed the three point reporting threshold for the first time.

### East Asia and Pacific

Dropping below being the largest market in the region, Myanmar saw a 60% decrease although it is important to note that the country's PAYGo section is still stable whereas the cash section is decreasing sharply due to the lack of government tenders, present in the last reporting round. The Philippines and Vanuatu are contesting the top spot in terms of sales volumes with around 40,000 units each. Both countries registered large increases compared to last rounds, mainly comprising of solar lanterns with mobile charging. Papua New Guinea continues to see volumes around 30,000 units and Fiji has passed the three point reporting threshold once again with over 20,000 units. Thailand and Cambodia remain smaller markets while Indonesia has not passed the three point reporting threshold meaning no conclusions about the country's trajectory after it hit 100,000 units in the second half of 2017 can be made.





## Further Sales Data Trends and Analysis

**Table 8 Sales Volumes and Values by Country – Sub-Saharan Africa**

Countries	Sales volumes			Values	
	Total	PAYGo	Cash	PAYGo	Cash
<b>Sub-Saharan Africa</b>	<b>2,275,877</b>	<b>875,864</b>	<b>1,400,013</b>	<b>\$143,424,008</b>	<b>\$31,027,213</b>
<b>East Africa</b>	<b>1,854,920</b>	<b>720,982</b>	<b>1,133,938</b>	<b>\$109,659,979</b>	<b>\$24,981,136</b>
Ethiopia	338,177	49,159	289,018	\$507,705	\$6,332,538
Kenya	749,909	300,224	449,685	\$58,649,180	\$12,869,561
Madagascar	23,998	-	-	-	-
Malawi	33,783	3,330	30,453	\$84,369	\$481,619
Rwanda	98,723	71,972	26,751	\$14,363,334	\$290,248
Tanzania	102,038	56,260	45,778	\$21,734,584	\$1,449,036
Uganda	193,600	147,121	46,479	\$8,483,040	\$1,520,720
Zambia	88,000	72,595	15,405	\$3,373,068	\$320,126
Zimbabwe	14,168	-	-	-	-
<b>West Africa</b>	<b>269,911</b>	<b>111,834</b>	<b>158,077</b>	<b>\$23,791,211</b>	<b>\$2,869,930</b>
Benin	8,755	8,429	326	\$521,183	\$17,256
Burkina Faso	23,725	1,430	22,295	-	\$324,563
Cote d'Ivoire	22,921	21,425	1,496	\$8,328,152	-
Ghana	13,096	7,322	5,774	\$2,738,152	\$99,494
Liberia	9,650	-	-	\$3,678,835	-
Mali	20,802	6,873	13,929	\$818,506	\$348,880
Nigeria	133,801	32,439	101,362	\$2,399,103	\$1,952,954
Senegal	18,104	12,641	5,463	\$1,860,583	-
Togo	7,727	-	-	\$3,143,722	-
<b>Central Africa</b>	<b>118,440</b>	<b>31,046</b>	<b>87,394</b>	<b>\$3,730,353</b>	<b>\$2,428,331</b>
Cameroon	54,649	2,705	51,944	-	\$1,373,139
Chad	9,235	-	-	-	\$124,588
Congo, Dem. Rep.	54,316	-	-	-	-
<b>Southern Africa</b>	<b>32,606</b>	<b>12,002</b>	<b>20,604</b>	<b>\$6,242,464</b>	<b>\$747,816</b>
Namibia	2,567	-	-	-	-
South Africa	30,039	-	-	-	\$725,829

**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The value of products is not presented as a total because it is computed differently for cash and PAYG products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYG products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

## Further Sales Data Trends and Analysis

**Table 9 Sales Volumes and Values by Country – South Asia**

Countries	Sales volumes			Values	
	Total	PAYGo	Cash	PAYGo	Cash
<b>South Asia</b>	<b>1,256,110</b>	<b>10,288</b>	<b>1,245,822</b>	<b>\$1,954,342</b>	<b>\$60,538,307</b>
Bangladesh	51,802	0	51,802	\$0	-
India	1,184,003	4,813	1,179,190	\$591,846	\$57,665,868
Nepal	420	-	-	-	-
Pakistan	19,355	4,755	14,600	\$1,339,364	\$441,634

**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The value of products is not presented as a total because it is computed differently for cash and PAYG products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYG products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

**Table 10 Sales Volumes and Values by Country – East Asia and Pacific**

Countries	Sales volumes			Values	
	Total	PAYGo	Cash	PAYGo	Cash
<b>East-Asia &amp; Pacific</b>	<b>194,827</b>	<b>60,166</b>	<b>134,661</b>	<b>\$18,913,773</b>	<b>\$3,689,320</b>
Cambodia	438	260	178	\$58,885	-
Fiji	22,142	-	-	\$0	-
Myanmar	27,196	20,932	6,264	-	-
Papua New Guinea	30,249	-	-	-	\$1,212,646
Philippines	38,891	16,962	21,929	\$3,373,419	-
Thailand	2,709	-	-	-	-
Vanuatu	38,962	18,642	20,320	\$8,002,251	\$827,149

**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The value of products is not presented as a total because it is computed differently for cash and PAYG products given their different nature. For Cash products the value is calculated using the reported FOB price, while for PAYG products the reported total cost of ownership (defined as the average amount of USD received from a customer repaying the product in full and on time without applying a financial discount rate).

## Further Sales Data Trends and Analysis





# Off-Grid Solar Appliances



# A growing off-grid solar sector contributing to the Sustainable Development Goals

**Off-Grid Solar Appliances are energy-efficient electrical appliances that are appropriate for both off-grid or weak-grid areas<sup>11</sup>** where low capacity power systems are not suitable for use of conventional appliances. These devices are typically compatible with a DC-powered system and should be more energy efficient than traditional counterparts, allowing for a relatively lower load energy system to power them.

The provision of well designed, efficient and cost-effective appliances is crucial to ensure that households can fully benefit from electrification. **This report provides a snapshot of how our sector is growing and adapting, as the ways in which solar power is being used in households is diversifying.** The growing use of solar home systems (SHS) means that more households across the developing world can not only turn on their lights and charge their mobile phones, but can now also run energy efficient off-grid appliances such as fans and televisions (TVs). Technological innovations and new business models have also expanded access to solar powered water pumps and various types of refrigeration options for domestic and commercial applications. **These developments are life-changing. Off-grid solar appliances can provide more and better quality energy services for domestic and commercial applications.** This could unlock new income generating activities or boosting productivity of existing ones. In terms of development, improving access to modern energy across the globe has positive economic impacts as well as boosting health, gender equality, education and virtually every one of the 17 United Nations' Sustainable Development Goals (see Text Box for details).

As a result of this evolution, the way we track and collect data is also broadening. **Thanks to the partnership GOGLA has established with the Efficiency for Access Coalition, this latest report has expanded to include sales data on a range of off-grid solar appliances.** For this first effort we have put our focus on TVs, fans, refrigeration units and solar water pumps. We invite you to explore this new section of the report, and its preliminary insights into this exciting and expanding market.

**This is a new and challenging frontier for our sector, and it is important to highlight that sales reported here do not represent the whole global market for the off-grid solar appliances.** We are encouraged by the number of affiliates involved in this data collection - 59 out of the total 84 companies that participated this year - and we hope that with increased participation this analysis will blossom in the coming months and years.

**At times few data points on a specific region, country or product category are available due to insufficient current data to pass our three data point rule.** This means that at least three separate product manufacturers should have reported sales for any single data point to be shown. When there are fewer than three responses for a region, country or product category, no results are shown to protect the proprietary interests of the companies who have supplied data in support of this industry report. This will be signaled by an empty bar next to the name of the region, country or product category. While if there are no companies reporting data at all, the graph will show a "0".

Moreover, for the time being, the sales of off-grid solar appliances are collected separately from the off-grid solar lighting products, without distinguishing if appliances are sold bundled with SHS or standalone with own panels. Efforts will be put to link these two segments to identify key connections and trends in future rounds.

<sup>11</sup> "Off-grid" refers to populations that live beyond the reach of the national grid; "weak-grid" refers to populations that have unreliable grid connectivity and suffer frequent and sometimes lengthy outages.

## Behind the numbers: how off-grid solar appliances contribute to the Sustainable Development Goals

Off-grid solar provides millions of households with access to electricity globally. Yet this access only becomes truly transformative when combined with appliances that give households the power to effectively use that energy. Off-grid solar appliances play a vital role in allowing households to enjoy an enriched quality of life and the benefits that can come from having access to modern energy. Appliances have the potential to help accelerate progress toward many of the Sustainable Development Goals<sup>12</sup>:

- Access to off-grid solar appliances broadly supports SDG 1: No poverty, as it increases access to new technologies for poor and vulnerable communities.
- Televisions in particular can support education, SDG 4, by providing access to educational content and news.
- Fans—important devices for improving quality of life through comfort in the home, especially for young children—help address part of SDG 3: Good health and well-being. Refrigerators and electric cookstoves also contribute to SDG 3, reducing food contamination and reducing indoor air pollution.
- Products such as refrigerators, and electric cookers are critical to freeing up time for women in the home and improving gender equality as outlined by SDG 5.
- The growth of the off-grid appliance market is also creating employment for sales representatives and technicians, supporting SDG 8.

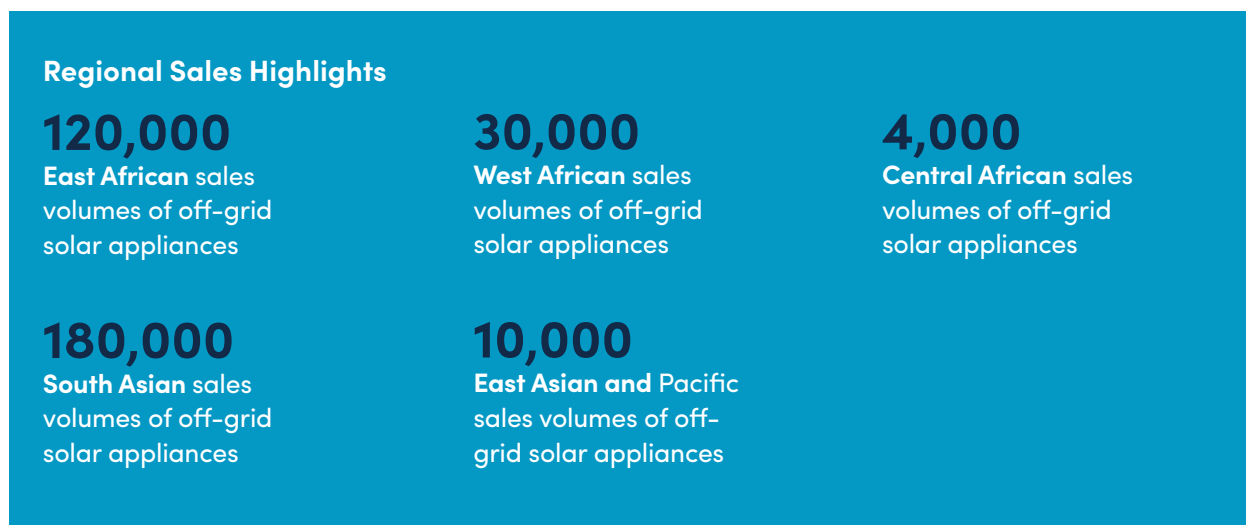
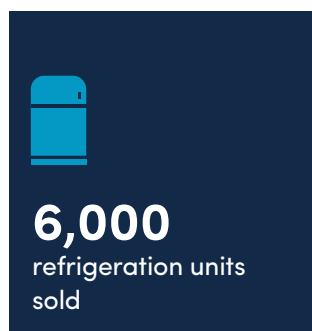


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# Off-Grid Solar Appliances Highlights

## Key Figures

Sales refer to all off-grid solar appliances<sup>13</sup> reported sold by participating affiliates<sup>14</sup> in the period between July 1st–December 31st 2018



<sup>13</sup> All off-grid solar Appliances refer to the TVs, fans, solar water pumps and refrigeration units sold targeting customers living in off- or weak-grid areas.

<sup>14</sup> Affiliates include GOGLA members, companies selling Lighting Global quality-verified products, and appliance companies that participated in the Global LEAP Energy Efficient Appliance Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme.

# Off-Grid Solar Appliances Highlights

## Market Insights

### All Off-Grid Solar Appliances

The term ‘all off-grid solar appliances’ refers to the sum of all TVs, fans, solar water pumps and refrigeration units reported. Following a similar trend as the off-grid solar lighting products market, the data underscore the dominance of PAYGo sales models in Sub-Saharan Africa and the dominance of cash sales in South Asia. This is due to the fact that the latter is dominated by largely cash-based economies and, unlike the African market, mobile money – a key component enabling PAYGo – is not yet widely used. Aside from mobile money, industry experts have identified other barriers to scaling PAYGo in India as: dominance of agent-based networks, lack of company capital required to scale, fluctuations in policy and legislation, and problems with on-the-ground operationalisation<sup>15</sup>.

Appliance sales data in Figure 26 indicate that it is overall primarily a cash sales business. Yet, it is critical to note that this aggregate insight is primarily driven by reported sales of fans in South Asia. Fans are the cheapest appliance of those considered for this report and are more affordable for low-income cash buyers. Fans account for 88% of the total cash sales worldwide reported by our affiliates. If these fan sales are excluded from the overall sales, PAYGo seems to be just as crucial for the bulk of appliance sales as it is for SHS. Disregarding the cash sales of fans, 87% of off-grid solar appliances are sold as PAYGo. The bulk of this percentage is made up of TVs, complimented by small volumes of fans and solar water pumps. Currently, fridges are sold mostly on a cash basis, and sales can anecdotally be seen as driven by institutions supporting vaccine preservation.

As Table 11 shows, the top countries for solar appliance sales are Pakistan, India (with fans being the main appliance type sold) and Kenya (where the majority of sales are for TVs). One important market not visible in this table is Bangladesh, where the sales of off-grid solar

appliances have benefitted from the Global LEAP Procurement Incentives program<sup>16</sup> reaching large volumes of products sold. However, not enough companies among those currently active in this market have been mobilised to participate in this first round of data collection and efforts will be made to ensure better coverage in upcoming rounds.

**Table 11 - Sales Volumes by Country – All Off-Grid Solar Appliances**

Countries	Total	Cash	PAYGo
Pakistan	133,710	131,220	24,990
Kenya	69,361	4,172	65,189
India	33,105	-	-
Uganda	19,345	825	18,520
Tanzania	14,263	-	-
Cote d'Ivoire	12,504	0	12,504
Ghana	6,048	-	-
Vanuatu	5,610	-	-
Zambia	5,029	-	-
Mozambique	5,009	5,009	0
Rwanda	4,229	-	-
Nigeria	2,946	557	2,389
Mali	2,610	-	-
Myanmar	2,440	-	-
Philippines	2,097	-	-
Papua New Guinea	1,573	253	1,320
Senegal	1,497	-	-
Zimbabwe	1,471	-	-
Malawi	464	464	0
Cameroon	59	59	0

#### NOTE:

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

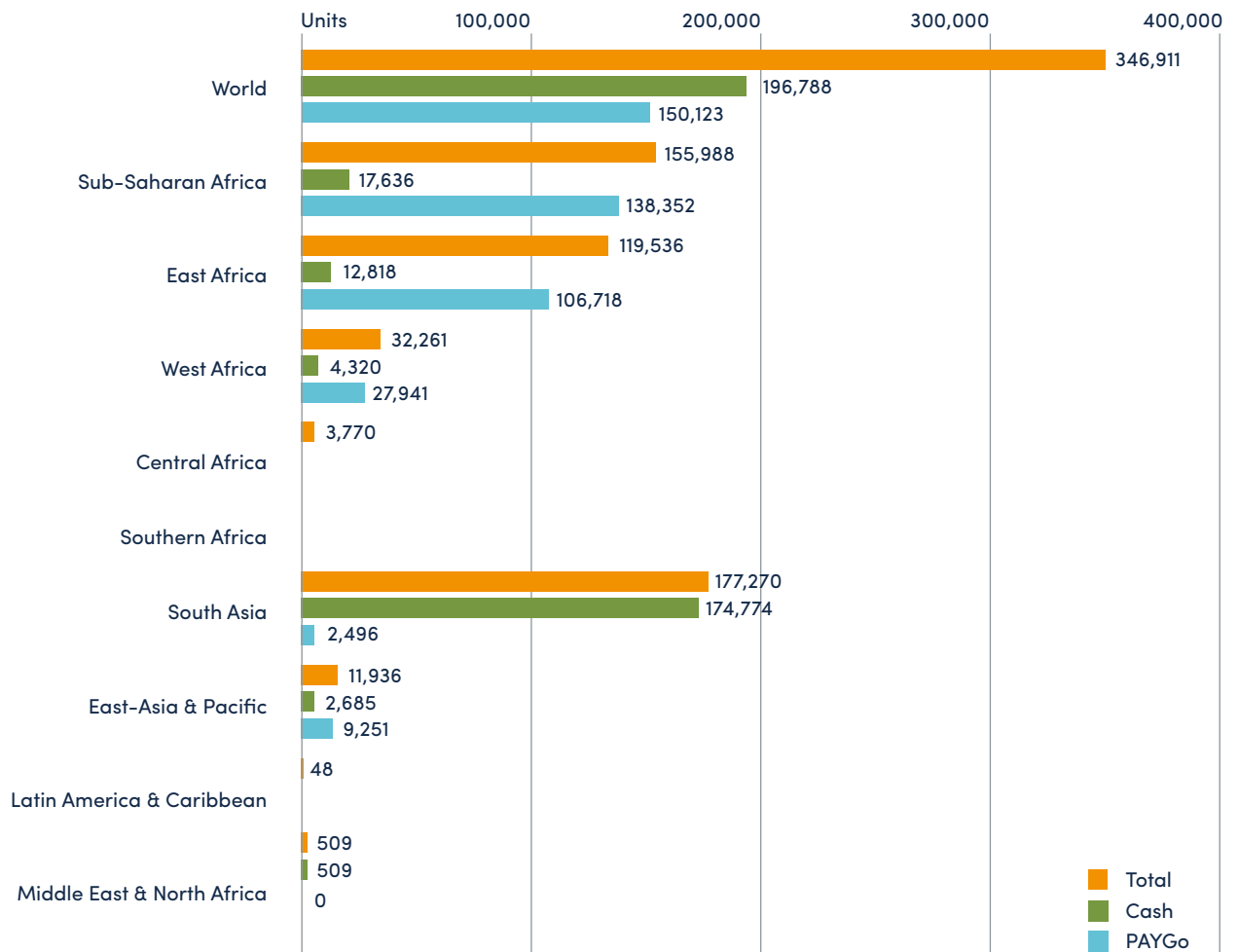
<sup>15</sup> GOGLA, “In Focus: South Asia and the use of PAYGo”, Jan 2019. Full article here: <https://www.gogla.org/about-us/blogs/in-focus-south-asia-and-the-use-of-paygo?platform=hootsuite>

<sup>16</sup> For more information, please visit: <https://efficiencyforaccess.org/global-leap-procurement-incentives>



# Off-Grid Solar Appliances Highlights

Figure 26 - Volume of Products Sold per region – All Off-Grid Solar Appliances



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

# Off-Grid Solar Appliances Highlights



## TVs

After lighting, TVs are one of the most desired appliances by off-grid households and businesses, according to a recent Efficiency for Access Coalition survey<sup>17</sup>.

In this chapter, results are presented based on the sales of TVs by affiliates, broken down in the following product categories based on the diagonal screen size, as measured in inches:

- Small, screens between 12" and 17"
- Medium, screens between 18" and 23"
- Large, screens between 24" and 29"
- Extra Large, screens larger than 30".

## Global Insights

The data in Figure 27 shows that TVs are mostly sold on a PAYGo basis with Sub-Saharan Africa, specifically East Africa, making up the lion's share of all TVs sold at 92% of the total units.

In terms of the diversity of product categories sold, the majority of TVs sold seem to fall in the large and medium categories (Figure 28). This may be driven by a variety of factors; for example, there is not usually a dramatic increase in price or energy consumption with a larger TV compared to a smaller one. Other drivers for such decisions are social ones like the fact that a larger TV can be shown to a large group of people, though these factors depend on the specific case.

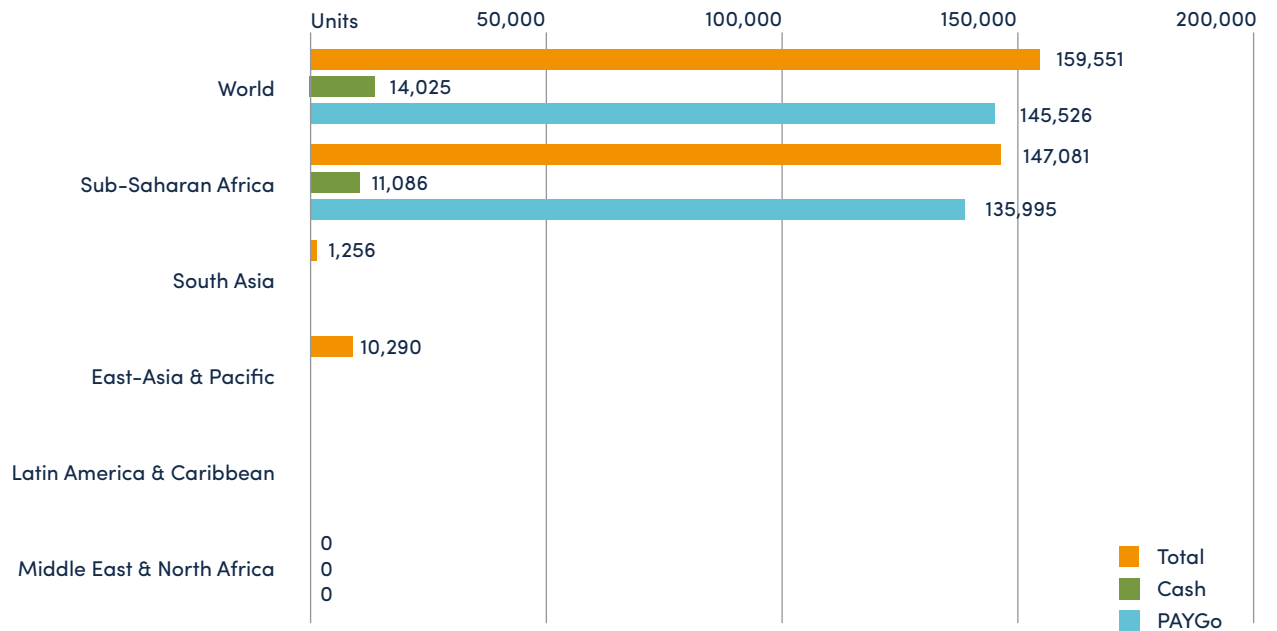


© GOGLA/Jeffrey M. Walcott

17 Efficiency for Access Coalition, Off-Grid Appliance Market Survey, 2018. Full report here: <https://efficiencyforaccess.org/publications/off-grid-appliance-market-survey>

# Off-Grid Solar Appliances Highlights

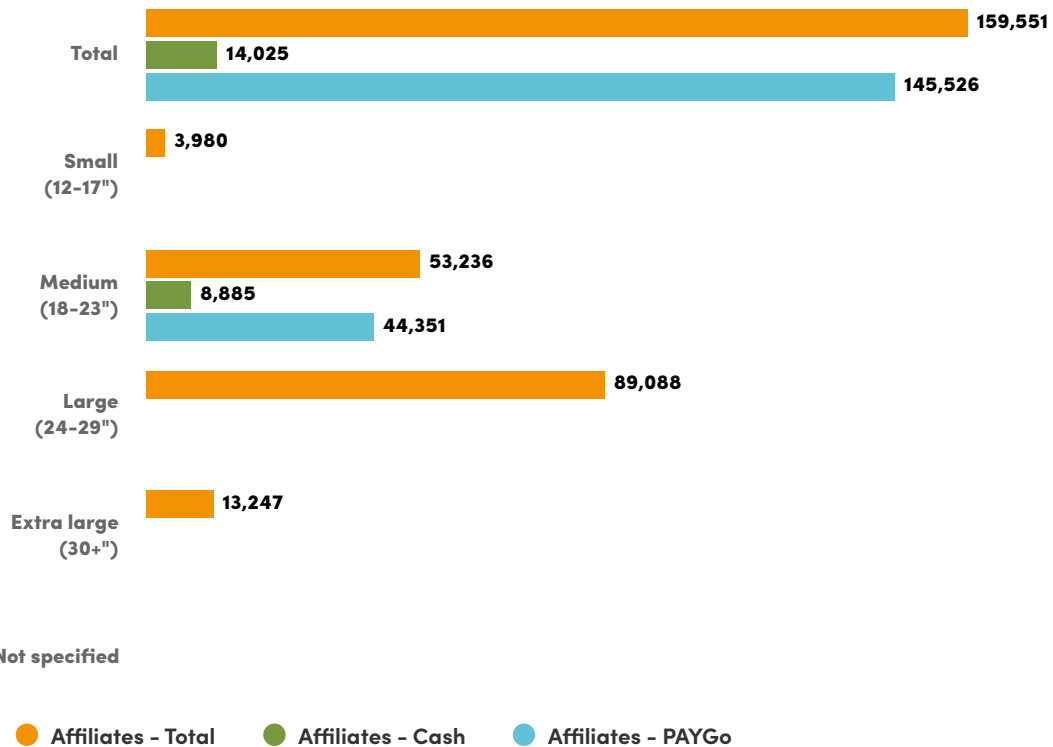
**Figure 27 - Volume of Products Sold per region – TVs**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

**Figure 28 - Volume of Products Sold Globally by Product Category - TVs**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYGo is shown only if both segments passed the three-data point control.
3. The segmentation of sales is done on the basis of the diagonal display size (in inches).

# Off-Grid Solar Appliances Highlights

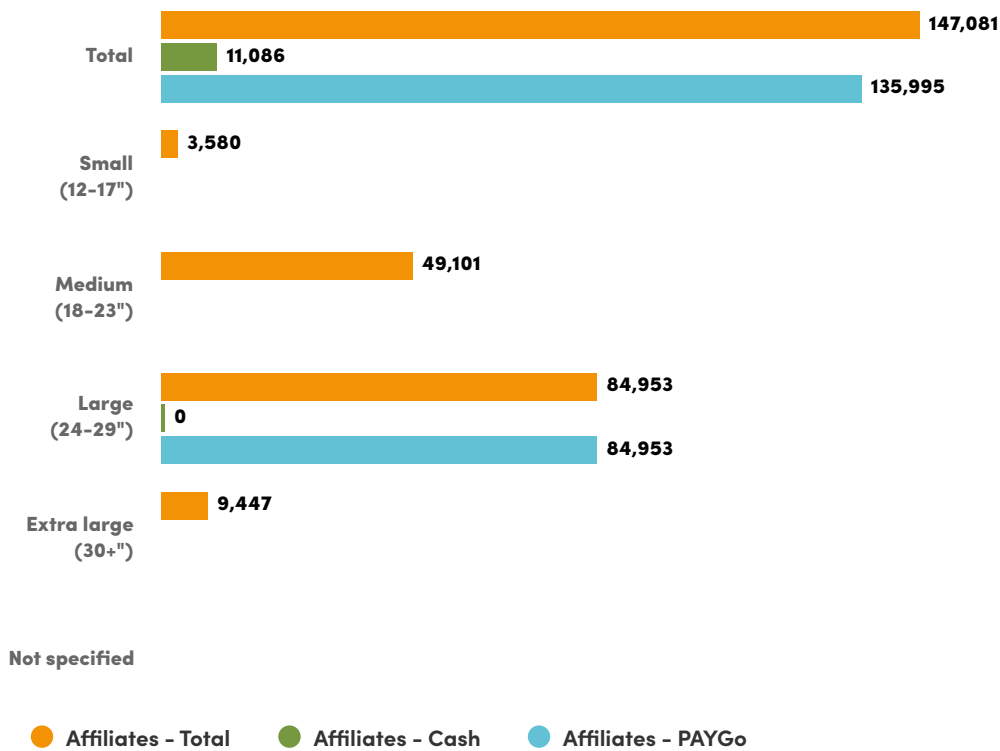
## Regional Insights

**Regionally, the same trends as we see globally prevail, with predominant sales of large and medium TVs, likely sold along with SHS (Figure 29).**

As Figure 30 shows, within Sub-Saharan Africa, most of the sales are from the East Africa region, totaling 116,000 units. This is likely due to the fact that East Africa is the most mature market for SHS via PAYGo business models; which is evidenced by the fact that only 8% of the TVs are reported to

be sold on a cash basis to end-customers. Of the East African sales, large TVs represent 60%, and medium TVs 30%. West Africa is overwhelmingly represented by PAYGo TV sales, with 0 cash sales. These are mostly for medium size TVs, making up 49% of the total, while large TVs makeup 39%. The data for East Asia and Pacific in Figure 31 show that the most common units sold are in the medium and large categories.

**Figure 29 - Sales Volumes by Product Category – Sub-Saharan Africa – TVsz**

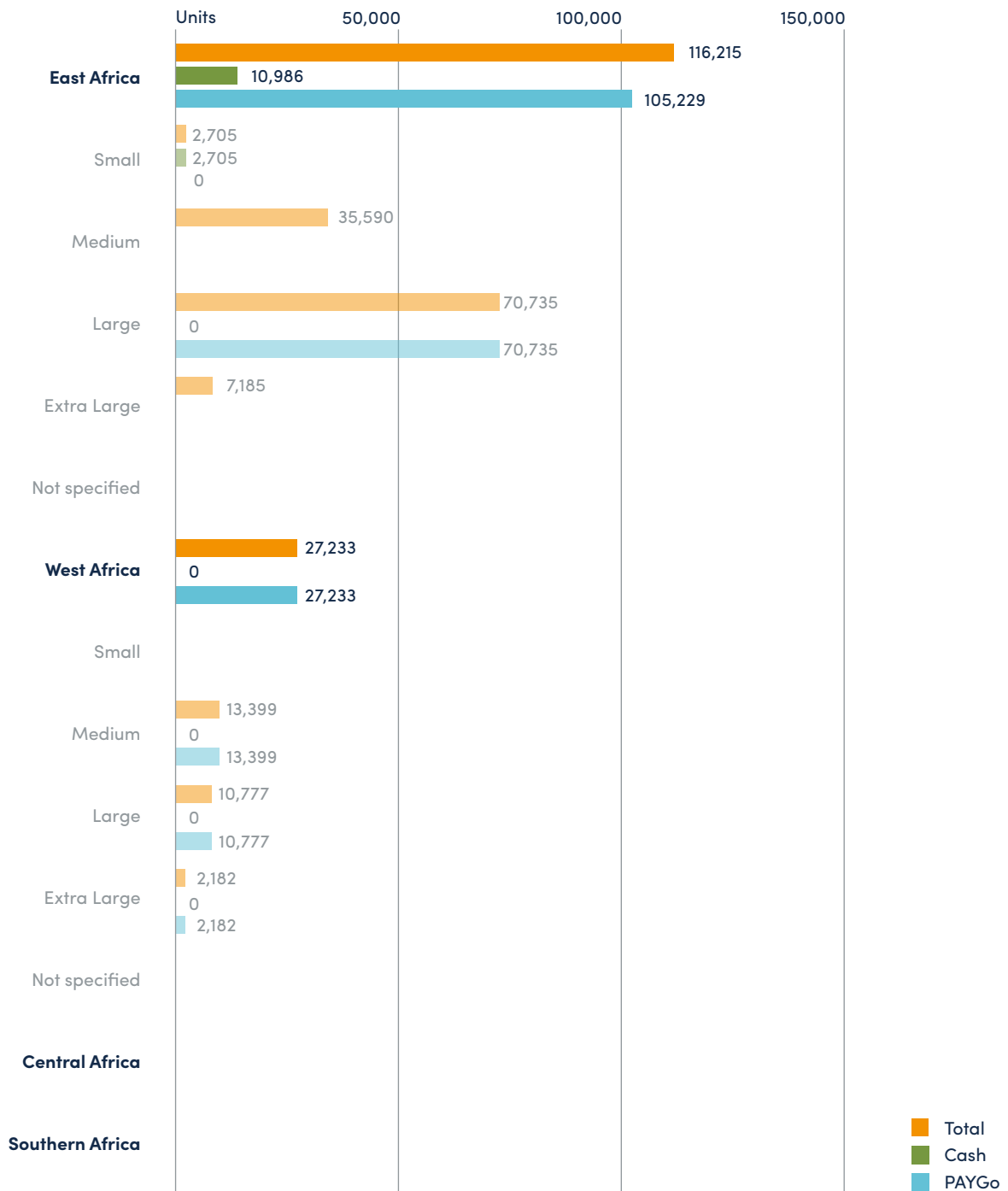


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYGo is shown only if both segments passed the three-data point control.
3. The segmentation of sales is done on the basis of the diagonal display size (in inches).

# Off-Grid Solar Appliances Highlights

**Figure 30 - Sales Volumes by Product Category – African Sub-regions – TVs**

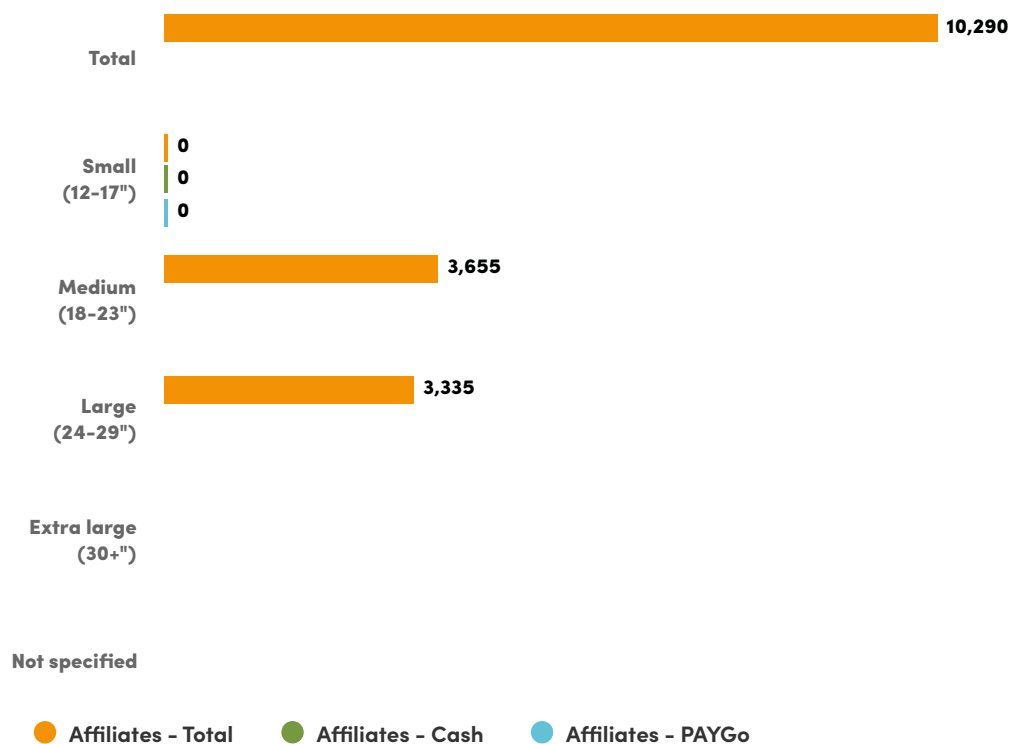


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control
3. The segmentation of sales is done on the basis of the diagonal display size (in inches).

# Off-Grid Solar Appliances Highlights

Figure 31 - Sales Volumes by Product Category – East Asia and Pacific - TVs



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYGo is shown only if both segments passed the three-data point control.
3. The segmentation of sales is done on the basis of the diagonal display size (in inches).

## Country Insights

Breaking down the data by country, Kenya has the most reported sales overall, representing 42% of total reported TV sales worldwide. These sales are predominantly through PAYGo business models, a predictable conclusion as Kenya is the oldest PAYGo-enabled market housing the largest number of existing players, thanks to its early - and by now comprehensive - mobile money penetration.

Table 12 - Sales Volumes by Country – TVs

Countries	Total	Cash	PAYGo
Kenya	67,343	3,332	64,011
Uganda	18,840	-	-
Cote d'Ivoire	12,504	0	12,504
Vanuatu	5,460	0	5,460
Zambia	4,865	-	-
Rwanda	4,205	-	-
Myanmar	2,440	-	-
Nigeria	1,689	0	1,689
Senegal	1,409	0	1,409
Papua New Guinea	1,343	-	-
Pakistan	1,250	-	-
Philippines	1,047	0	1,047

**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

# Off-Grid Solar Appliances Highlights



## Fans

Fans represent what is likely to be the most cost-efficient cooling solution for off-grid populations living in hot and humid climates such as South Asia<sup>18</sup>. In this chapter, results are presented based on the sales of fans by affiliates. Sales will be broken down in the following three product categories, further categorised based on the diameter in inches where possible:

- Table fan, a smaller-diameter propeller-bladed fan having two or more blades and intended for use with free inlet and outlet of air. It may be a table fan or bracket-mounted fan for wall or ceiling mounting.
- Pedestal fan, a propeller-bladed fan having two or more blades mounted on a pedestal of fixed or variable height and intended for use with free inlet and outlet of air.
- Ceiling fan, a propeller-bladed fan having two or more blades and provided with a device for suspension from the ceiling of a room so that the blades rotate in a horizontal plane.

## Global and Regional Insights

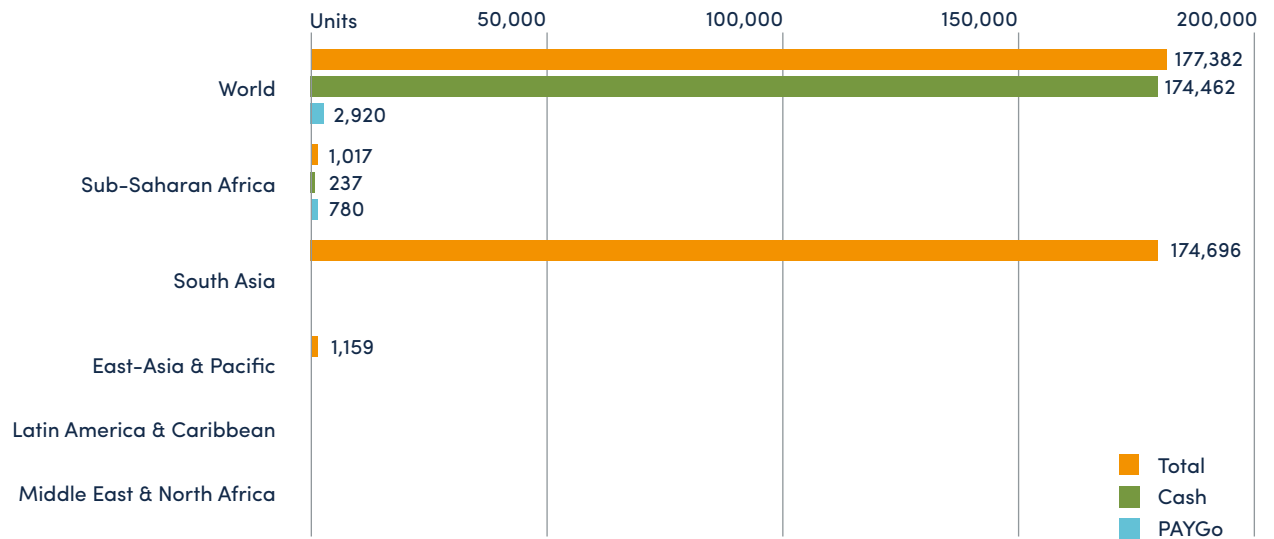
In terms of global sales, **the majority of fans were sold on a cash basis** (Figure 32). **The lower price of the technology relative to other off-grid solar appliances enables rural end-customers to buy fans without any consumer financing.** This trend largely reflects the South Asia reality, where nearly all sales were reported as cash sales, with 175,000 units sold, 98% of the total 177,000 units. Reasons for this dominance of cash sales could be to the local market for fans has developed locally long before than other regions, with more traditional products sold over the counter.

Conversely, just over 1,000 units were reported across Sub-Saharan Africa, with the majority of these on a PAYGo basis (in keeping with the broader regional trend for SHS and off-grid solar appliances, where PAYGo dominates over cash sales). This PAYGo dominance may be due to the fans being bundled with SHS in these geographies rather than the need for end-customer financing to afford those off-grid solar appliances.

**In terms of the diversity of product categories sold, Figure 33 shows that similar volumes of table and pedestal fans were reported,** overall at approximately 55% of the total. Of this, nearly all of the table fans were 12 inches or greater in diameter. The remaining 45% of fans could not be categorised as the number of companies reporting did not meet the three data point rule.

# Off-Grid Solar Appliances Highlights

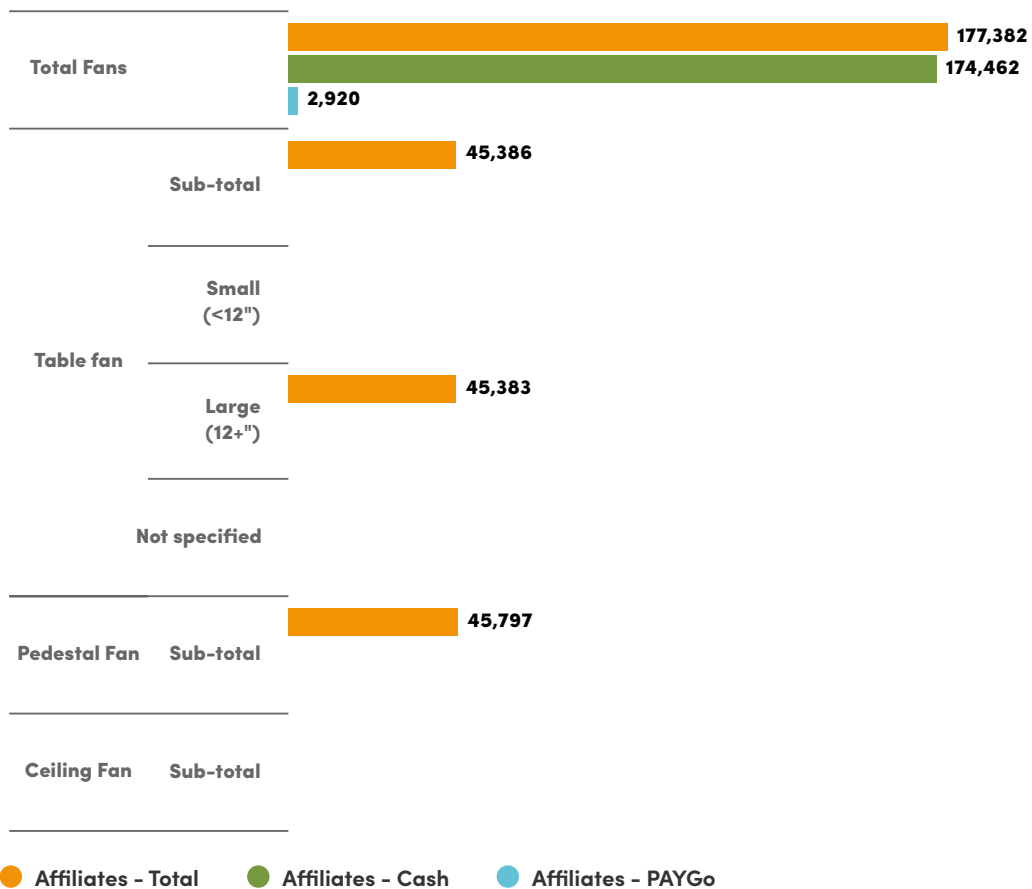
**Figure 32 - Volume of Products Sold per region – Fans**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

**Figure 33 - Volume of Products Sold Globally by Product Category – Fans**



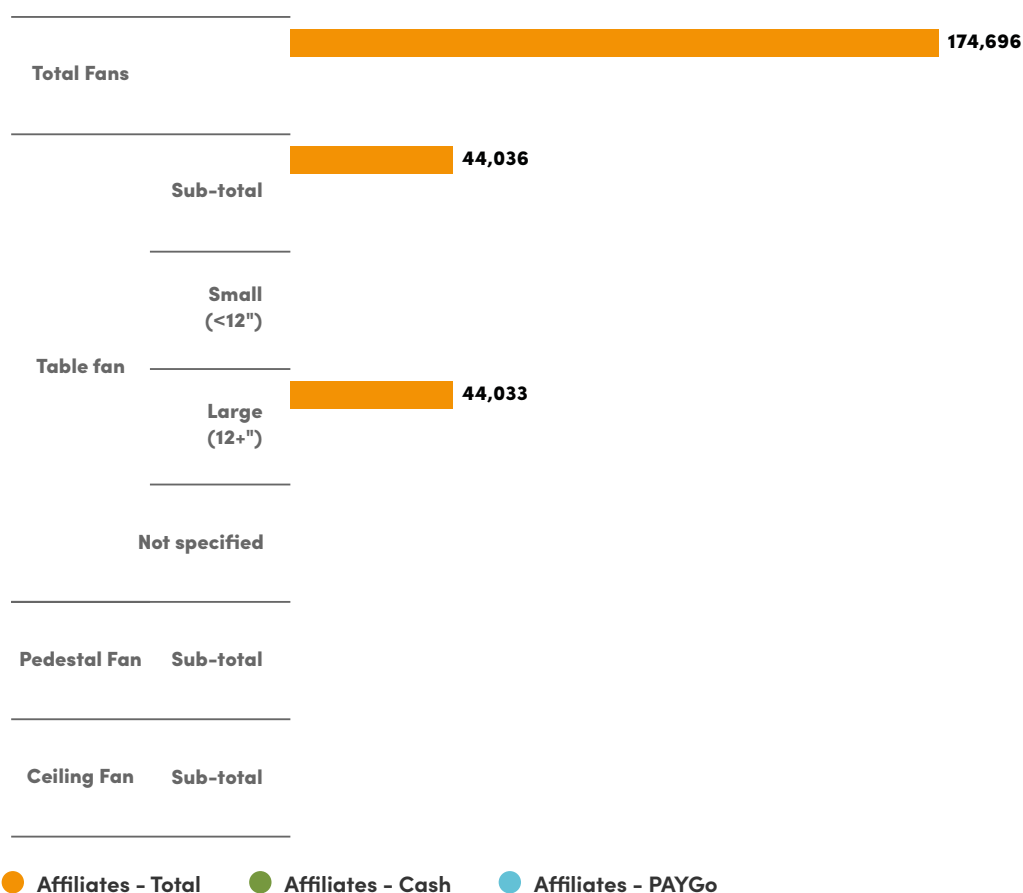
**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYGo is shown only if both segments passed the three-data point control.
3. The segmentation of sales is done on the basis of the diameter (in inches).



# Off-Grid Solar Appliances Highlights

Figure 34 - Sales Volumes by Product Category – South Asia – Fans



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYGo is shown only if both segments passed the three-data point control.
3. The segmentation of sales is done on the basis of the diameter (in inches).

## Countries Insights

Pakistan held the record for the highest sales of fans with 74% of the total number of fan sales reported worldwide. One important market not visible in this table is Bangladesh, where the sales of fans have benefitted from the Global LEAP Procurement Incentives reaching large volumes of products sold. However, not enough companies among those currently active in this market have been mobilised to participate in this first round of data collection; efforts will be made to ensure better coverage in upcoming rounds.

Table 13 - Sales Volumes by Country – Fans

Countries	Total	Cash	PAYGo
Pakistan	131,660	-	-
India	32,639	32,639	0
Nigeria	712	-	-

**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

# Off-Grid Solar Appliances Highlights



# Off-Grid Solar Appliances Highlights



## Refrigeration Units

Overall, off-grid Refrigeration Units still have a very low penetration rate and this report shows small sales volumes; this is due to a variety of barriers such as lack of affordable products and end-customer financing, high cost of energy supply, and difficulty of last-mile transportation<sup>19</sup>. Products reported here are all designed to be suitable for off-grid settings, and are therefore more efficient and run on less power than conventional refrigeration units.

Generally, these refrigeration units may contain two different types of compartments:

- Fresh-food compartments, defined as compartment for the storage and preservation of unfrozen food and beverages, where the storage temperature is between +2°C and +8°C.
- Freezer compartments, defined as compartment for the storage and preservation of frozen food and beverages where the storage temperature is not warmer than -6°C.

This chapter will present sales of refrigeration units by affiliates, broken down in the following three product categories and further segmented based on their size in liters where possible.

- Refrigerators: with one or more fresh food or vaccine compartments.
- Refrigerators-Freezer Combination Units: with at least one fresh food compartment and at least one freezer compartment.
- Multi-Temperature Refrigerator: with one or more compartments that can be operated either as a refrigerator or freezer by adjusting the thermostat control.

## Global, Regional and Countries Insights

**Refrigeration units are not regularly included within SHS packages.** As such, most units are sold on a cash basis, and lower numbers are reported in the PAYGo section. Access to finance could encourage more global sales of refrigeration units.

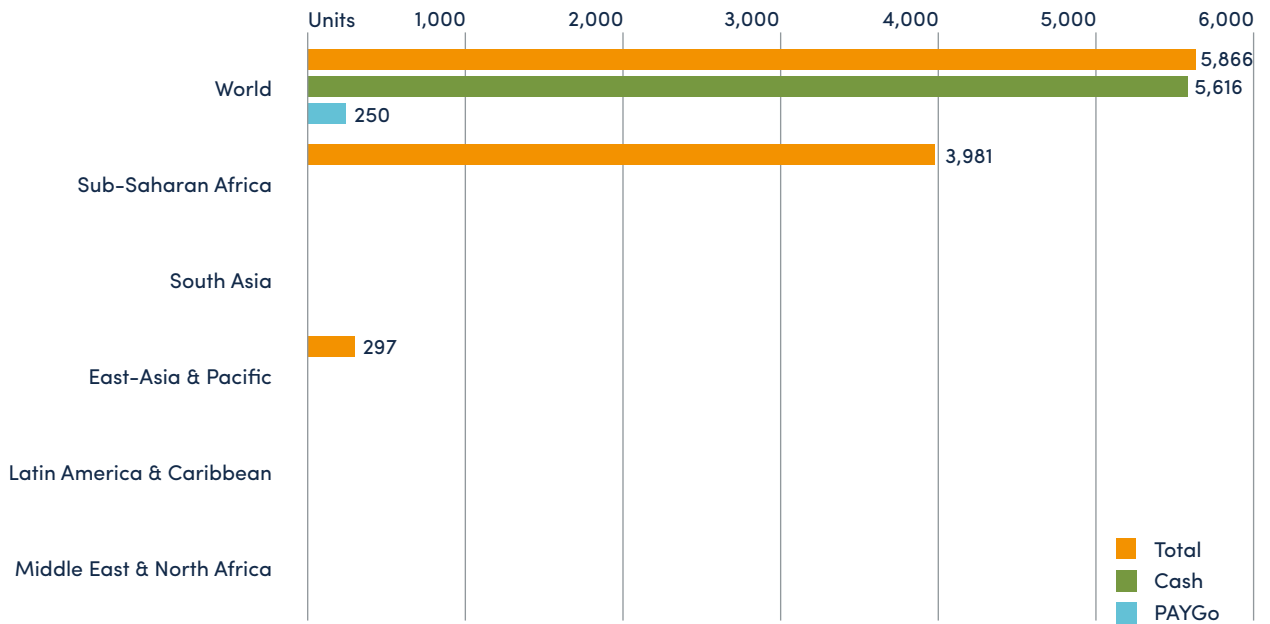
**Sub-Saharan Africa dominates the sale of refrigeration units with approximately 4,000 of the total 6,000 units sold globally,** as Figure 35 shows. These volumes have been anecdotally attributed to institutional sales for ensuring vaccine preservation. West Africa makes up the lion's share of the sales, with East and Central Africa lagging behind (Figure 36). When breaking data down by country, none pass the three data point rule due to the low number of reporting companies.

**The most common product category in the off-grid refrigeration market is refrigerators** - meaning units with one or more fresh food compartments but no freezer compartments - accounting for 82% of all sales (Figure 37). All such refrigerators are medium sized (51-100 litres), probably because they are suitable for use by households, small businesses and institutions alike. Multi-temperature units make up 10%, and refrigerator-freezer combination units 8% of the overall sales. These two categories offer more flexible usage, with the possibility to not only preserve fresh food but also to freeze it.

<sup>19</sup> Efficiency for Access Coalition, "Appliance Data Trends";2018. Full report here: <https://storage.googleapis.com/e4a-website-assets/EforA-ApplianceDataTrendsReport-Sept7.pdf>

# Off-Grid Solar Appliances Highlights

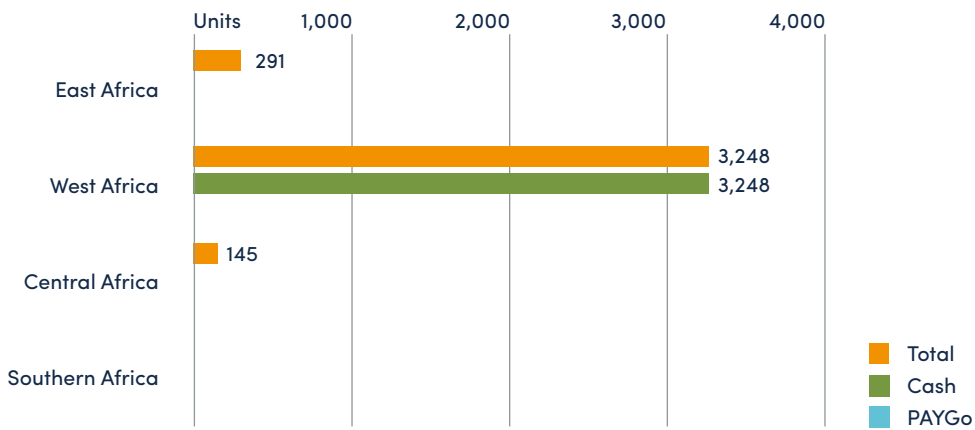
**Figure 35 - Volume of Products Sold per region – Refrigeration Units**



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

**Figure 36 - Sales Volumes African Sub-regions – Refrigeration Units**

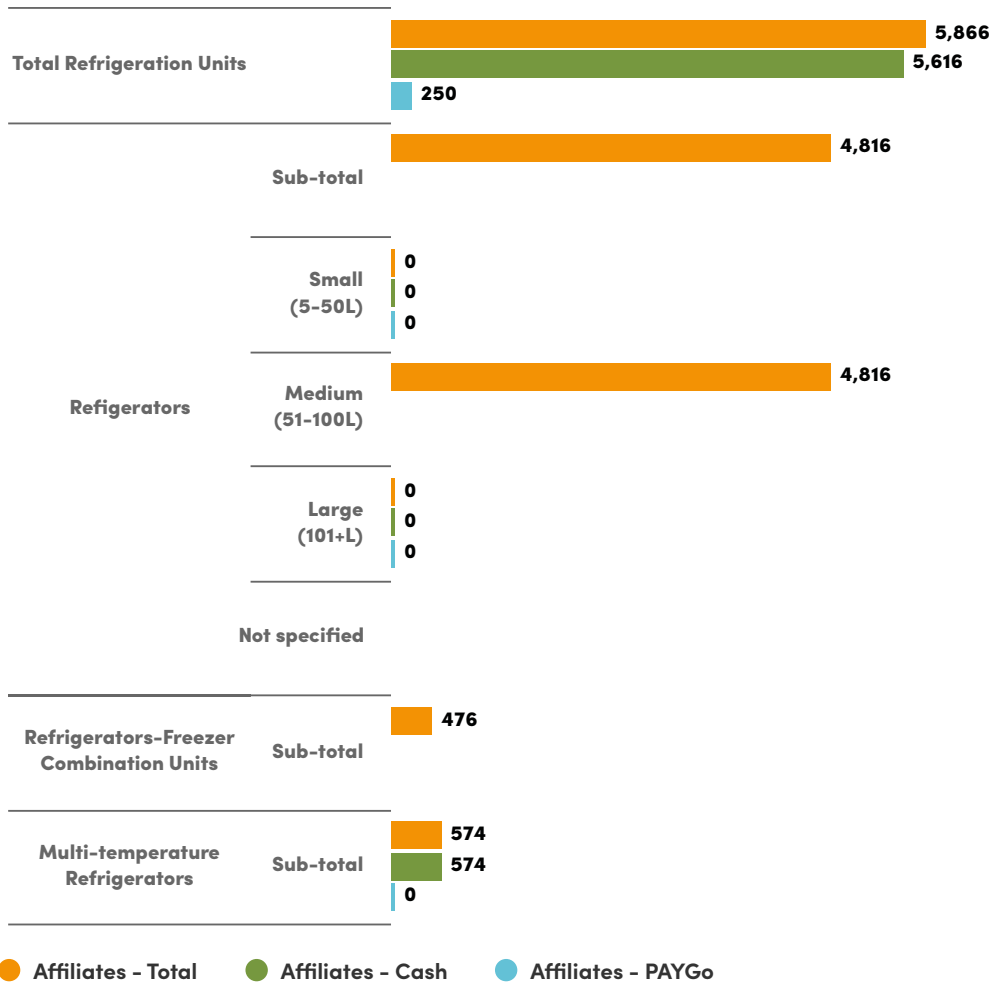


**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

# Off-Grid Solar Appliances Highlights

Figure 37 - Volume of Products Sold Globally by Product Category – Refrigeration Units



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYGo is shown only if both segments passed the three-data point control.
3. The segmentation of sales is done on the basis of the size (in liters).



# Off-Grid Solar Appliances Highlights



## Solar Water Pumps

The agricultural sector employs 40% of the world's population and many of the world's smallholder farmers, especially those in remote locations, have no access to energy. Over the last few years, solar water pumps for irrigation have emerged as a revolutionary technology to help farmers increase crop yields and income, in addition to making them more climate resilient<sup>20</sup>.

However, the sales volumes reported here are still rather small, due to several barriers: lack of affordable products and end-customer financing, low awareness and availability of technology local to intended users, water scarcity, and complexity of use of this technology, among others<sup>21</sup>.

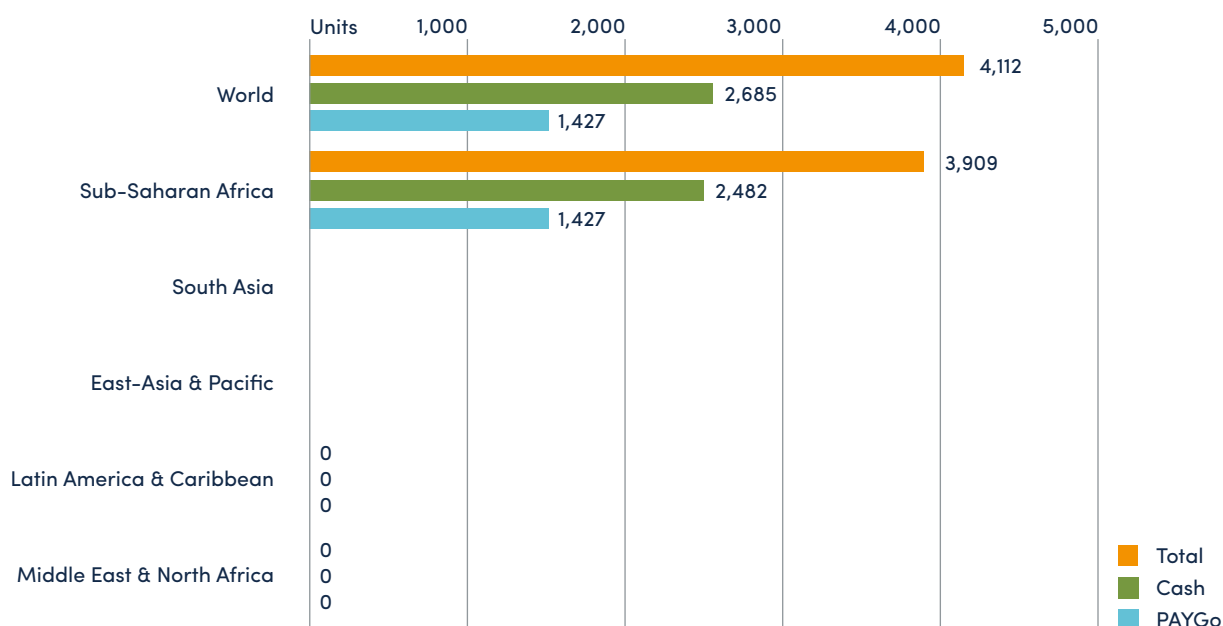
This chapter will present the sales of solar water pumps by affiliates; all products reported here are all DC-powered submersible and surface water pumps designed to be suitable for off-grid settings. However, unlike other off-grid solar appliances in this report, this will not be broken down with further product categorization due to insufficient diversity of product sizes being reported.

## Global, Regional and Countries Insights

**Solar water pumps, due to complexities around standardisation, are not regularly included within SHS packages, and are therefore predominantly sold on a cash basis.** However, PAYGo solutions are already contributing to around 35% of total sales, thanks to the innovation brought by companies specialized in agricultural productive assets which have integrated remote monitoring. Improving access to finance can unlock these markets and deliver a healthy boost to sales.

As Figure 38 shows, **Sub-Saharan Africa accounts for the majority of the units sold, making up 95% of the total sales.** Between the east and west region of Sub-Saharan Africa, East Africa represents 77% of the combined sales in Sub-Saharan Africa (Figure 39). As with the product sub-categorization, no country data can be shown in this report, as this level of granularity did not pass the three data point control due to the low number of reporting companies.

**Figure 38 - Volume of Products Sold per region – Solar Water Pumps**



### NOTE:

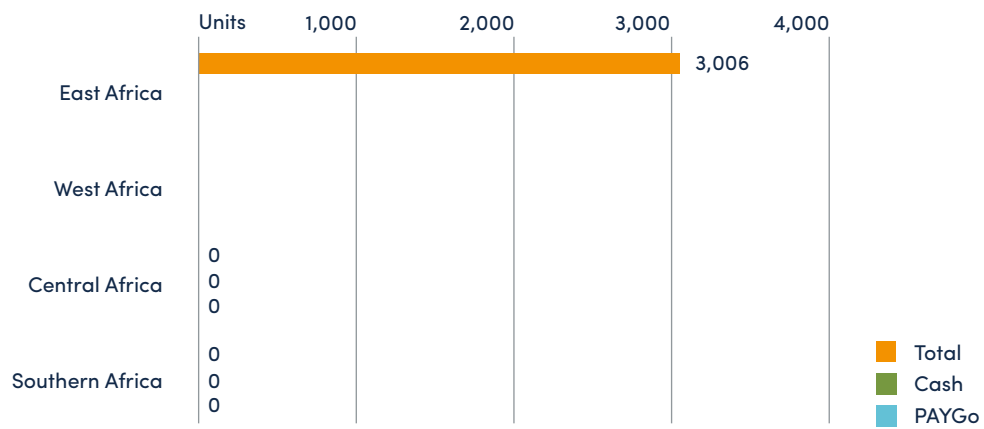
1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control

<sup>20</sup> GOGLA, "How solar water pumps are pushing sustainable irrigation", 2019. Full article here: <https://www.gogla.org/about-us/blogs/how-solar-water-pumps-are-pushing-sustainable-irrigation?platform=hootsuite>

<sup>21</sup> Efficiency for Access Coalition, "Tanzania Market Snapshot: Horticulture Value Chains and Potential for Solar Water Pump Technology", 2019. Full report here: [https://storage.googleapis.com/e4a-website-assets/SWP\\_MarketSnapshot\\_Tanzania.pdf](https://storage.googleapis.com/e4a-website-assets/SWP_MarketSnapshot_Tanzania.pdf)

# Off-Grid Solar Appliances Highlights

Figure 39 - Sales Volumes by Product Category – African Sub-regions – Solar Water Pumps



**NOTE:**

1. Data is not shown for categories for which insufficient or no data points were provided.
2. The split Cash/PAYG is shown only if both segments passed the three-data point control





# Impact Metrics





# Introduction to Impact Metrics

**Impact is calculated using the Standardised Impact Metrics for the Off-Grid Solar Energy Sector<sup>22</sup>**, first launched in 2015 and revised in September 2018. These metrics provide a framework for the off-grid solar sector to collectively estimate its social, economic and environmental impact in a consistent and comparable way.

**The metrics help build the evidence base for the many benefits that off-grid solar lighting products and services unlock for people previously living in energy poverty.** These include unlocking financial savings, generating additional income, and using the light hours to work, study or spend time with family.

## Methodology

Each impact metric in this report combines relevant company data, such as sales and product characteristics, with coefficients and default values. The default values of the coefficients have been developed by the GOGLA Impact Working Group, a body of industry practitioners and academic observers. They incorporate findings from a review of publicly available data. This data was made available by participating companies and by the application of informed assumptions and calculations. The metrics have been reviewed by external experts and are aligned with the IRIS impact metrics<sup>23</sup>.

**The impact estimates for this reporting round were calculated by applying these standardised impact metrics to the off-grid solar lighting products sales reported by affiliates.** The impact of sales between July and December 2018, as well as all sales of off-grid solar lighting products reported by participating companies in previous reports, are included in these calculations.

**Please note that impact created by off-grid solar appliances is not included in this section as metrics have not yet been created for this segment; the impacts detailed refer only to the impact of off-grid solar products.** Efforts will be put to create such metrics for appliances in the coming years.

**The following pages present the aggregated impact of affiliates.** This matrix of companies includes GOGLA members, companies selling Lighting Global quality-verified products, and appliance companies that participated in the Global LEAP Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme. To avoid double-counting, the results are only drawn from data provided by manufacturers.

## Limitations

This report estimates the impact made by participating companies. **Therefore, while the numbers shown represent the aggregate impact of key players in the off-grid solar sector, this report does not present an estimate of the overall global impact of off-grid solar lighting products sold outside the scope of this report for this reporting period.** Based on previous analyses by Dalberg Advisors for the Off-Grid Solar Market Trends Report 2018, we estimate that the data reported here represents the impact of about 30% of all global sales of solar lanterns and multi-light systems (<11Wp) and 60–80% of SHS with over 11 Wp solar panels. This representative proportion varies significantly from country to country.

**This report takes a conservative approach to data inclusion and may underestimate the total impact of participating companies.** To estimate when a product reaches end of life, 1.5x its warranty period is used. This means that no impact is attributed to a product after that time. However, it is possible that a significant number of these products are continuing to benefit households beyond this period. If companies have not provided all the product specifications needed for a particular impact metric, such as lumen output or runtime, the product will not be included in the analysis for that metric.

Please note that research on off-grid solar, and the GOGLA analysis metrics, are being continuously improved. With each reporting round, GOGLA's impact metrics continue to be refined and improved. Therefore it is important to note that the numbers presented are estimates, and may change as new evidence becomes available.

<sup>22</sup> GOGLA, Standardised Impact Metrics for the Off-Grid Solar Energy Sector, Version 3.0, 2018. Full report here: [www.gogla.org/gogla-impact-metrics](http://www.gogla.org/gogla-impact-metrics)

<sup>23</sup> For more information, please visit: <https://iris.thegiin.org/off-grid-energy-metrics>

# Introduction to Impact Metrics

## List of Impact Metrics

The following table gives an overview of all the metrics for which the estimated results are presented in this report. All metrics, as well as the default values and definitions including the methodology and sources can be found in the

GOGLA Standardised Impact Metrics for the Off-Grid Solar Energy Sector<sup>24</sup>.

**Please note that all numbers calculated using the metrics should be expressed as estimates.**

1ai.	<b>Number of people with improved energy access<sup>25</sup>, cumulatively</b> Cumulative number of people who have ever lived in a household with improved energy access (as a result of access to off-grid solar)
1a.ii.	<b>Number of people with improved energy access, currently</b> Number of people who currently live in a household with improved energy access (as a result of access to off-grid solar)
1bi.	<b>Number of people with access to Tier 1 energy services</b> Number of people who currently access Tier 1 energy services, based on the Sustainable Energy for All Global Tracking Framework (as a result of access to off-grid solar)
1b.ii.	<b>Number of people with access to Tier 2 energy services</b> Number of people who currently access Tier 2 energy services, based on the Sustainable Energy for All Global Tracking Framework (as a result of access to off-grid solar)
2a.	<b>Number of People undertaking more economic activity</b> Number of people who are currently undertaking more economic activity as a result of using off-grid solar
2b.	<b>Number of People using products to support enterprise</b> Number of customers using their system to support an enterprise or income generating activities e.g. charging phones for a fee or operating a bar, restaurant or shop/stall at night
2c.	<b>Number of People that spend more time working</b> Number of customers spending more time working as a result of using off-grid solar e.g. as a household member can shift tasks to the evening time as a result of increased light hours or as they spend less time travelling to buy fuel – unlocking time for work
3b.	<b>Additional income generated, cumulatively</b> Cumulative amount of additional income generated as a result of off-grid system ownership; generated over the expected lifetime of the solar products
4.	<b>Kerosene lanterns replaced</b> Number of kerosene lanterns no longer in use because users have replaced them with solar lighting
5.	<b>CO<sub>2</sub>e emissions avoided</b> Metric tons of CO <sub>2</sub> and black carbon averted due to reduction in kerosene use (in CO <sub>2</sub> e) over expected lifetime of all solar products
6ai.	<b>Additional light hours used, by household</b> Average additional hours of light usage, per household; over the expected lifetime of their solar product
6a.ii.	<b>Additional light hours used, cumulatively</b> <b>Cumulative number of additional light hours used by all households; over the expected lifetime of their solar products</b>
6b.	<b>Change in quality of light, by household</b> Change in lumens of light used, per household (on average)
7ai.	<b>Savings on energy expenditure, by household (solar lanterns and multi-light systems &lt;11Wp only)</b> Amount of US\$ savings on energy-related expenditure <sup>26</sup> , per household; over expected lifetime of solar product
7a.ii.	<b>Savings on energy expenditure, cumulatively (solar lanterns and multi-light systems &lt;11Wp only)</b> Amount of US\$ savings on energy-related expenditure, in aggregate of all sales ever; over the expected lifetime of products

<sup>24</sup> GOGLA, Standardised Impact Metrics for the Off-Grid Solar Energy Sector, Version 3.0, 2018. Full report here: [www.gogla.org/gogla-impact-metrics](http://www.gogla.org/gogla-impact-metrics)

<sup>25</sup> In this context, 'improved' is used to reflect lighting and energy provided by appropriate (less expensive, less dangerous, better quality) technologies such as solar, instead of baseline technologies such as kerosene lanterns, battery lights, candles, or even poor-quality solar products etc.

<sup>26</sup> Change in energy expenditure calculated using expenditure on lighting and phone charging only

# Impact Metrics Highlights

## Key Impact Estimates

Impact estimates relate to all off-grid solar lighting products reported sold to date by participating affiliates<sup>27</sup> (as of December 2018)



<sup>27</sup> Affiliates include GOGLA members, companies selling Lighting Global quality-verified products, and appliance companies that participated in the Global LEAP Energy Efficient Appliance Awards or are engaging with the Low Energy Inclusive Appliances (LEIA) programme.

# Impact Metrics Highlights

## Why is there a difference between the cumulative and current energy access figures?

The number of people currently benefiting from off-grid solar lighting products sold by affiliates is just under half of those who, cumulatively, have benefitted from improved energy access. The difference between the two estimates arises from the conservative way that GOGLA reports impact data, incorporating a product 'end of life' period into the measurement that is equal to 1.5 times the warranty. This is usually between two and five years. After that point, no further impact is reported for that product. However, it is likely that a significant number of the products are continuing to benefit households beyond this period, or that these households may have continued to use solar products not captured in this exercise.

## Global Analysis of Estimated Impact

**Impact estimates continue to rise, highlighting the benefits unlocked by the nearly 4 million new sales of off-grid solar lighting products in the second half of 2018.** Significant increases are seen across all household level impact figures; from the number of people using their system to support enterprise rising from 2.4 million to 2.7 million, to the amount of additional income unlocked by the sales of off-grid solar to date which has increased from \$3.5 billion to \$4.2 billion.

Beneficial environmental impact has also risen from an estimated 51 million metric tonnes of CO<sub>2</sub>e averted to 58.4 million over the lifetime of all products sold. This is equal to taking 15 coal-fired powered power plants off-line for a year.

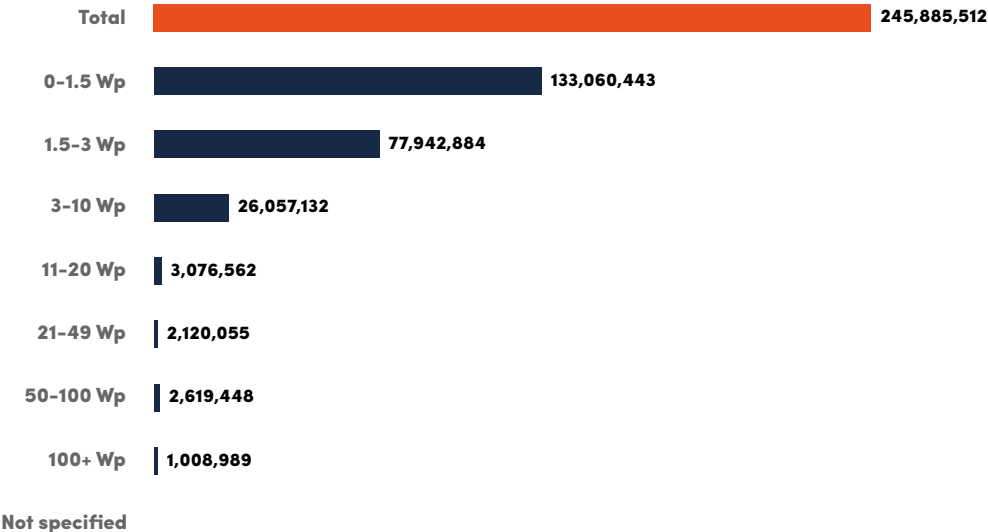
The cumulative number of people who have ever benefited from energy access has seen a more rapid increase since the first half of 2018, from 214.8 million to 245.9 million, although this is largely related to the increase in the number of companies who have reported their data to GOGLA. This gives us a stronger understanding of the improvements in energy access that the sector has created since 2010.

**The most significant impact trend for the second half of 2018 is the increase in the number of people now benefiting from Tier 2 energy access as a result of the increasing sales of larger SHS, which has seen a boost of 33% compared to the first half of 2018. Close to 5 million people now have access to enough energy each day to power a range of appliances.** This improved energy service for those previously living in energy poverty means almost 5 million people have enough power to watch television, turn on a fan, or use additional appliances such as sewing machines, electric razors or multiple phone charging kits.

This boost in system capacity is also increasing the light quality that is now available to households using solar. Across all system types the average improvement in lumen outputs – a measure of brightness – is 71 lumens but for the largest 100+ Wp systems the increase is over 1,000 lumens (see Table 14). This means that for those using solar, the lights are not only being switched on, they are continuing to get brighter.

# Impact Metrics Highlights

Figure 40 - People with Improved Energy Access – Cumulatively



# Impact Metrics Highlights

Figure 41 - People with Improved Energy Access - Currently

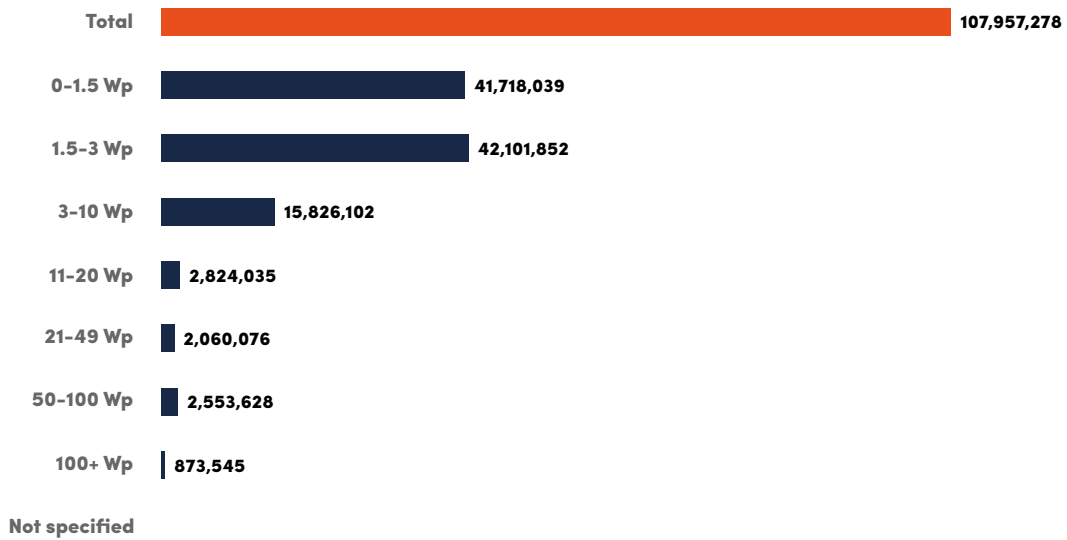
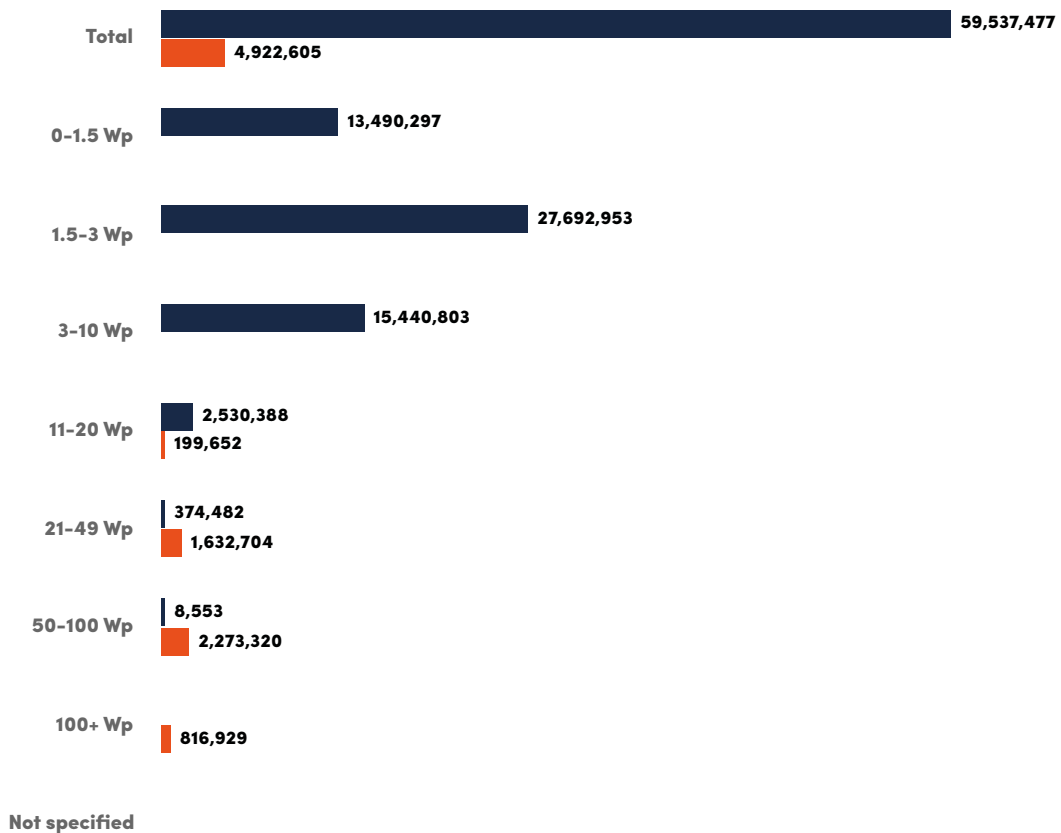


Figure 42 - People with Access to Tier 1 and Tier 2 Energy Services (According to SEforALL Methodology)



**NOTE:**

1. The Global Tracking Framework was introduced by the UN's SEforALL program and comprises five tiers which address a previous shortfall in energy access categorization. Before the framework was introduced, a household either had a grid connection or it was unconnected i.e. electricity access was seen as binary. The framework includes a more nuanced approach, starting with Tier 1 as the most basic energy access of task lighting and phone charging, progressing up to Tier 5 which describes general home lighting system, television and fan, plus any other high power appliance.

# Impact Metrics Highlights

Figure 43 - People Undertaking More Economic Activity

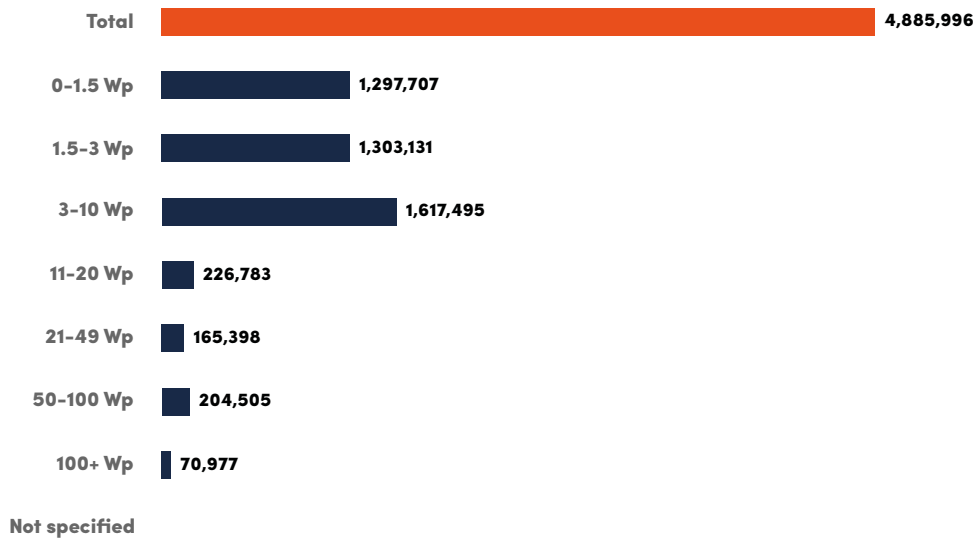
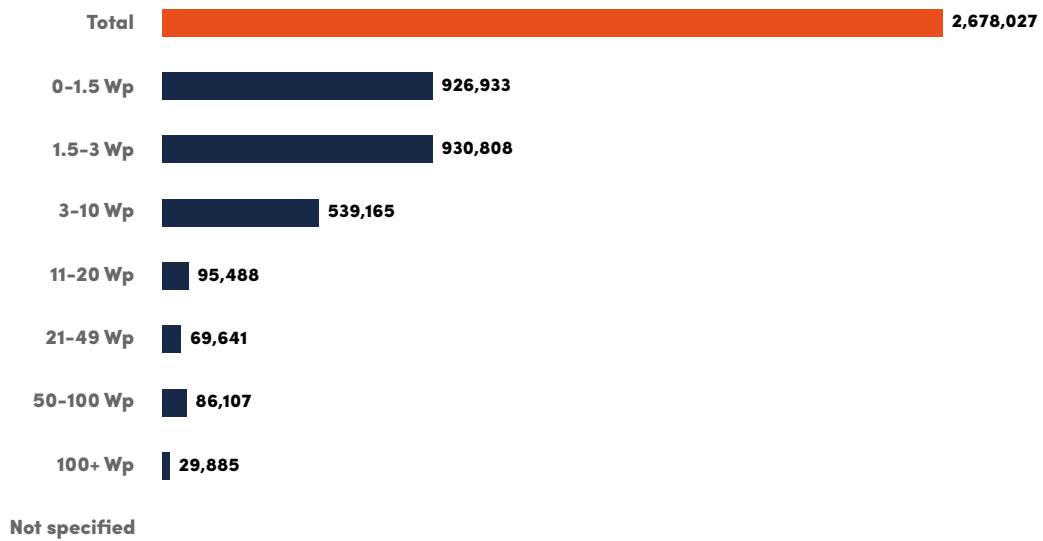


Figure 44 - People Using Products to Support Enterprise



# Impact Metrics Highlights

Figure 45 - People that Spend More Time Working

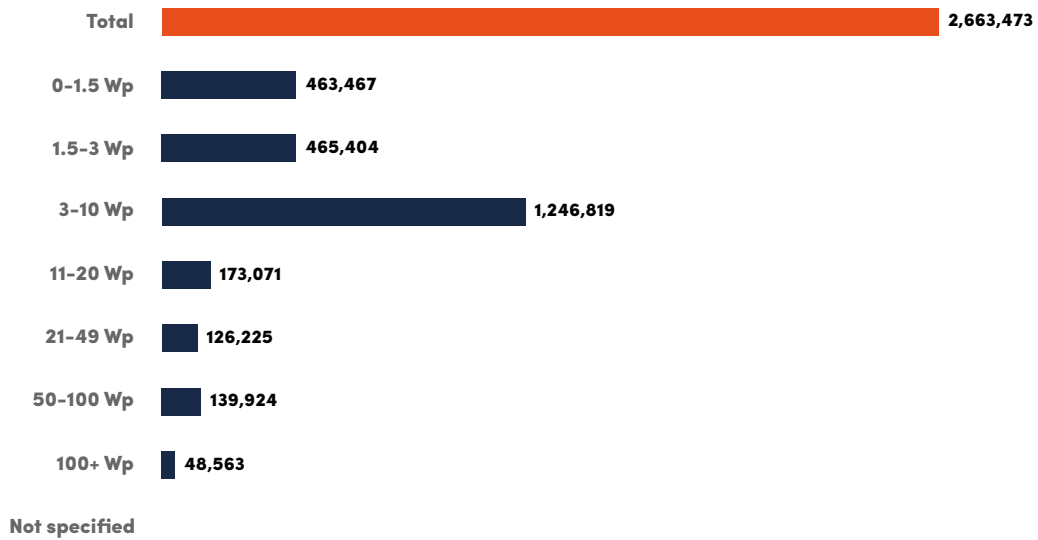
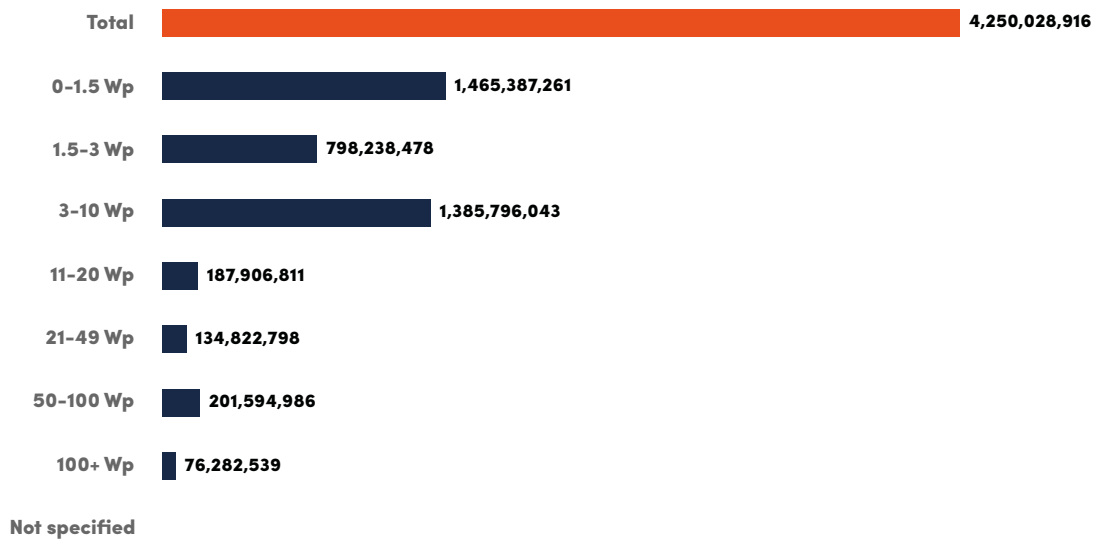


Figure 46 - Additional Income Generated





# Impact Metrics Highlights

Figure 47 – Kerosene Lanterns Replaced

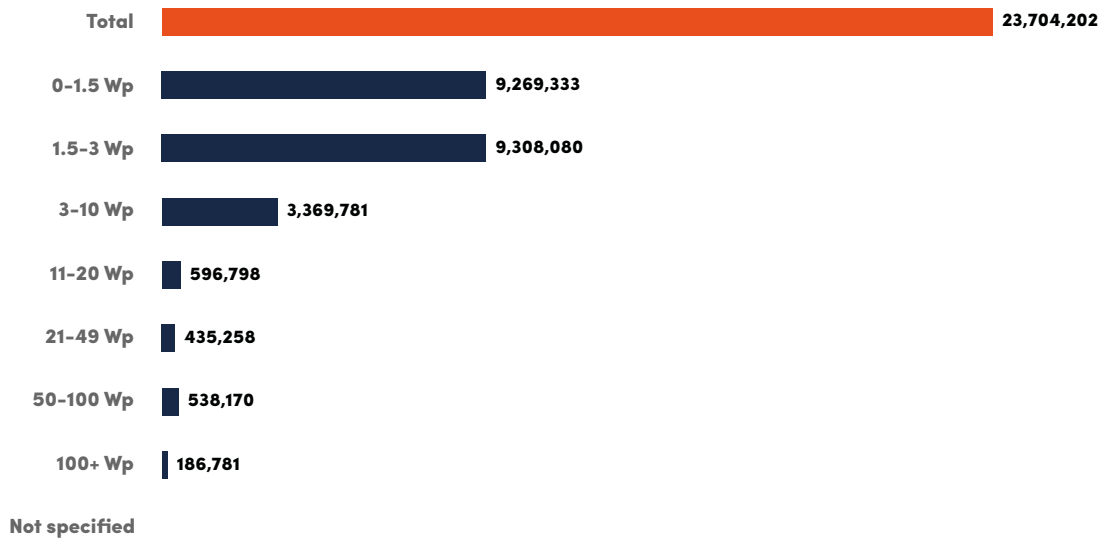
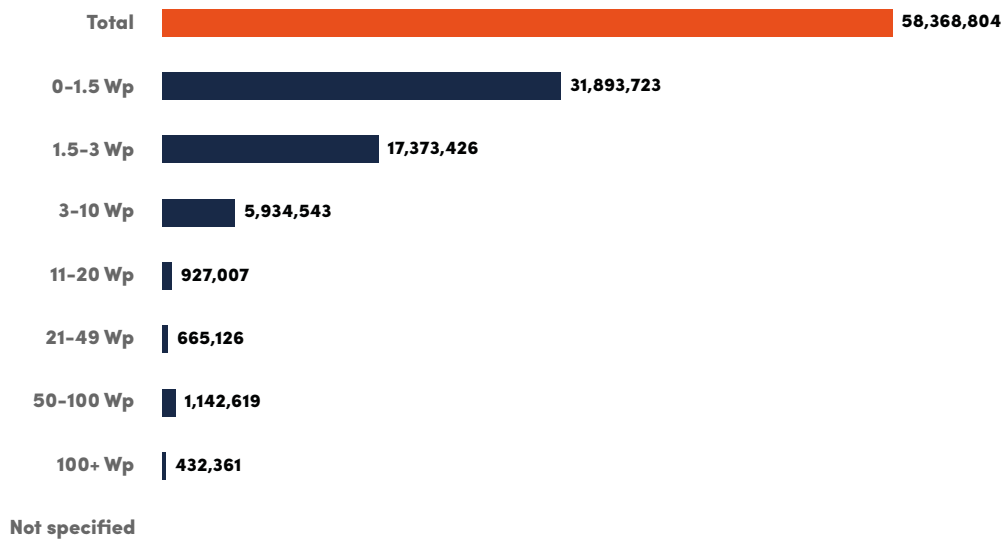


Figure 48 – CO2e Emissions Avoided



# Impact Metrics Highlights

Figure 49 - Additional Light Hours Used – Household

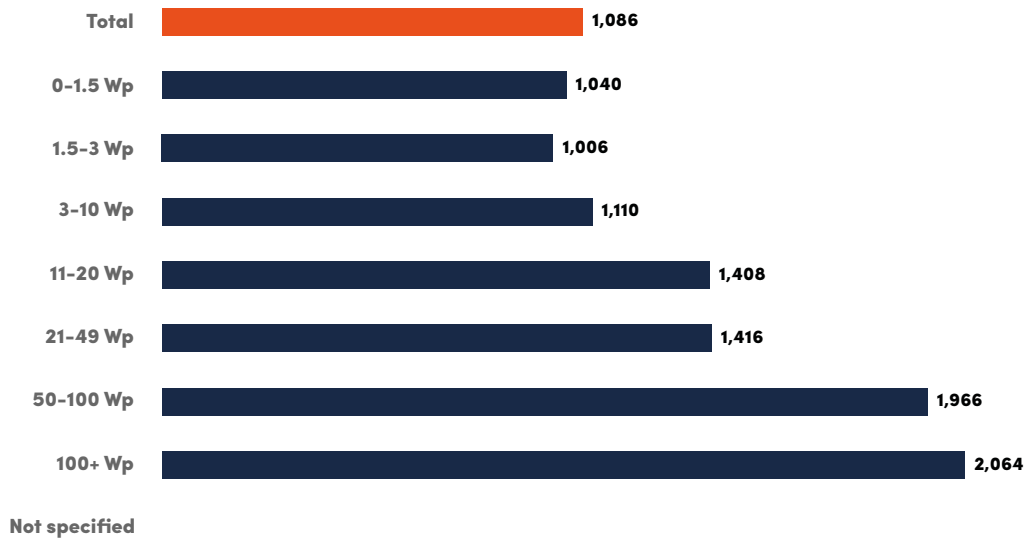
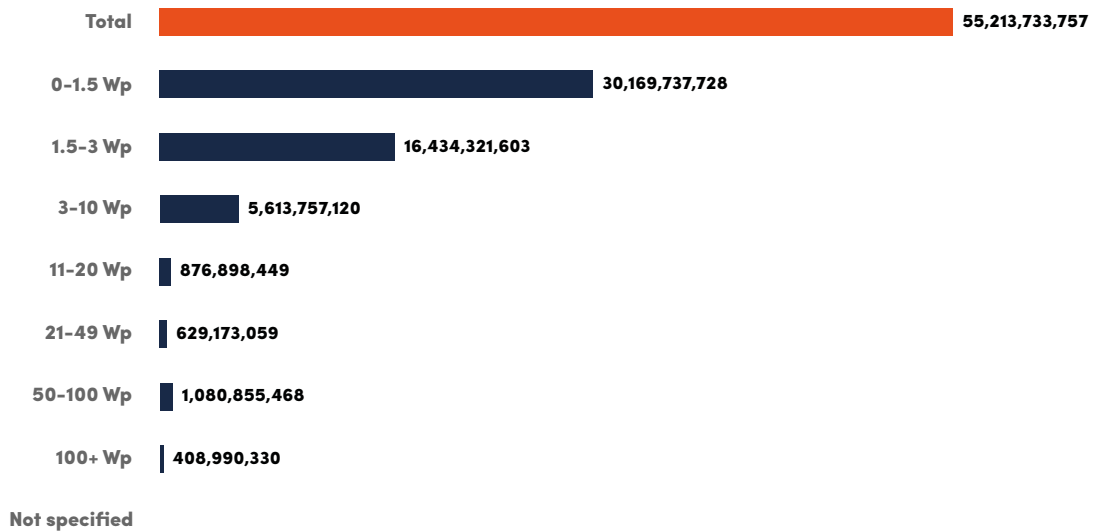


Figure 50 - Additional Light Hours Used - Cumulatively



# Impact Metrics Highlights

Figure 51 - Change in Quality of Light – Household

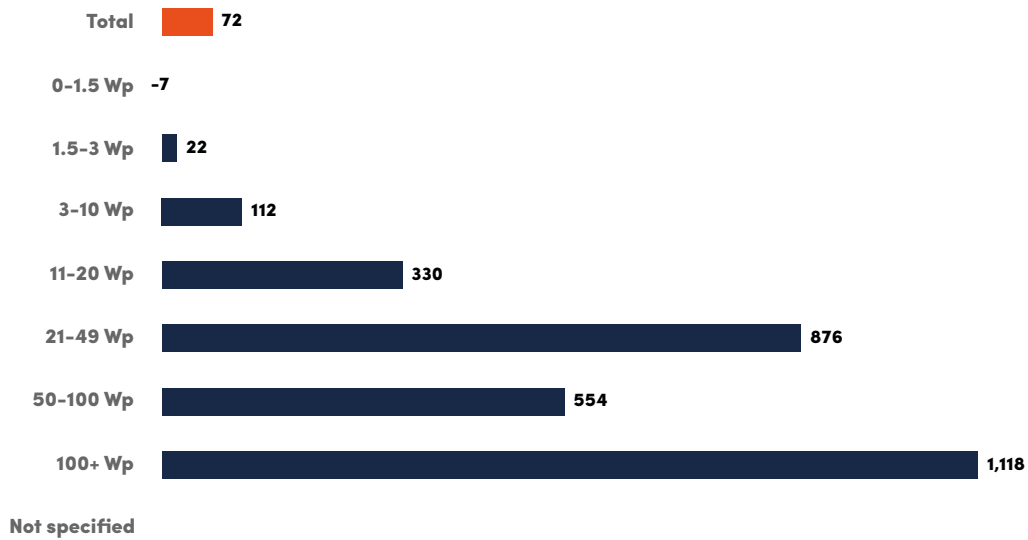
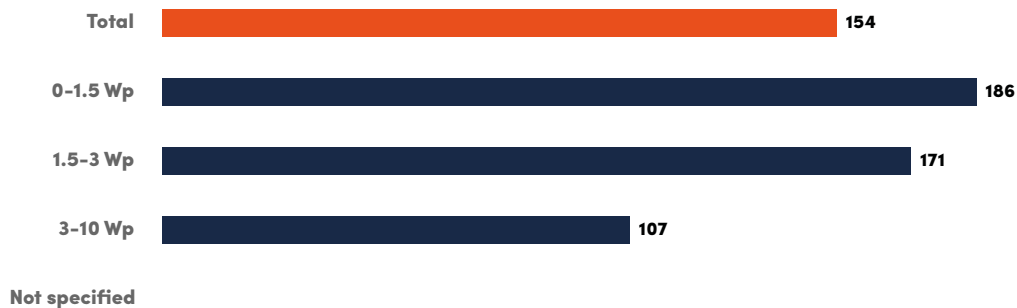


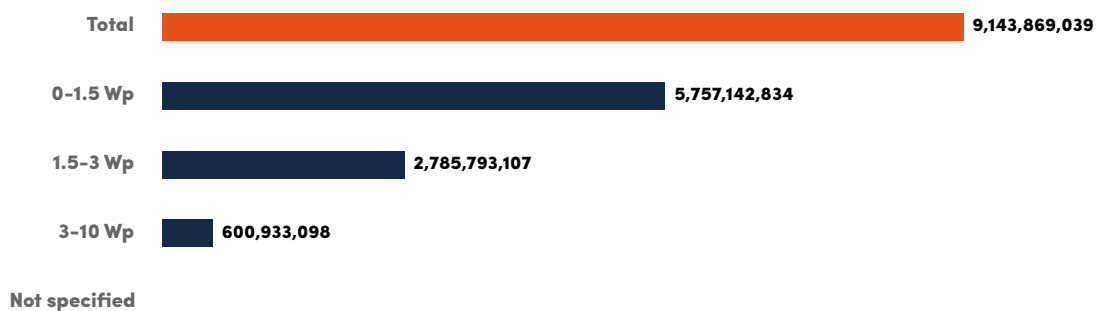
Figure 52 - Savings on Energy Expenditure – Household



**NOTE:**

1. This metric is computed only for systems with wattage lower than 11 Wp as those are the ones which normally replace the previously used light sources (e.g. kerosene lanterns etc.)

Figure 53 - Savings on Energy Expenditure – Cumulatively



**NOTE:**

1. This metric is computed only for systems with wattage lower than 11 Wp as those are the ones which normally replace the previously used light sources (e.g. kerosene lanterns etc.)

# Impact Metrics Highlights

**Table 14 – Global Impact by Product Category**

	People with Improved Energy Access – Cumulatively	People with Improved Energy Access – Currently	People with Access to Tier 1 Energy Services (According to SE4All Methodology)	People with Access to Tier 2 Energy Services (According to SE4All Methodology)
<b>World</b>	<b>245,885,512</b>	<b>107,957,278</b>	<b>59,537,477</b>	<b>4,922,605</b>
0-1.5 Wp	133,060,443	41,718,039	13,490,297	-
1.5-3 Wp	77,942,884	42,101,852	27,692,953	-
3-10 Wp	26,057,132	15,826,102	15,440,803	-
11-20 Wp	3,076,562	2,824,035	2,530,388	199,652
21-49 Wp	2,120,055	2,060,076	374,482	1,632,704
50-100 Wp	2,619,448	2,553,628	8,553	2,273,320
100+ Wp	1,008,989	873,545	-	816,929
Not specified	-	-	-	-

	People Undertaking More Economic Activity	People using products to support enterprise	People that spend More Time Working	Additional Income Generated
<b>World</b>	<b>4,885,996</b>	<b>2,678,027</b>	<b>2,663,473</b>	<b>\$4,250,028,916</b>
0-1.5 Wp	1,297,707	926,933	463,467	\$1,465,387,261
1.5-3 Wp	1,303,131	930,808	465,404	\$798,238,478
3-10 Wp	1,617,495	539,165	1,246,819	\$1,385,796,043
11-20 Wp	226,783	95,488	173,071	\$187,906,811
21-49 Wp	165,398	69,641	126,225	\$134,822,798
50-100 Wp	204,505	86,107	139,924	\$201,594,986
100+ Wp	70,977	29,885	48,563	\$76,282,539
Not specified	-	-	-	-

	Additional Light Hours Used - Household	Additional Light Hours Used - Cumulatively	Change in Quality of Light - Household
<b>World</b>	<b>1,086</b>	<b>55,213,733,757</b>	<b>72</b>
0-1.5 Wp	1,04	30,169,737,728	-7
1.5-3 Wp	1,006	16,434,321,603	22
3-10 Wp	1,11	5,613,757,120	112
11-20 Wp	1,408	876,898,449	330
21-49 Wp	1,416	629,173,059	876
50-100 Wp	1,966	1,080,855,468	554
100+ Wp	2,064	408,990,330	1,118
Not specified	-	-	-

	Savings on Energy Expenditure - Household	Savings on Energy Expenditure – Cumulatively	Kerosene Lanterns Replaced	CO2e emissions avoided
<b>World</b>	<b>\$154</b>	<b>\$9,143,869,039</b>	<b>23,704,202</b>	<b>58,368,804</b>
0-1.5 Wp	\$186	\$5,757,142,834	9,269,333	31,893,723
1.5-3 Wp	\$171	\$2,785,793,107	9,308,080	17,373,426
3-10 Wp	\$107	\$600,933,098	3,369,781	5,934,543
11-20 Wp	-	-	596,798	927,007
21-49 Wp	-	-	435,258	665,126
50-100 Wp	-	-	538,17	1,142,619
100+ Wp	-	-	186,781	432,361
Not specified	-	-	-	-

## Impact Metrics Highlights



# References and Credits

## References

- Off-Grid Solar Market Trends Report 2018, Published by Dalberg Advisors and Lighting Global, an innovation of the World Bank Group, in cooperation with GOGLA. <https://www.lightingglobal.org/2018-global-off-grid-solar-market-trends-report/>
- Beyond Connections: Energy Access Redefined, Published by the Energy Sector Management Assistance program of the World Bank group (ESMAP Technical Report 008/15), 2015. <https://www.esmap.org/node/55526>
- In Focus South Asia and the use of PAYGo, Jan 2019, GOGLA. <https://www.gogla.org/about-us/blogs/in-focus-south-asia-and-the-use-of-paygo?platform=hootsuite>
- Energy Access and the Syrian Refugee Crisis: A Situational Report on the Solar Energy Sector in Lebanon, March 2019, Lighting Global. <https://www.lightingglobal.org/wp-content/uploads/2019/02/Solar-Energy-in-the-Syrian-Refugee-Crisis-Updated-3.20.19.pdf>
- How solar water pumps are pushing sustainable irrigation, 2019, GOGLA. <https://www.gogla.org/about-us/blogs/how-solar-water-pumps-are-pushing-sustainable-irrigation?platform=hootsuite>
- Tanzania Market Snapshot: Horticulture Value Chains and Potential for Solar Water Pump Technology, 2019, Efficiency for Access Coalition. [https://storage.googleapis.com/e4a-website-assets/SWP\\_MarketSnapshot\\_Tanzania.pdf](https://storage.googleapis.com/e4a-website-assets/SWP_MarketSnapshot_Tanzania.pdf)
- Appliance Data Trends, 2018, Efficiency for Access Coalition. <https://storage.googleapis.com/e4a-website-assets/EforA-ApplianceDataTrendsReport-Sept7.pdf>
- Off-Grid Appliance Market Survey, 2018, Efficiency for Access Coalition. <https://efficiencyforaccess.org/publications/off-grid-appliance-market-survey>
- Standardised Impact Metrics for the Off-Grid Solar Energy Sector, Version 3.0, September 2018, GOGLA. [www.gogla.org/gogla-impact-metrics](http://www.gogla.org/gogla-impact-metrics)
- Lighting Global Quality Standards (Lighting Global / International Electrical Commission Technical Specification 96652). <https://www.lightingglobal.org/quality-assurance-program/>

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# Contact Information

## **GOGLA**

Arthur van Schendelstraat 500A,  
3511 MH Utrecht  
The Netherlands

[www.gogla.org](http://www.gogla.org)  
[info@gogla.org](mailto:info@gogla.org)

## **Lighting Global**

2121 Pennsylvania Avenue NW,  
Washington, D.C. 20433  
United States of America

[www.lightingglobal.org](http://www.lightingglobal.org)  
[info@lightingglobal.org](mailto:info@lightingglobal.org)

## **Efficiency for Access Coalition**

[www.efficiencyforaccess.org](http://www.efficiencyforaccess.org)  
[info@efficiencyforaccess.org](mailto:info@efficiencyforaccess.org)

## **Energy Saving Trust**

30 North Colonnade, 6th Floor,  
London, E14 5GP  
United Kingdom

[www.est.org.uk](http://www.est.org.uk)  
[info@est.org.uk](mailto:info@est.org.uk)

## **CLASP**

1401 K Street NW., Suite 1100,  
Washington, D.C. 20006  
United States of America

[www.clasp.ngo](http://www.clasp.ngo)  
[info@clasp.ngo](mailto:info@clasp.ngo)

Arthur van Schendelstraat 500A  
3511 MH Utrecht  
The Netherlands

[info@gogla.org](mailto:info@gogla.org)  
+31 304 100 914



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