

A report by



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# PRiCiNG QUALiTY

## COST DRiVERS AND VALUE ADD iN THE OFF-GRiD SOLAR SECTOR



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## ABOUT iBAN

The Inclusive Business Action Network (iBAN) is a global initiative supporting the scaling and replication of inclusive business models. Through its strategic pillars iBAN blue and iBAN weave, iBAN manages an innovative online knowledge platform on inclusive business ([► inclusivebusiness.net](https://www.inclusivebusiness.net)) and offers a focused Capacity Development Programme for selected companies and policymakers in developing and emerging countries. iBAN creates a space where evidence-based knowledge transforms into learning and new partnerships. With its focus on promoting the upscale of inclusive business models and consequently improving the lives of the poor, iBAN is actively contributing to the achievement of the United Nations Sustainable Development Goals.

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## ABOUT HYSTRA

Hystra is a global consulting firm that supports corporations, social businesses and social investors in designing and implementing sustainable and scalable inclusive business strategies. Since its creation in 2009, Hystra has supported multinationals such as Total, Engie, LafargeHolcim and Unilever in setting up or improving inclusive business models, prepared business plans or helped refine the marketing and sales strategy of pioneering inclusive businesses, supported several social impact funds, and helped public and private donors work with companies to achieve their development objectives. In ten years, Hystra has worked on more than 200 projects in over 20 countries, to support business models that change the lives of low-income communities across the globe.

For more information on Hystra and our publications, visit [► www.hystra.com](https://www.hystra.com)

## ABOUT GOGLA

GOGLA is the global association for the off-grid solar energy industry. Established in 2012, GOGLA now represents over 160 members as a neutral, independent, not-for-profit industry association. Its mission is to help its members build sustainable markets, delivering 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, go to [► www.gogla.org](https://www.gogla.org).

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# PRiCiNG QUALiTY:

## COST DRiVERS AND VALUE ADD iN THE OFF-GRiD SOLAR SECTOR

### CONTENT

Executive Summary.....	6
Introduction .....	10
1. Quality is key for both consumers and governments .....	14
2. Quality comes at a justifiable cost .....	20
3. Policymakers and industry players have an opportunity to make quality more affordable .....	32
Conclusion.....	42
Policymaker pitch .....	44
Sources .....	45

# LIST OF ABBREVIATIONS

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<b>CFL</b>	Compact Fluorescent Lamp
<b>EAC</b>	East African Community
<b>EnDev</b>	Energising Development
<b>FAO</b>	Food and Agriculture Organization
<b>FOB</b>	Free on Board
<b>FOREX</b>	Foreign exchange
<b>KES</b>	Kenyan Shilling
<b>KOSAP</b>	Kenya Off-grid Solar Access Project
<b>LED</b>	Light Emitting Diode
<b>LEIA</b>	Low Energy Inclusive Appliances
<b>LG</b>	Lighting Global
<b>LGQA</b>	Lighting Global Quality Assurance
<b>MFI</b>	Microfinance Institution
<b>NGO</b>	Non-Governmental Organizations
<b>ODI</b>	Overseas Development Institute
<b>OGS</b>	Off-Grid Solar
<b>PAYGO</b>	Pay-As-You-Go
<b>PPP</b>	Purchasing Power Parity
<b>QV</b>	Quality Verified
<b>R&amp;D</b>	Research & Development
<b>RBF</b>	Result-Based Financing
<b>REA</b>	Rural Electrification Agency
<b>SDG</b>	Sustainable Development Goals
<b>SHS</b>	Solar Home System
<b>SSA</b>	Sub-Saharan Africa
<b>TAREA</b>	Tanzanian Renewable Energy Association
<b>TV</b>	Television
<b>USD</b>	United States Dollar
<b>VAT</b>	Value Added Tax

# EXECUTIVE SUMMARY

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The off-grid solar (OGS) sector is currently providing energy access to 108 million people<sup>1</sup> and delivering remarkable social, economic and environmental impact. Some countries have combined supportive policy environments with a dynamic private sector and have achieved rapid growth. There is truly a historic opportunity to achieve universal energy access. However, the sector needs to address worrying market trends; non-quality verified (non-QV) OGS products are estimated to represent 71 percent of the market. Healthy competition is good for customers, but a race to the bottom that fails to deliver customer value and satisfaction is not serving anyone. **GOGLA and HYSTRA partnered on this research to better understand the cost drivers of quality premiums, and inform policymakers of opportunities to promote affordable, quality products to off-grid and poor-grid families.**

**Quality matters: it is a necessary condition for bringing social and financial benefits to families and enabling a sustainable expansion of OGS. Quality is not limited to product characteristics. Quality is delivered by companies who sell high-performance products, but also offer effective services to consumers beyond sales (e.g. effective after-sales and consumer finance) and who adopt responsible business practices, including paying their taxes.** In 2017, the Lighting Global Quality Assurance (LGQA) team led research on top-selling non-QV solar products sold in five markets across Africa and South Asia. All 17 tested products failed to meet the Lighting Global (LG) quality standards. Poor quality can be detrimental in several ways: consumers not only miss out on the promised benefit that they paid for, they also often end up paying more to replace defective products than they would have otherwise paid for a higher quality product. Furthermore, the lack of trust that poor quality fosters in the sector hinders the market's growth for all players.

**Yet, quality also comes at a cost: quality products are generally more expensive (to varying extents) than non-quality products offering similar functionalities (vs. similar quality).** Price differences of 4-5x have been observed. The comparative analysis between QV and non-QV solar home systems (SHS) sold in Kenya shows that, for any QV product, consumers can either purchase a non-QV product with similar capacity at a significantly lower price, or a significantly higher capacity non-QV product at a similar price.

**For this report, we conducted a cost breakdown analysis based on desk research and past Hystra in-depth case studies of 20+ solar players among both non-quality and quality products. We further pressure-tested those hypotheses with 15+ OGS companies and experts.** As a caveat, these analyses are indicative of trends, not reflective of a given product or country. They also do not reflect the wide variations in both quality and price points that exist within each of the quality and non-quality categories. Yet, they provide validated insights into why quality costs more.

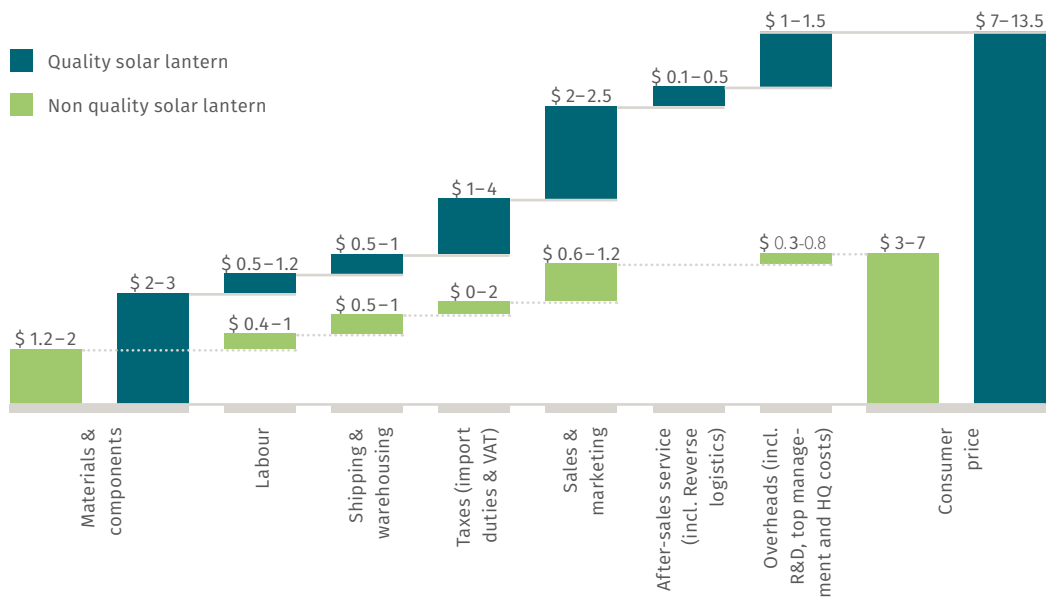
**Upstream, the primary sources of the quality premium (~25per cent of premium for solar lanterns; ~15 per cent for SHS) are the cost of quality components – namely batteries – and taxes.** Prices of components are expected to be reduced by 14-30 per cent in the coming two years, and programs such as Low Energy Inclusive Appliances (LEIA) are working on developing more efficient appliances that could make a significant difference in lowering prices. Quality players pay higher taxes, while non-quality products are often sold via leaner - sometimes informal - routes, including retail and open markets. Narrowing the gap implies enforcing tax payments more consistently for all players.

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1 GOGLA (2019), Global OGS Market Report Semi-Annual Sales and Impact Data, July-December 2018

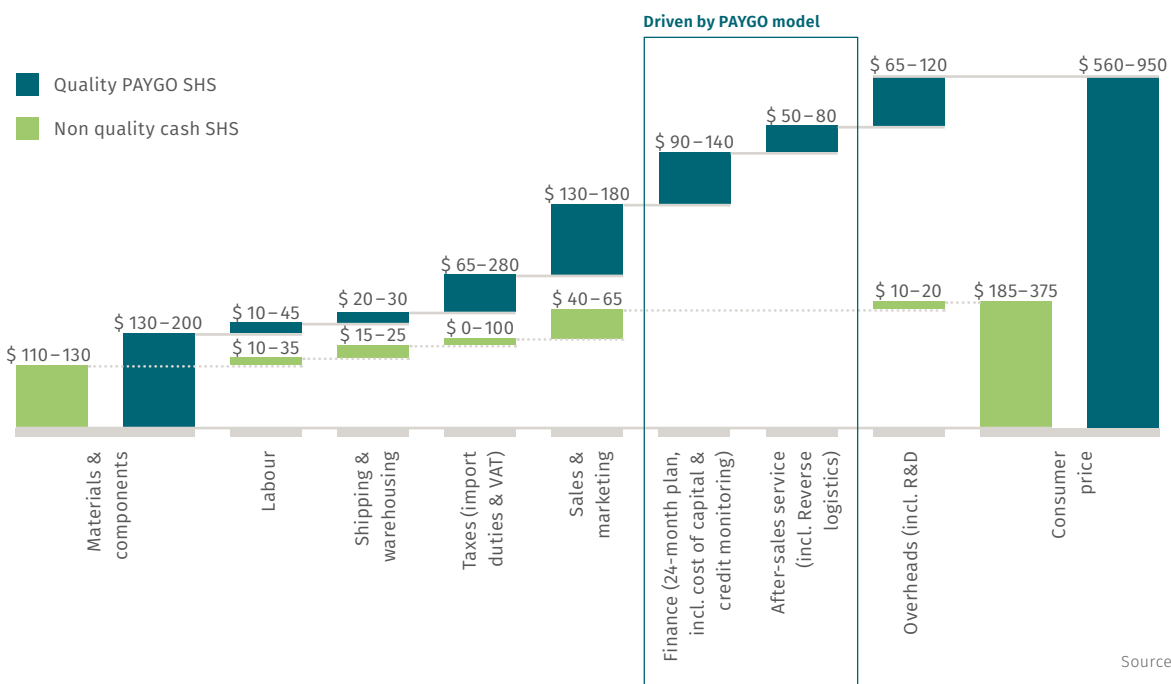
**Downstream, after-sales services and financing, which bring critical durability and affordability benefits to consumers, drive the quality premium, in particular for Solar Home Systems (SHS) (35 per cent of the total premium).** For both solar lanterns and SHS, the remaining quality premium is found in the overheads and distribution categories; many of the companies selling quality products have heavier research & development (R&D) expenses and a higher proportion of expatriate staff (although this is decreasing, as most companies are refocusing on profitability). They also develop costly proprietary distribution networks to reach consumers at the last mile. The question is then how to narrow the gap in these cost categories, by leveraging more efficient distribution channels and developing smart and targeted subsidy programs when the above is not sufficient.

### Solar lanterns Cost Breakdown



Source: Hystra analysis

### SHS Cost Breakdown



Source: Hystra analysis



**Three potential areas of intervention emerge for policymakers to make quality products more affordable to consumers.** These options were discussed by GOGLA and Hystra on October 2019 in Dakar, with policymakers from 15+ Sub-Saharan African (SSA) countries, at one of the Community of Champions events regularly organized by GOGLA:

**1. How to enhance public-private collaborations and develop electrification plans more likely to encourage access to quality solar products?**

- a. Integrate quality products in electrification planning and ensure better data-sharing to help solar distributors adapt their extension plans, and conversely use pay-as-you-go (PAYGO) data to inform policymakers' planification
- b. Leverage result-based financing (RBF) to encourage quality solar to focus on areas where on-grid electrification does not make economic sense
- c. More generally, propose more fora for discussion between government and the OGS sector to enhance synergies and improve efficiency

**2. How to lower the costs incurred by companies upstream by designing and better enforcing appropriate regulatory frameworks and tax exemptions?**

- a. Lower taxation is one of the most effective ways to improve affordability
- b. Clarity on the scope of exemption limits access to non-quality products

**3. How to lower the downstream costs with awareness campaigns, training programs, support of efficient, local distribution models, and reduction of financing costs?**

- a. Back quality products with more endorsement by relevant authorities to efficiently create awareness on quality products and reduce marketing spending
- b. Train more qualified technicians or pool after-sales service to lower the costs of after-sales
- c. Collaborate with donors to lower the costs of financing for local distributors
- d. Support local distributors in improving their offering and operations to lower the costs of serving the last mile

# INTRODUCTION

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## WHY THIS REPORT?

Today, 434 million households live off-grid or in poor-grid regions<sup>2</sup>. The necessity to look beyond traditional grid extension to include minigrids and off-grid solutions in the broader electrification strategy that governments adopt has become widely accepted. The off-grid industry has responded to this challenge through product and business innovations. Over the past 10 years, a large network of off-grid solar (OGS) product manufacturers and distributors have been tackling this issue.

However, the sector needs to address worrying market trends. The solar lantern cash sale market is at risk of stagnating in the face of commoditisation. Non-quality products currently represent 71 per cent of the solar lanterns sold globally (20-40 per cent of Solar Home Systems (SHS))<sup>3</sup>. OGS players who have embraced quality standards – including 84 companies that opted for the Lighting Global (LG) one<sup>4</sup> – suffer from this race to the bottom that fails to deliver customer value and satisfaction.

Policymakers face a choice in defining their vision for the OGS market:

- A non-quality product market scenario – whereby the market constitutes many undifferentiated low-quality brands in which sellers compete on price and customers lack trust. The environmental impacts are high due to the short product lifespan
- A quality product market scenario whereby quality-verified and consumer-recognised brands differentiate themselves with attractive products and services

Whilst policymakers increasingly lean towards the second scenario, there are concerns that consumer prices for quality products are too high. Often, a simple comparison is made between non-quality verified products that are sold on a cash basis and quality products that come with consumer financing and after-sales service. With little information available regarding the cost drivers in the provision of high-quality products and services, there is a suspicion that private companies may be over-charging their customers.

The objective of the study is to enhance understanding of the main cost drivers in the provision of quality products and services (including both upstream in product manufacturing, and downstream in product sales and added services) and of the levers policymakers can use to narrow the price gap with non-quality products.

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2 Dalberg Advisors and LG (2018) OGS Market Trends Report 2018

3 Dalberg Advisors and LG (2018) OGS Market Trends Report 2018

4 To protect consumers from poor-quality products and to promote consumer confidence, the World Bank / IFC LG program maintains a series of quality standards and test methods for solar lanterns and SHS up to 350W. Test methods have been adopted by the International Electrotechnical Commission under IEC Technical Specification 62257-9-5. Standards cover five key areas:

- Truth in Advertising: advertising and marketing materials accurately reflect tested product performance
- Durability: the product is appropriately protected from water exposure and physical ingress, has durable switches and connectors and, if portable, survives being dropped
- System Quality: the product passes a visual wiring and assembly inspection
- Lumen Maintenance: the product maintains consistent light output after 2,000 hours of operation
- Warranty: a consumer-facing warranty is available; the required warranty duration varies by product type

## QUALITY VERSUS NON-QUALITY PRODUCTS

This report uses the definitions of quality and non-quality product companies described below.

### Quality product companies

Quality manufacturers and distributors differentiate themselves by their products or services. These companies invest in the customer experience to gain trust and recognition and deliver impact. Specific characteristics include:

**Product:** the product meets relevant IEC standards, and has passed or could pass the test for LG certification or equivalent.

**Service:** the product is sold with a warranty (at least one year for solar lanterns<sup>5</sup> and two years for SHS kit). The companies also provide after-sales service and in the case of pay-as-you-go (PAYGO<sup>6</sup>) businesses, service centers with roaming agents / technicians.

**Consumer finance:** in the case of PAYGO businesses, consumers make a deposit and complete payments over a defined period. Most solar lanterns are sold on a cash basis.

**Responsible business:** companies' supply chains fulfill legal and social obligations, including paying tax, adhering to product standards and consumer protection principles, upholding employee rights and environmental standards.

### Non-quality products

Non-quality companies sell products rather than services. The price of their products is typically determined by the market price of equivalent types. They may be branded with a name or symbol, though sometimes are not. Specific characteristics include:

**Product:** the product does not meet international or national standards; it is likely to have a deficiency that results in a short lifespan (compared to a quality-verified (QV) product).<sup>7</sup>

**Service:** the product does not include a consumer-facing warranty; consumers have no recourse in the event of product failure.<sup>8</sup>

**Consumer finance:** the product is sold on a cash basis.

**Responsible business:** the supply chain of non-quality companies is characterized as 'free-rider'; they do not typically fulfill legal and social obligations, including paying taxes, adhering to product standards and consumer protection principles, and upholding employee rights and environmental standards.

5 Off-grid products with peak power ratings of 10 W or less

6 PAYGO is a technology that allows consumers to digitally pay for solar energy in several instalments

7 LG (2018), Quality Matters, Technical notes issue 27, August 2018. The study showed that 17 leading non quality-verified products in East Africa had deficiencies that are likely to result in a short lifespan compared to LG certified products.

8 LG (2018), Quality Matters, Technical notes issue 27, August 2018. 88% of the tested products do not include a consumer-facing warranty.

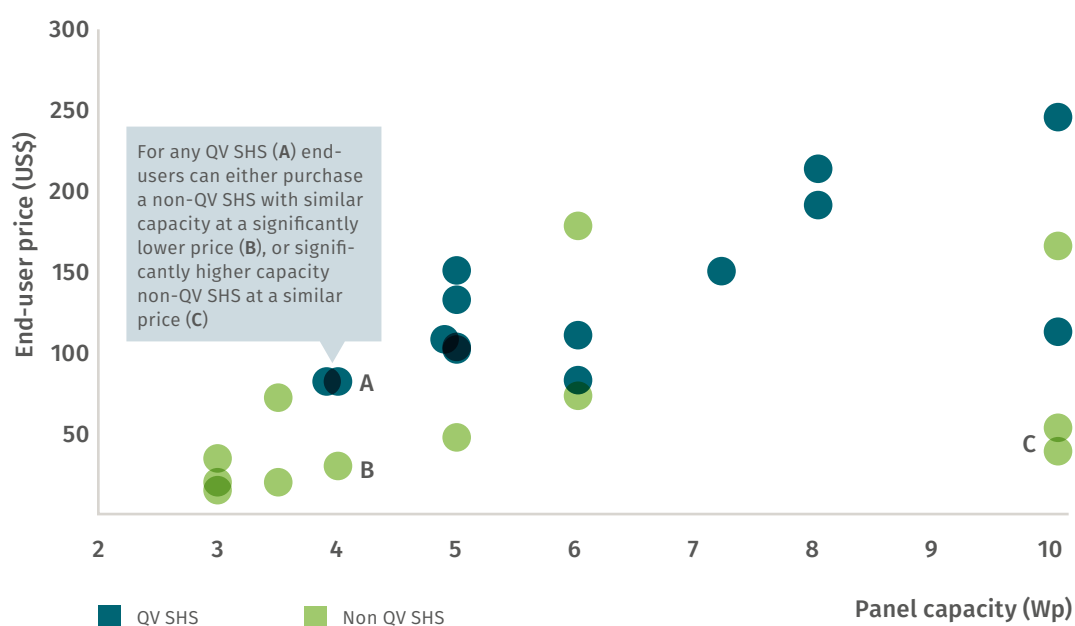
It is important to note that products that are not quality-verified can still be of good quality. Reasons for not opting for certification include:

- The product design falls outside the scope of the product quality standard, e.g. if it is a component-based system
- The manufacturer has other means of assuring quality and customer satisfaction, e.g. through remote monitoring and control or a strong consumer service network
- The manufacturer does not see value in the testing and certification, e.g. if it is not a requirement from investors or if the country of operation does not apply a relevant standard

It is fair to say, however, that a large majority of the non-quality-verified (non-QV) products would fail if put to the test. LG tested 17 non-QV solar lanterns that are top sellers in East Africa and found<sup>9</sup> that out of all tested products:

- 94 per cent fail to meet the standards due to one or more deficiency affecting product durability
- 88 per cent inaccurately advertise product performance
- 88 per cent do not include a consumer-facing warranty
- 76 per cent would require significant changes to product design and components to meet the quality standards

Quality products are generally (but not always) more expensive (to varying extents) than non-quality products offering similar functionalities (vs. similar quality). Price differences of 4–5x have been observed. Furthermore, the analysis below, based on 26 data points of price per watt-peak collected among quality and non-quality SHS sold in Kenya, shows that, for any quality product, end-consumers can either purchase a non-quality product with similar capacity at a significantly lower price (B), or significantly higher capacity non-QV SHS at a similar price (C).



Source: Hystra analysis; based on data from Jumia Kenya, Mangoo and interviews with field players

9 LG (2018), Quality Matters, Technical notes issue 27, August 2018

## METHODOLOGY

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The report is informed by literature review, Hystra's experience working on solar for the past 10 years, including conducting in-depth case studies on several dozen QV and non-QV solar lights companies (manufacturers and distributors), and a continuous conversation with key stakeholders in the sector, as well as GOGLA knowledge of their QV members.

We conducted a cost breakdown analysis among both non-quality and quality products, which we pressure-tested with 15+ OGS companies or experts.

To facilitate comparisons, this report has focused on two product categories that are representative of the OGS affordable product range:

- 1Wp solar lantern represent entry-market products and the bulk of basic lighting sales across the off-grid population
- 40–50 Wp SHSs with basic Television (TV) and 3 light emitting diodes (LED) represent typical aspirational products

As a caveat, these analyses are indicative of trends, not reflective of a given product or country. They also do not reflect the wide variations in both quality and price points that exist *within* each of the quality and non-quality categories. Yet, they provide validated insights into why quality costs more.

1. **QUALITY IS KEY FOR BOTH  
CONSUMERS AND GOVERNMENTS**



## 1.1 SOLAR PRODUCTS INCREASINGLY CONTRIBUTE TO NATIONAL ELECTRIFICATION PLANS

With just 11 years to go for the realisation of the Sustainable Development Goals (SDGs) 2030 target, and with over a billion people yet to be reached (SDG7 “access to affordable, reliable, sustainable and modern energy for all by 2030”<sup>10</sup>), the world is running out of time. Access to modern energy services is a critical component of global targets for inclusive and sustainable development and of the realisation of the national, social and economic development goals set by governments. Indeed, energy is a foundation that supports all sectors, from business, medicine and education to agriculture, infrastructure, communications and high technology.<sup>11</sup> While governments are increasingly rising to the challenge, reaching the 2030 target will require much faster progress.

Policymakers have acknowledged that off-grid solutions promoted by the private sector can cost-efficiently complement the grid. The Africa Energy Outlook 2040 for the implementation of the energy PIDA (Programme for Infrastructure Development in Africa) indicates that extending national power grids to reach an electrification rate of 65 per cent would require €45.6 billion of annual investment between 2014 and 2040<sup>12</sup>, resources that the public sector does not have at hand. Furthermore, it has become clear that the grid cannot be extended to many households and communities, especially those located in remote and/or less dense areas in a commercially viable manner. From this perspective, OGS solutions have become a proven and important component in providing access for off-grid communities, much of which will have to be provided through the private sector. As a result, national electrification strategies across various countries have increasingly incorporated and provided specific targets for the contribution that OGS products are expected to make in their respective energy mixes.



Photo: M-KOPA

In Rwanda, the 2016 Rural Electrification Strategy set a target to realize national universal energy access by 2020<sup>13</sup> (a target that has since slipped to 2024). Based on location, income and consumption level criteria, the strategy estimated that the grid would only provide 52 per cent of the required connections, while OGS would ultimately contribute 48 per cent of connections.

In the 2019 Ethiopian National Electrification Program, which provides integrated —grid and off-grid— electricity access, OGS solutions are expected to provide pre-electrification solutions for beneficiaries not connected to the grid by 2025 and long-term solutions for those not expected to be reached at an affordable cost by the distribution network. It is expected that 6 million beneficiaries — 35 per cent of the population — will have access to OGS solutions by 2025<sup>14</sup>.

Other countries in West and Southern Africa have witnessed similar adoption of off-grid solutions into policy frameworks.

10 United Nations Development Program (2019), sustainable development goals, goal 7

11 UN (2018), Affordable and Clean Energy: Why It Matters

12 Sylvy Jaglin (2019), Off-grid Electricity in SSA Africa: from rural experiments to urban hybridizations

13 Rwanda, Rural Electrification Strategy (2016)

14 Ethiopia, National Electrification Program 2.0 Integrated Planning for Universal Access (2019)

With governments increasingly including solar products within their energy mix, a meaningful definition of access or connection using off-grid products is an important component in determination and measurement of progress towards energy access. As an example, Kenya and Rwanda set the Minimal service (Tier 1, as defined by the SE4All Multi-Tier Framework) as the baseline for standalone energy service<sup>15</sup>. In Rwanda, policymakers established a requirement of Tier 2 or higher access levels for on-grid, mini-grid and larger standalone SHS that could count towards its grid or grid equivalent access target numbers<sup>16</sup>.

In Euro		Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
<b>1. Capacity</b>	Power		Very Low Power Min. 3 W	Low Power, Min.50 W	Medium Power, Min. 200 W	High Power, 800 W	Very High Power, Min. 2KW
	AND Daily capacity		Min. 12 Wh	Min. 200 Wh	Min. 1.0 kWh	Min. 3.4 kWh	Min. 8.2 kWh
	OR Services		Lighting of 1.000 lmhrs per day and phone charging	Electrical lighting, air circulation, television and phone charging			
<b>2. Duration</b>	Hours per day		Min. 4 hrs	Min. 4 hrs	Min. 8 hrs	Min. 16 hrs	Min. 23 hrs
	Hours per evening		Min. 1 hr	Min. 2 hrs	Min. 3 hrs	Min. 4 hrs	Min. 4 hrs
<b>3. Reliability</b>						Max. 14 disruptions per week	Max. 3 disruptions per week of total duration < 2 hrs
<b>4. Quality</b>						Voltage problems do not affect the use of desired appliances	
<b>5. Affordability</b>						Cost of a standard consumption package of 365 kWh per annum is less than 5% of household income	
<b>6. Legality</b>						Bill is paid to the utility, prepaid card seller, or authorized representative	
<b>7. Health and Safety</b>						Absence of past accidents and perception of lower risk in the future	

GOGLA (2018), Providing Energy Access through OGS: Guidance for governments

<sup>15</sup> Kenya National Electrification Strategy (2018)

<sup>16</sup> Rwanda, Rural Electrification Strategy (2016)



## 1.2 QUALITY PROTECTS THE CONSUMER, THE MARKET AND PUBLIC INTEREST

### 1.2.1 Policymakers need quality products to fulfill their development goals

In any global market (including the OGS one), full liberalization has sometimes paved the way for the arrival of products of varying quality, oftentimes including poor-quality/substandard/non-performing products.

Non-quality or substandard products have been shown to undermine important public sector agendas. For example, a study established that poorly performing Compact Fluorescent Lamps (CFLs) undermined energy efficiency programs in Asia. It found that, “if CFLs did not meet performance claims, they may not meet energy savings and greenhouse gas reduction targets as a consequence.”<sup>17</sup> For the off-grid sector, sub-standard products not meeting established performance requirements put the public sector’s agenda for energy access at risk and can delay the realisation of electrification goals.

This is why countries like Kenya and Rwanda set up minimum quality standards. In both cases, the adoption of national standards supports the proper implementation of the national electrification strategy and ensures both consumers and private sector players are protected. The Rwandan government notably voiced the prioritisation of quality products meeting both performance and reliability requirements to ensure that off-grid products are a long-term electrification solution.<sup>18</sup>

Globally, the standards framework that many countries are using as a model is the IEC/TS 62257-9-5 standards. National standards are generally minimum requirements largely driven by concerns for safety to human health and environment, fitness for purpose, and performance. The process of developing and adopting national standards is consultative and requires consensus amongst key stakeholders including policymakers, consumer advocates and industry players.

In developing the LG Standards, a precursor to the IEC/TS 62257-9-5 standards, the World Bank/IFC LG program noted that the protocol was designed to serve a broad range of OGS stakeholders.<sup>19</sup> These included manufacturers and distributors who could use these standards to verify the quality and performance of products from different batches and potential business partners. Market support programs could also benefit from them by more accurately selecting who to support with financing, consumer education, awareness, and other services.

While the adoption and enforcement of standards is absolutely critical, it is important to note that standards do not equate with quality. Standards allow products of different quality and performance levels to exist and compete within the market. Within any market segment, there will be products of differing qualities, many exceeding the minimum standards. While one would expect that market price would be an indicator of quality, policymakers and other stakeholders interviewed for this report indicated that there were instances where higher priced off-grid products underperformed against lower priced products.

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17 USAID (2007), *Confidence in quality: Harmonization of CFLs to Help Asia Address Climate Change*

18 Rwanda, *Rural Electrification Strategy* (2016)

19 LG (2012), *Quality Assurance Protocols*

### 1.2.2 Poor quality hurts consumer confidence and undermines the market

Beyond the public sector imperatives driving the need for minimum performance, many stakeholders including the OGS industry, development partners and consumer advocates have recognized the need for quality promotion to build and maintain consumer confidence in OGS solutions.

In countries where the market has emerged but is missing adequate regulation to promote quality, low-quality products take a significant proportion of market share by benefiting from the investment in awareness-raising and distribution chain development made by more reputable companies. In Kenya, for example, non-quality products, which comprise products with no names, copycats and counterfeits, were estimated to account for at least half of the solar lantern market<sup>20</sup>. These products imitate the look and feel of respected brands but usually use inferior technology, often leading to early failure. These products also often falsely claim to provide a level of service that they do not deliver. As a result, consumers lose trust in OGS solutions, leading to demand reduction and market damages.

A technical report on “The Dynamics of Off-grid Lighting Adoption” by the Lumina Project found a strong and statistically significant market spoiling impact of exposure to low-quality LED flashlights on people’s choice to purchase better quality LED task lights. People with prior exposure to low quality products were much less likely to purchase LED products in general.<sup>21</sup>

On the contrary, promoting quality in the marketplace helps to build trust in solar technology and creates demand. Analysis by the Global LEAP program<sup>22</sup> shows strong growth can only be sustained if there is a robust quality assurance framework. This, in turn, accelerates energy access, household savings and broader social impact.

### 1.2.3 Quality products offer better value for money, especially to vulnerable consumers

A general concern amongst policymakers and regulators is the vulnerability of their citizens with lower purchasing power. Despite valuing quality, price remains a key criterion for all consumers purchasing solar products, over and above quality aspects like quality certification, hours of lighting and lifespan.<sup>23</sup> For low-income consumers, a more expensive product can be seen as a higher risk: if the product fails, consumers will have lost more than if they had bought a cheaper product. In the long run, this hurts consumers as, typically, quality products that may come at higher costs at the initial stage, have lower operational (or replacement) costs in the longer term.

To illustrate such trade-offs, the table below shows the choices that consumers face at the time of purchase.

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20 Dalberg Advisors and LG (2018), OGS Market Trends Report 2018

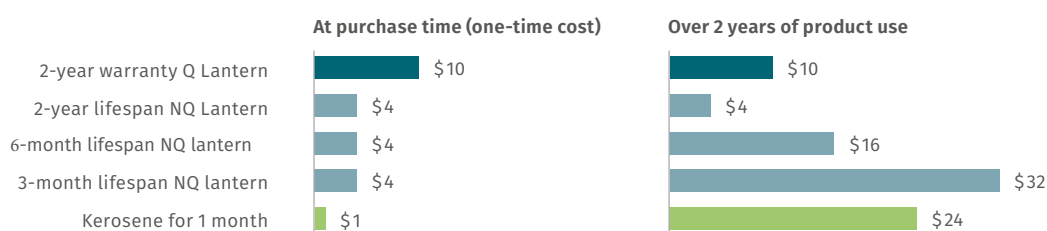
21 The Lumina Project (2013), The dynamics of Off-grid Lighting Adoption, Technical report #12

22 Navigant consulting (2015), Analysis of the Potential Future of the LG Quality Assurance Program

23 Ipsos, 2016, 2107 – cited in Dalberg Advisors and LG (2018) OGS Market Trends Report 2018

## Which one would you buy?

The graphs below compare the one-time cost of different lighting solutions to their running costs over 2 years of use, based on different possible lifespans for non-quality products.<sup>24</sup> Non-quality products (here a \$4 non-quality lantern) are cheaper to purchase initially, and thus in the absence of trust in quality products, will seem like a less risky investment. However, they are often a gamble as their lifespan can vary widely and may end up costing more than a quality lantern (here a \$10 lantern with a certified 2-year lifespan). In the worst-case scenario below (3-month lifespan), non-quality lanterns could even end up being more expensive than kerosene.



Source: Hystra analysis

Some policymakers have started to make efforts to shift consumers' mindset towards quality products. The Rwandan Ministry of Infrastructure underscored in a public campaign that while quality-certified products cost more initially to procure, poor quality products have higher lifetime costs with the need for earlier replacement and breakdowns.

The need to convince consumers to buy quality products decreases as they go up the energy ladder. While only 30 per cent of all solar lanterns sold globally are QV products, this share goes up to 60-80 per cent for SHSs<sup>25</sup>. This is probably linked to the fact that many SHSs are sold with consumer financing. The simple fact that consumers pay over time means that they have a lever they can activate if the product fails (they can stop paying). This considerably de-risks the purchase, and helps consumers overcome the higher price barrier and opt for a better-quality option. For SHS, the availability of financing schemes that both increase product affordability and lower the purchase risk is therefore critical to generate demand for quality products.

<sup>24</sup> Lifespans are hypothetical as there is no data available on the average lifespan of non-quality products. Hypotheses are based on first-hand experiences from the authors and insights from the "Quality matters" report showing that 94 per cent of the tested products fail to meet the Standards due to one or more deficiency that affects product durability

<sup>25</sup> GOGLA, affiliates' sales data, 2018, H2



## 2. QUALITY COMES AT A JUSTIFIABLE COST

Anyone who has been to a market in Africa must have noticed solar lights sold over the counter, without warranty or promise of after-sales service. These are often half the price of quality products – and this price difference can be wider for larger products such as multi-appliance SHS.

This section aims to understand where this price difference comes from, and what impact it can have on consumers. To facilitate comparisons, the analysis below has focused on two product categories that are representative of the OGS affordable product range:

- 1Wp solar lanterns represent entry-market products and the bulk of basic lighting sales across the off-grid population
- 40-50 Wp SHSs with basic TV and 3 LEDs represent typical aspirational products. In this category, to portray the reality of the market, non-quality products are considered commercialized in cash (typically sold as individual parts), while quality products are considered commercialized via PAYGO

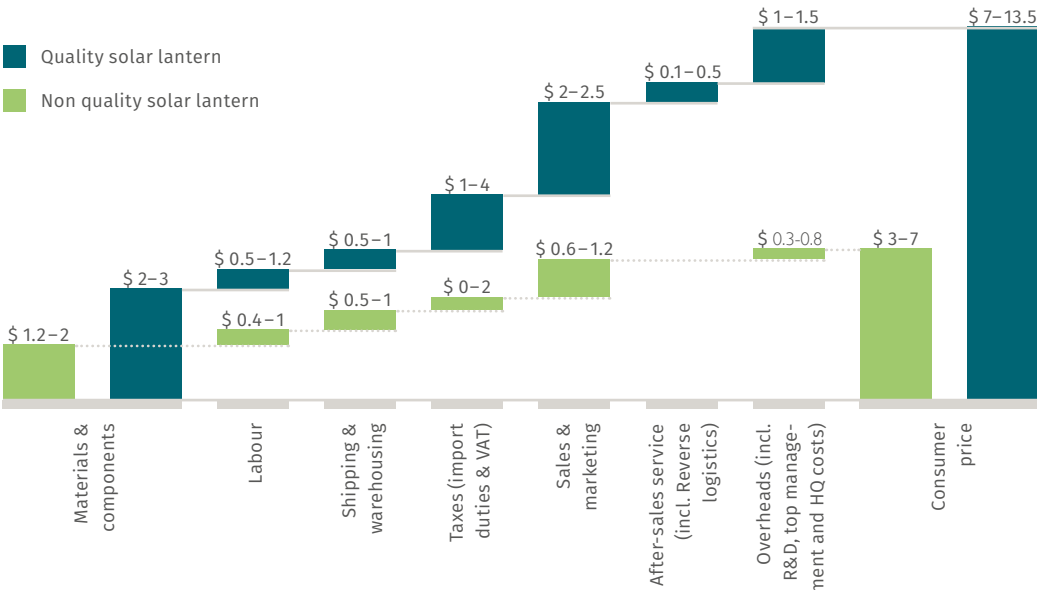
This cost breakdown analysis aims at being broadly reflective and relevant across various markets. Estimates do not reflect the reality of a given country or the maximum cost difference that can be observed, but aggregate learnings across 20+ case studies and 15+ additional validation interviews with manufacturers and distributors. It is also important to note that indicated costs assume that products are manufactured and distributed at sufficient scale to ensure sustainability (i.e., that product price covers all value chain costs).

The graphs below present the cost waterfalls that explain those differences, which are then detailed in the following sections.

How to read these graphs:

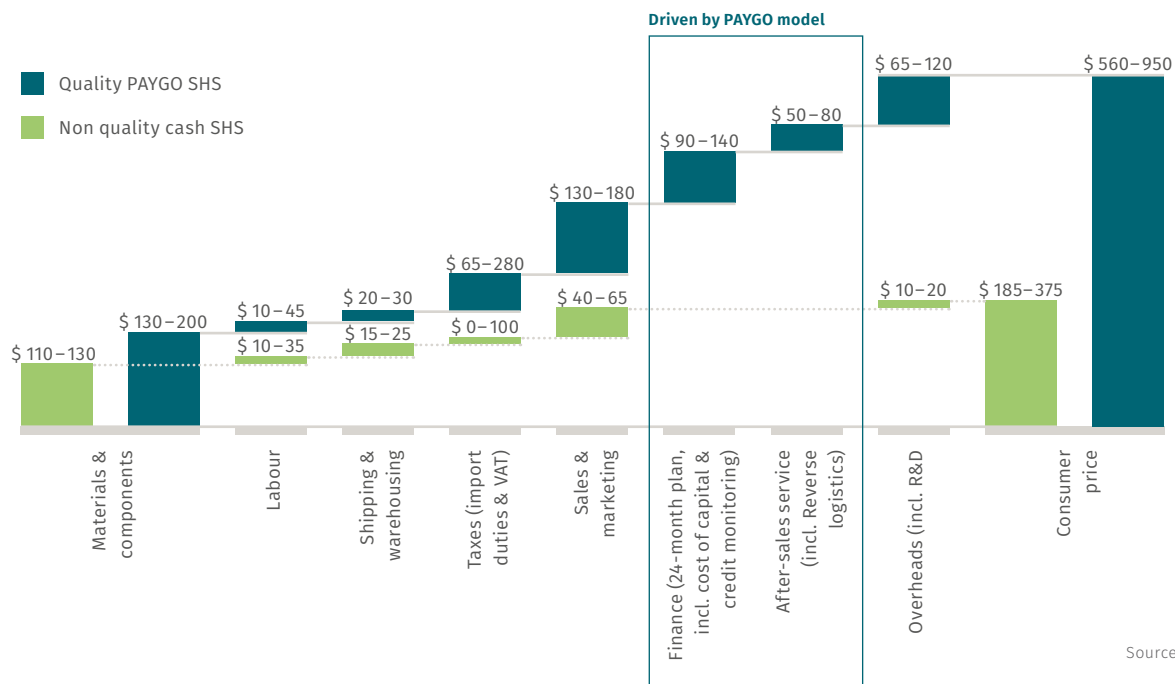
The cost of a solar lantern is split between materials and components, labor, shipping and warehousing, taxes, sales and marketing, after-sales services and overheads. For a quality solar lantern with an end-consumer price comprised between \$7-\$13.50, the cost of material and components represents between \$2 to \$3 on average. For a non-quality solar lantern with the same functionalities sold at US\$3-7, it represents \$1.20-\$2.00. The upper limits of end-consumer prices do not always reflect the sum of the upper cost of each category, as these extreme cases are rarely seen in reality.

**Solar lanterns Cost Breakdown**



Source: Hystra analysis

## SHS Cost Breakdown



Source: Hystra analysis

## 2.1 UPSTREAM, THE QUALITY PREMIUM IS DRIVEN BY BATTERY PRICES

### 2.1.1 Components and material costs are key upstream costs, with batteries responsible for the biggest price difference

While components and material costs have decreased steeply in the past ten years and will continue to decrease thanks to fast technological development, they still represent one of the biggest costs incurred by OGS manufacturers and represent on average 20 to 30 per cent of quality products' end-consumer prices.

Batteries are not only one of the most expensive components, but also the one where the biggest price differences can be observed. When comparing products of similar functionalities like entry-level solar lanterns, industry players estimate that good quality batteries are up to 1.8 times more expensive than poor quality ones. The type of battery selected sometimes explains this difference; quality products generally have lithium batteries while some non-quality ones still use lead acid ones which are less efficient at storing power and have a shorter lifecycle. Even when battery types are the same, some non-quality manufacturers use reconditioned second-hand ones, or batteries that have failed the quality tests of their production lines.

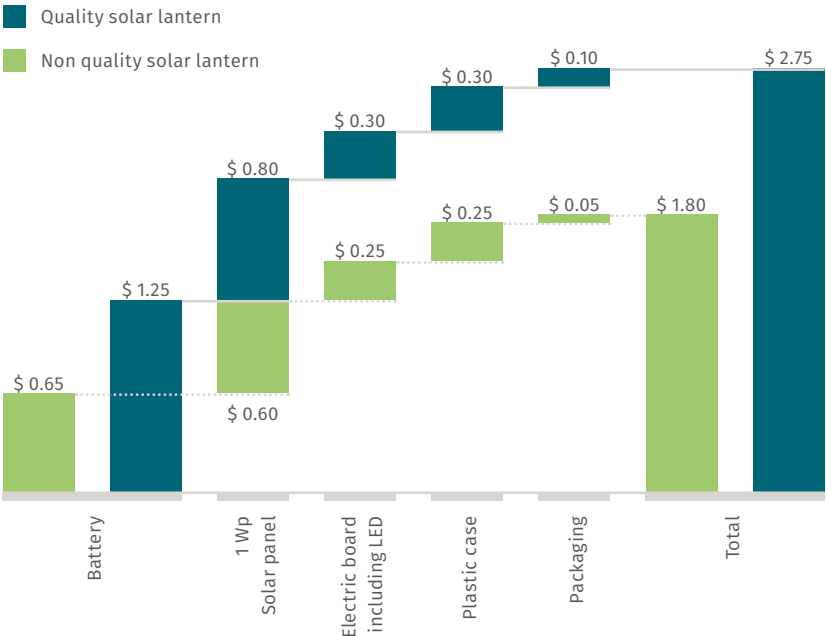
The result of this cost trade-off on batteries is that a majority of non-quality products have at least one battery issue compared to quality products, according to the "Quality matters" study.<sup>26</sup> The report showed that 58 per cent of the 17 non-QV solar lanterns studied did not meet battery storage durability standards, 38 per cent had a battery deep discharge protection issue and 32 per cent failed on the overcharge protection criteria.

Other components are less subject to quality defects or performance gaps, and price differences are similarly less important. Premiums range from 10 to 30 per cent for solar panels, plastic, wires, as well as appliances such as TVs.

26 LG (2018), Quality Matters, Technical notes issue 27, August 2018

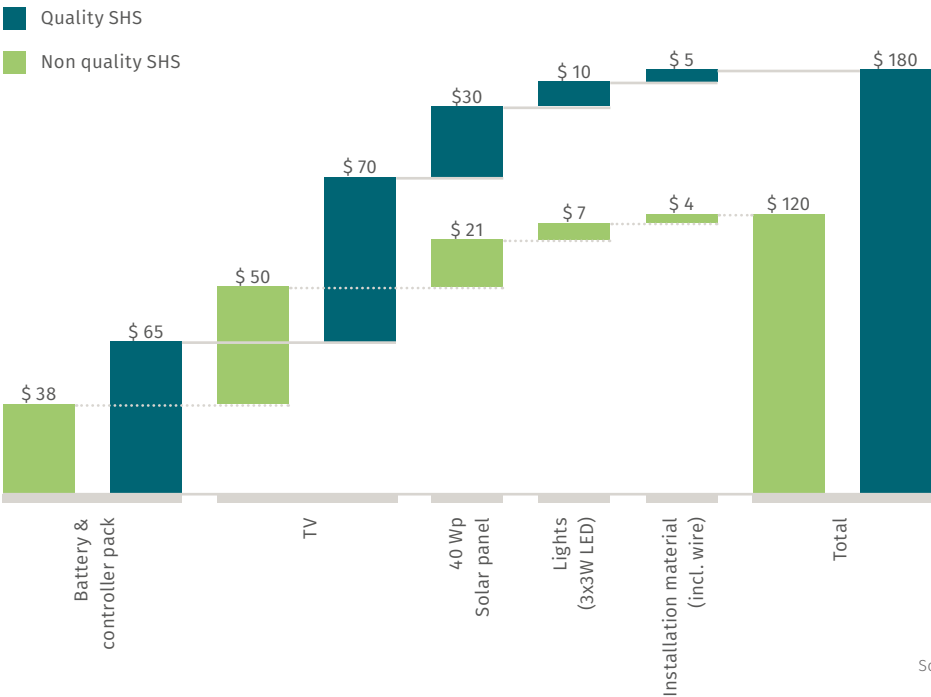
The tables below illustrate the breakdown of the top components' cost for solar lanterns and SHSs, as well as the average differentials that can exist between good and poor quality materials.

**Material and component cost breakdown for solar lanterns**



Source: interviews, Hystra analysis

**Material and component cost breakdown for SHS**



Source: interviews, Hystra analysis

In the upcoming two years, prices of components are expected to continue falling by 14 to 30 per cent<sup>27</sup>. In particular, programs like LEIA, supported by UK Aid, are working on more efficient appliances that could double the efficiency and halve the cost of a range of electrical appliances suited for off- and poor-grid households.<sup>28</sup>

Compared to component costs, assembly on one side and shipping and warehousing on the other side represent a very small proportion — 2 to 10 per cent — of the end-consumer price. Assembly costs are only marginally lower for non-quality products, as the vast majority of products — both quality and non-quality — are manufactured in China, where local production costs (salaries, power) are similar for everyone. The 15–20 per cent additional costs for quality products are mainly due to stricter quality checks on quality products. Shipping and warehousing costs mainly depend on the weight and size of the product and are not driven by quality standards.



Photo: Renewit

### Case study: How Nadji.Bi and Fenix International minimize their components' end-of-life costs



Photo: NadjiBi

While the production costs of components are key, their associated end-of-life recycling costs are often overlooked.

According to a GOGLA study<sup>29</sup>, these end-of-life costs depend on two main variables: the product size and the type of battery. While the value of solar lanterns' material is lower than the costs of collection and treatment (negative end-of-life value), the opposite is true for larger SHS with lead-acid batteries. The increasing usage of lithium-ion batteries is problematic in this regard, as they have a negative end-of-life value as opposed to lead-acid ones.

Although serious reflection should be conducted at industry level, OGS players can also be part of the solution, minimizing their products' end-of-life costs in several ways:

- By designing modular systems, manufacturers can enable re-use of the same battery and facilitate components' segregation into dedicated recycling branches (when they exist). For instance, Nadji.Bi, an African manufacturer of productive and smart solar solutions, design their product so that they can be easily dismantled and offer a warranty component by component.<sup>30</sup> Stocks of components are delivered to local distributors to facilitate and expedite replacement of faulty material.
- By developing proper take-back strategies, leveraging their proximity to last mile consumers, distributors can improve waste collection and recycling. As an example, Fenix International, the market leader in Uganda and Zambia and winner of the Global LEAP Awards Solar E-Waste Challenge,<sup>31</sup> uses its service centers as trade-in locations for customers interested in recycling their products. They currently manage to recycle a significant portion of their end-of-life units<sup>32</sup> and plan to extend their recycling process to non-Fenix products, including 15,000 kilos of non-quality ones.<sup>33</sup>

27 Bloomberg and LG (2016), OGS market trends report 2016

28 Efficiency for Access website (2019), LEIA Programme

29 GOGLA (2019), E-waste Toolkit Module 3, Briefing Note

30 Interview with Julien Potron, CEO, Nadji.Bi (August 2019)

31 Global LEAP Awards (2019), Winners company profiles

32 Interview with Chris Emmot, Product Portfolio Manager, Fenix International (August 2019)

33 Global LEAP Awards (2019), Winners company profiles



## 2.1.2 Certifying quality is a necessary cost, which becomes negligible at large volumes and brings value to both manufacturers and consumers

Beyond the intrinsic component costs, manufacturers have to pay \$7,000–\$9,000 for any new product to be quality-certified by LG.<sup>34</sup> These costs are mainly due to the test lab fees — around \$6,000–\$8,000 — but also include a Lighting Global Quality Assurance (LGQA) fee for their quality test method (\$300) and sampling fees (\$500). A renewal test (\$100) is then due every two years. Obtaining LG certification usually also requires pre-shipment inspections to control the quality, quantity, marking, packing and loading of shipments, which adds 0.5 per cent to 1 per cent to the Free on Board (FOB) value.

Certification also adds indirect costs; understanding and abiding by the standard from a design and manufacturing perspective is demanding, especially as companies providing QV products generally seek to comply with all rules. Certification is a rather heavy and long process (4–6 months) that also requires that companies do not significantly change the product, which is challenging given the technological development rate. Therefore, the portfolio of some quality players is partially or completely left out of the LG standards.

The certification also brings benefits that more than compensate for its cost. It enables players to differentiate their products thanks to a certification that consumers recognise in certain geographies like Kenya, where LG has created deep impact with their campaigns. It also avails the possibility for manufacturers to apply for tax exemptions and bid for public tenders, which can represent very significant opportunities for these companies.

Most LG-certified products come from relatively large players, who have been able to offset the costs of certification with large volumes. It is worth noting that the World Bank is trying to make the standards accessible to more (and smaller) quality players. In Nigeria for instance, the World Bank is implementing a quality assurance framework for component-based systems,<sup>35</sup> which are not currently covered by LG Standards. The World Bank is working closely with the Quality Assurance team to work on this framework with the goal of harmonising them at the global level in due time.

## 2.2 DOWNSTREAM, AFTER-SALES AND FINANCING DRIVE THE QUALITY PREMIUM

### 2.2.1 Product warranty and subsequent after-sales service increase the quality premium

Product warranty is one of the biggest differentiators between quality and non-quality products, and one of the most underestimated costs of the sector, according to a leading quality player in East Africa. It is indeed a critical component to ensure effective value for money for consumers but is rarely provided — or honored — by non-quality distributors. Among the non-QV products tested in the “Quality matters” report, 88 per cent did not include a consumer-facing warranty. As a result, non-quality players have virtually no cost associated with product warranty.

It is important to note that the availability of a product warranty is not sufficient to ensure its effectiveness. Research in Western Kenya indeed demonstrated that the quality of the after-sales service is highly dependent on distribution channel and agents’ diligence.<sup>36</sup> For example, selling through a direct salesforce generally ensures a better after-sales service than through retail. Within the retail channel, not all retailers are willing to provide a service to consumers beyond the sale of the product — and if not trained properly, they would simply not know how to proceed to return a product. Up to this date, too many consumers do not have the proper level of information on the services covered by the warranty.

<sup>34</sup> [LG \(2019\), Quality Assurance Program pricing and GOGLA analysis](#)

<sup>35</sup> [World Bank \(2019\), Quality Assurance Capacity Building for the OGS Sector](#)

<sup>36</sup> Interview with Wambugu, Anne & Elise Harrington, discussion of preliminary findings from work on solar quality in Kenya, September 12, 2019



For companies effectively handling after-sales service, this represents 5–15 per cent of end-consumer prices for quality SHSs and 1–7 per cent for quality solar lanterns, corresponding to (i) the replacement of faulty products, (ii) the cost of call centers and (iii) reverse logistics.

Product replacement costs are positively correlated with product complexity. Interviews suggest that while failure ratio is around 0.5 to 2 per cent for quality solar lanterns — mainly due to battery and power system — it is around 3 to 4 per cent for quality SHS. This differential can be explained in different ways:

- TVs have higher failure rate due to signal issues. Improper transportation of fragile products like TVs might also worsen products' conditions during reverse logistics, hence increasing the repair costs
- SHSs are more prone to improper uses: consumers tend to plug in too many appliances on the system, leading to system malfunctions and breakdowns
- PAYGO SHSs offer longer repayment periods, which increases the probability of receiving consumers' requests for replacement of a product or a component over time. This can include improper replacement requests, as consumers (who are still paying) sometimes request a product replacement as soon as they have a small issue. While these risks can be mitigated by SHS manufacturers and distributors with consumer education, the possibility for consumers to stop payments acts as a strong incentive for the SHS distributor to address these sometimes improper requests

Replacement costs can be reduced through better agent training and modular product design; today the lack of troubleshooting skills and the complex assembly of products encourages them to swap products or send them back to the warehouse rather than repair failed components. The limited costs associated with technicians' visits, from 0.5 per cent to 1 per cent of consumer price, indicates that it could indeed be a cost-effective solution. However, companies currently deal with a shortage of skilled workers. This is particularly acute for the installation and after-sales jobs that require specific technical skills and currently only represent a fifth of all jobs in the sector.

The costs associated with call centers — which represent today 2–3 per cent of the end-consumer price — could also be decreased through consumer education. In interviews, a quality distributor indicated that up to 80 per cent of the calls they receive are not related to a real technical issue but rather to a misuse of the product, such as bad solar panel positioning, or a PAYGO issue like misunderstanding of coding instructions.

Finally, reverse logistics costs vary significantly depending on the size and business model of distributors. For some companies who have reached a critical size and invested in regional/national repair centers, bringing back faulty products is almost free as they can use their own trucks coming back empty after delivery. However, a significant proportion of quality players is still not able to propose cost-efficient models delivering the right level of service in rural areas. Critical masses of consumers in the same area are hard to reach, especially for companies proposing bigger SHSs. These are areas where innovations such as the one implemented by Zonful could change the game.

### **Case study:**

#### **How Zonful Energy delivers a cost-effective after-sales service leveraging existing communities**

Zonful Energy is a Zimbabwean distributor selling PAYGO SHSs at the last mile. At only three years old, Zonful is about to reach \$4 million in annual sales. Their CEO considers leveraging existing structures within the communities key to delivering efficient operations as well as strong after-sales support.

To deliver its after-sales support quickly and cost-effectively, Zonful has set up a centralised, 24/7 call center that customers call to register issues with their SHS. Zonful then puts out a request to its network of over 6,000 freelance technicians via an in-house, 'Uber-like' application, which directs the first available and nearby technician to the customer's house. These technicians, who are trained in partnership with national vocational training centers, are paid a commission of \$5 to \$15 per job and earn on average \$4–500 a month, an incentive that ensures high retention rates and thus avoids the high costs of staff churn.

The key to this model, however, lies in its focus on the quality of service delivered: technicians' commission is only paid once customers have paid their next monthly instalment, to ensure that the repair has been made to the customer's satisfaction; technicians are overseen by over 20 full-time quality-control agents; and Zonful maintains a strict policy for removing technicians that are underperforming.

Through this lean and automatised aftersales system, Zonful thus manages to deliver quality service while keeping aftersales costs low, at just two per cent of the end-consumer price.

### **2.2.2 Financing makes SHS more affordable but increases total price for consumers**

Financing is another service providing key added value to consumers. It makes some services — including security lighting, business lighting, and access to aspirational appliances like TV and fridges — widely available to a population segment that may never have access to them otherwise. GOGLA's sales figures showing that over 90 per cent of products >11Wp are paid on PAYGO<sup>37</sup> confirm that PAYGO is widely valued for its impact on product affordability.

This is again a great advantage for quality products. Non-quality products are generally not able to offer financing facilities to their consumers. Indeed, investors and donors are not ready to take the risk to fund finance schemes without a strong assurance from manufacturers of the quality of the products. The same also applies to downstream financing: microfinance institutions (MFIs) distributing OGS products are keenly aware of the non-payment risk of supplying products that could fail. As such, MFIs typically partner almost exclusively with well-known brands, most of which are LG affiliate products, covered by warranty typically exceeding the credit period.<sup>38</sup>

However, financing comes at a great cost. It represents up to 15 to 25 per cent of the end-consumer price, reflecting both the high cost of capital in most developing countries — up to 21 per cent interest rate per annum in Uganda for instance — and the costs associated with loan monitoring and product recovery.

OGS players have significant and growing working capital needs. In particular, consumer receivables held by companies offering PAYGO schemes will need to be funded by external capital as this can represent \$35–65 million<sup>39</sup> per company. However, commercial debt markets, especially at the local level, remain largely unavailable for most industry players.

<sup>37</sup> GOGLA, affiliates' sales data, 2018

<sup>38</sup> Dalberg Advisors and LG (2018) OGS Market Trends Report 2018

<sup>39</sup> Dalberg Advisors and LG (2018) OGS Market Trends Report 2018

The limited track record, lack of profitability, liquidity needs, and challenging market conditions do not render off-grid products bankable in the eyes of many commercial lenders. When industry players manage to raise funds, it often comes from Western investors. As a result, currency volatility represents a significant challenge for companies. The fact that a majority of upstream transactions are made in USD while sales happen in local currencies also adds to these foreign exchange (FOREX) risks. Currency variations can have significant impact on net margins, namely in countries using free float currencies. As an example, over the past five years Zambian and Ugandan currencies have dramatically weakened over the USD — 40 per cent for the Ugandan Shilling, 113 per cent for the Zambian Kwacha. This volatility risk cannot be entirely borne by companies and is therefore included in product costs, hence increasing the price paid by end-consumers.

In addition to the cost of capital, companies have to price credit default risks. Depending on the companies and the type of product, interviews suggest that 0 to 15 per cent of consumers do not fully repay their solar products. This forces companies to invest in robust consumer finance management, including having credit officers on the ground and sending SMS reminders that can represent up to 1–2 per cent of the total costs. It also implies that they have to manage repossessed products that sometimes have been used for only a few months. For those who work with mobile money, associated fees can also be prohibitive, in particular in West Africa where they can represent 2–3 per cent of each payment amount.

### 2.2.3 Going last mile drives sales and marketing costs up for quality players, with room for efficiency improvement

Regardless of the distribution channel used to sell products — typically retail for solar lanterns and direct sales or partnerships for quality SHS — sales and marketing costs generally represent 20–30 per cent of end-consumer prices for quality products. Agents’ commissions, around 7–10 per cent of end-consumer prices, are the biggest costs within this category. Marketing and regional management costs represent each 3–5 per cent of total costs, while regional logistics and warehousing remains marginal —around 1 per cent of end-consumer price.

In theory distribution costs and agents’ commissions should not be dependent on quality. However, field observations show higher absolute costs for quality products than for non-quality ones. This can be explained in different ways, depending on the product category:

- For the increasingly commoditised solar lantern sector, the difference is due to the pace at which products are sold. The more volume retailers sell every month, the lower margin they ask for. This pace is often directly correlated with products’ price, disadvantaging quality products
- For SHSs, the differential is due to the costs of bringing solar products to the last mile. To reach rural consumers and prove their product quality, most quality distributors have invested heavily in developing a direct sales force, be it through their own network of agents or partnerships with local institutions (e.g., MFIs, or agricultural product distributors like One Acre Fund). Sales costs for quality SHSs thus include recruitment costs — which can be significant due to high attrition rates — own or partner agents’ compensation, and also logistics, product installation, as well as local branches’ costs. In comparison, non-quality SHS are saving on most of these costs as they mostly sell component-based systems through retail channels in urban or peri-urban areas

The analysis of the cost drivers in distribution also reveals a learning curve for quality players. Indeed, large OGS companies have faced pressure from investors to grow sales fast and capture territories before competitors, given the fast development of the industry. This has led to rapid expansion in new territories, with time needed to establish trust with local distributors and consumers, and make new sales agents fully productive, before sales can fully take off. As a result, current distribution costs probably reflect the early stages of this learning curve and should reduce over time.



Photo: Baobab+ and Mastercard Foundation for rural prosperity

On the marketing front, costs are usually only borne by quality players. They are typically the ones that open new markets and invest in creating awareness and trust around solar products, through (mostly proximity) marketing campaigns to attract consumers and support agents in their sales pitches. Non-quality players are often followers in these markets, limiting themselves to over the counter marketing while benefitting from the consumer awareness efforts made by their quality competitors.

## 2.3 ACROSS THE VALUE CHAIN, R&D, OVERHEADS AND TAXES INCREASE THE COST OF QUALITY PRODUCTS

### 2.3.1 R&D costs are largely borne by quality players

The OGS industry is growing at high speed and requires significant investments in research & development (R&D) to improve products, develop new services and make operations more efficient. Today R&D costs are mainly borne by quality players. This is a sunk cost that needs to be amortized by selling large volumes.

For upstream developments, quality players usually have in-house design teams that develop new products and features. Tooling, which costs around \$15,000–30,000 for solar lanterns and \$25,000–50,000 for SHS according to interviews, must then be developed for each new product design. While this cost remains marginal when producing at scale — less than one per cent for solar lanterns when producing 300,000 units — it does disadvantage innovative companies. Indeed, players doing their own design — as quality manufacturers typically do — have to pay large upfront fees to manufacturers while followers such as some non-quality players can benefit from these for free through “open tooling”. This refers to the practice of factories renting their tooling to other factories or companies, which typically happens if the initial company switches factory, or sometimes when the initial tooling gets copied.

Downstream, the development of a PAYGO platform, which allows easier and leaner payment recovery, is another significant R&D investment. As a case in point, a leading quality player in West Africa has hired 40 engineers to develop the technology and is currently investing more in R&D than in marketing.

#### Case study:

#### How Renewit lowers manufacturing costs through design and in-house production

Renewit is an OGS manufacturer selling hundreds of thousands of units per year, aiming at combining the highest standards of quality and performance with an affordable price. The managing director Richard Atwal identifies two factors that help them drive costs down<sup>40</sup>.

The first is linked to their ability to produce everything in-house (except batteries). By purchasing raw material in large volumes, they manage to save 15 per cent on costs of materials.

The second differentiating point lies in their 20-year expertise in “design for manufacturing.” Renewit often realises that initial product designs sent by its clients are not cost-effective and make assembly unnecessarily difficult. By giving them advice on how to optimise the design of their products, Renewit helps them save up to 25 per cent on materials and assembly. Adjustments help make all the electronic components fit on one board, reduce the number of raw materials used and position key elements like USB port or switches strategically. In addition to generating direct savings, such optimisation also helps reduce the size of products and the corresponding shipping costs.

<sup>40</sup> Interview with Richard Atwal, Managing director of Renewit (2019)

### 2.3.2 Early innovators from Western countries often bring a legacy of large HQ costs

A significant number of early entrants have Western founders and established their headquarters back in their founders' originating countries. Keeping these "remote from the field" headquarters sometimes remains relevant for fundraising purposes. However, as competition is getting fiercer, these companies — mostly quality players — are disadvantaged by the resulting expensive overheads needed to pay for these headquarters and also sometimes expatriates' wages on the ground. This is even more acute for vertically integrated players. In a bid to scale and quickly reach high-potential markets like India, Kenya or Nigeria, which they could not do solely through local distributors, these players took the risk of diversifying their distribution models. They thus invested heavily at each step of the value chain, from R&D to fundraising to marketing to distribution. This led to high operational complexity and significant staff on the ground.

A number of these companies are trying to lower these costs to become more competitive. As a result, they have started adopting leaner processes, hiring more local staff and partnering with specialized local firms for finance and distribution. Today, overheads for quality players still represent 10 to 20 per cent of the end-consumer price. Comparatively, leaner non-quality players have overheads representing 5 to 10 per cent of the end-consumer price.

It is important to mention that despite lowering these costs, most OGS companies are hardly — if at all — profitable. In particular, new business lines such as PAYGO that are critical to reaching new consumers require heavy investments in human resources and infrastructure that go beyond R&D.

### 2.3.3 As taxes are proportionate to price, they are higher for quality products

Taxes can be another significant cost, representing up to 45 per cent of the end-consumer price. Value added tax (VAT) in particular is very costly, as taxes are applied to the end-consumer prices, while import duties are only paid on upstream prices. However, the actual weight of taxes varies widely, as a wide variety of regulations can be observed across SSA.

The East African Community (EAC) has been one of the first to support the OGS sector by establishing favorable regulations through its Customs Union and Common External Tariff in 2005. Today, the majority of components — including batteries, modules, controllers and pumps — are tax-exempt. However, some components like TVs are not considered "solar" and are therefore more heavily taxed, which increases the costs of SHSs with TVs in particular.

Contrary to the general trend seeing import duties and VAT reduce over time, Nigeria has recently reclassified solar panels from exempt to taxed at five per cent<sup>41</sup>.

Figure: Summary of tax regulations in various SSA African countries

Country	Cameroon	Côte d'Ivoire	Kenya	Malawi	Mozambique	Nigeria	Senegal	Uganda
Duty	30%	20%	25%	10–25%	7.5%–20%	20%	20%	25%
VAT	19.25%	9–18%	16%	16.5%	17%	5%	18%	18%
Exemptions	No VAT on: control unit, solar panel, battery, lamps, cables, radio, USB phone charging cable		No tax on: control unit, solar panel, battery, lamps cables	No tax on: control unit, solar panel, battery, lamps cables		5% duty on solar panel	No tax on: solar panel	No tax on: control unit, solar panel, battery

41 [Agbaegbu \(2019\), Solar Import Duty and Tariffs. To exempt or not?, Techpoint.africa, September 6 2018](#)

Source: GOGLA analysis

While taxes are important sources of revenue for states, it is important to note that they are also disadvantaging quality products. As taxes are proportionate to products prices, quality products are more heavily taxed in absolute value than non-quality ones.

Beyond the issue of rates, another key challenge is tax consistency. A few distributors claim to have observed different tax rates being applied to two identical containers. As post-clearance audits are not systematic, some distributors also declare lower CIF (cost, insurance and freight) to pay lower taxes. Non-quality players tend to be subjected to less scrutiny during these audits as they usually import a more diverse range of products (mainly electronics).

Some non-quality distributors also skirt around national regulations and enter countries illegally. They are usually informal traders who import small quantities of non-quality products — via suitcases rather than containers — and sell them on informal markets.

## 2.4 PRICE DIFFERENCES HAVE CONSEQUENCES ON ACCESS TO QUALITY PRODUCTS

Core target communities for electrification using OGS products are low-income rural households. At the global level, the poverty rate in rural areas is more than three times higher than in urban areas<sup>42</sup>. Similarly, in SSA Africa, the core target communities for OGS electrification, the majority of which live in rural areas, have lower incomes than national averages<sup>43</sup>. Across the continent, almost 50 per cent of the households live with less than \$3.10 a day (2011 purchasing power parity (PPP)) according to Food and Agriculture Organization (FAO) (2016 calculations).

These target communities spend on average 10 per cent of their income on energy<sup>44</sup>, representing a \$9–10 monthly budget for the 18 per cent of the population living in rural areas on less than \$2.10 a day (2011 PPP USD) but above \$1.90 a day<sup>45</sup>. Due to constrained ability to pay, these households are very price sensitive and tend to purchase cheaper, non-quality products as the default choice.

Price sensitivity analyses show that reducing product prices would increase demand for quality products. A Duke Nicholas institute<sup>46</sup> study in 2019 showed that establishing a 20 per cent import tariff on SHS would be expected to cause an 18 per cent reduction in sales of basic systems that include a panel, lights, and phone charging equipment, and an even more significant drop of 32 per cent in sales of larger kits that include TVs. Similarly, a study carried out by Acumen in 2017<sup>47</sup> showed that reducing product prices would directly and significantly increase demand. The study assessed the price sensitivity of 1,400 Kenyan households — 99 per cent of which were conducting agricultural activities and 66 per cent of which were living on less than \$3.10 per person per day — through randomized control trials. While only 29 per cent of households were buying a solar lantern at the current market price of 900 Kenyan Shilings (KES), 37 per cent bought one at KES700 and 69 per cent at KES400 — implying that product uptake close to doubled (from 37 per cent to 69 per cent) with a 40 per cent price decrease. These two pieces of research suggest that lowering prices to bring the prices of quality products down would trigger a substantial growth in sales of quality products.

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42 UN statistics (2019)

43 FAO (2016) Estimates based on data from Burkina Faso, Côte d'Ivoire, Ethiopia, Mali, Malawi, Mozambique, Nigeria, Rwanda, South Africa, Uganda, United Republic of Tanzania, Zambia

44 Hystra (2009), Access to Energy for the Base of the Pyramid

45 FAO (2016) Estimates based on data from Burkina Faso, Côte d'Ivoire, Ethiopia, Mali, Malawi, Mozambique, Nigeria, Rwanda, South Africa, Uganda, United Republic of Tanzania, Zambia

46 Fetter & Phillips (2019), The True Cost of Solar Tariffs in East Africa, Nicholas Institute for Environmental Policy Solutions, Duke University

47 Rom, Gunther, & Harrison (2017), The Economic Impact of Solar Lighting

3. POLICYMAKERS AND  
INDUSTRY PLAYERS HAVE AN  
OPPORTUNITY TO MAKE  
QUALITY MORE AFFORDABLE





Quality legitimately increases end-consumer prices as it adds costs in order to deliver value for both consumers and governments. However, non-quality products have an advantage because of lack of consumer trust in claims and unfair business practices. As a result, many households still do not have access to efficient OGS products and solutions. Governments and industry players have a range of tools at their disposal that could be used to promote quality or bring down value chain costs and consequently end-consumer prices.

### 3.1 ENHANCING PUBLIC-PRIVATE COLLABORATIONS WHEN WORKING ON ELECTRIFICATION PLANS

#### 3.1.1 Policymakers could integrate quality products in electrification planning

Following the example of countries like Kenya or Rwanda, policymakers would benefit from officially integrating OGS solutions into their electrification plans.

The establishment of a robust policy framework for OGS solutions within national electrification plans is critical to helping governments set baselines and targets that will allow them to track progress against the realisation of their electrification objectives. It also entrenches the role that OGS solutions can play in strengthening energy access both to offer an alternate solution or as a back-up to grid connections, and to extend connections to off-grid communities.

Furthermore, integrated electrification planning allows governments to issue consistent policy statements and assign clear responsibilities to the various government agencies involved. Coordination and collaboration with industry stakeholders is vital to ensure that the proposed electrification policies can be met with available technology.<sup>48</sup> In turn, policy predictability helps companies attract customers and investments.<sup>49</sup>



Photo: Fenix International

#### 3.1.2 Policymakers could share data on electrification plans to help solar distributors adapt their extension plans, and conversely use PAYGO data to inform their plans

The interests of policymakers and OGS players clearly converge towards bringing power to as many people as possible. As a consequence, they have a clear interest in collaborating on how to tap into off-grid households' significant needs. They can start by making the right and accurate data available, which goes both ways.

On the one hand, policymakers can provide OGS players with grid expansion plans and any information, such as socio-economic status data, that can help assess customers' ability to pay. Making electrification plans publicly available would help inform the development strategy of OGS players, who in turn can allocate their sales and marketing investments more wisely towards rural areas with long-term potential. Making socio-economic data available would help OGS players better target clients based on their ability to pay. It could also guide development partners and other stakeholders towards communities that may be particularly vulnerable and where more support may be needed to increase affordability and access to quality products.

48 GOGLA (2018), Providing Energy Access through OGS Guidance for Governments

49 ODI (2016), Accelerating access to electricity in Africa with OGS

What's more, helping OGS players to coordinate their efforts with the grid expansion would help ensure that the right needs are met:

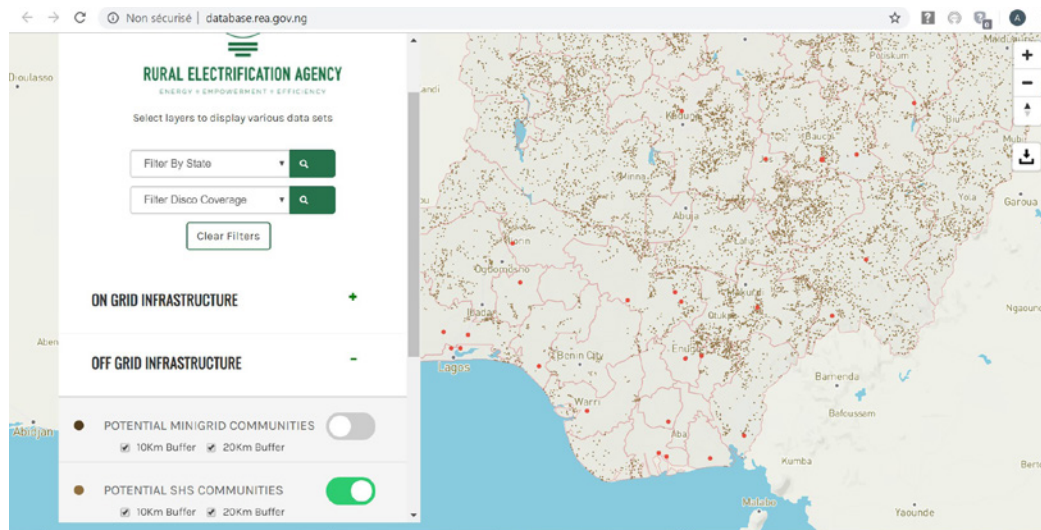
- The households not likely to be reached by the public grid (and/or public-private mini-grid) in the short/mid-term can be targeted by OGS quality players and improve their power and overall living situation by investing in durable off-grid products
- The households likely to be reached by the public grid in the same period can invest in fulfilling other needs

### Case study:

#### How the Rural Electrification Agency of Nigeria makes its database of potential SHS communities publicly available

The rural electrification agency (REA) created a collaborative database “seeking to provide vital energy/ community/ grid data and encouraging transparency in the Nigerian energy industry by creating a central home for energy statistics and community data collected by government agencies, donors and private entities.”<sup>50</sup> In particular, it positions on the map all the potential SHS communities of 1,000 (or less) to 3,000 people (or more, as can be selected).

This initiative has enabled an accelerated penetration of the Nigerian OGS market by quite a few players. This tool is a good starting point that players can then cross-check with field observations and data on purchasing power in selected communities to further target the right end-consumers.



### 3.1.3 Policymakers could leverage RBF to encourage quality solar to focus on areas where on-grid electrification does not make economic sense

Leveraging result-based financing (RBF) schemes and pairing them with geographical targets is an opportunity for policymakers to lower OGS players' costs to serve remote, non-electrified areas, while also contributing to their electrification goals. They can take a variety of forms, from impact bonds to output-based aid to carbon credit. The purpose of such schemes is to condition public subsidies on the achievement of pre-defined targets. These mechanisms can either directly impact consumers, by incentivising sales in targeted geographies or towards specific income segments, or indirectly by providing unrestricted financial resources required for companies to develop and eventually serve more consumers.

<sup>50</sup> REA Energy database

The Ghanaian GPOBA<sup>51</sup> RBF launched in 2008 overtook its initial target of supporting the purchase of quality SHS and solar lanterns for 15,000 remote households by 10 per cent. In Benin, the Energising Development (EnDev) RBF program has supported the creation of the quality market and provided access to energy to 135,000 households between 2012 and 2017.<sup>52</sup>

While impact studies<sup>53</sup> show that RBF enabled and accelerated market entry and penetration, they also note that companies tend to first go for low-hanging fruit and that “geographic outreach to remote areas is still sparse.”

To get the most benefits out of these RBF, policymakers must therefore be mindful of a few pitfalls. First, the scheme must set relevant business risk levels and financing duration, adapted to local context, to ensure returns on investment and preserve players’ business viability. The scheme’s objectives must be ambitious but attainable. Secondly, products or communities targeted by the RBF must be clearly specified, in line with policymakers’ objectives to prevent diversion of incentives. As an example, the Ugandan program established through Energy for Rural Transformation provided incentives mostly for larger products, thereby subsidising wealthier households that would have purchased products anyway, rather than giving access to lower-income ones.<sup>54</sup> Finally, performance has to be verified frequently to ensure fast money transfers to the companies involved in such schemes, thereby preventing any cash flow issues.<sup>55</sup>

#### **Case study: How the Kenya Off-grid Solar Access Project (KOSAP) reaches the last mile leveraging an RBF scheme**

In north and north east remote and low-density regions of Kenya, the poverty rate is at 70 per cent and only seven per cent of households had electricity access in 2018.<sup>56</sup> To serve these low-electrified areas, the government, with the support of the World Bank, launched the \$150 million KOSAP scheme to organise capacity building for OGS organisations and to install mini-grids, stand-alone solar systems, clean cooking solutions and solar water pumps. In particular, this program includes a market-based approach with a \$12 million competitive RBF facility launched in June 2019<sup>57</sup>.

The purpose of this cost-efficient financing scheme is to “establish sustainable supply chains for marketing and sales of multi-light LG QV OGS systems”<sup>58</sup> in areas where not much market data is available and distribution costs are up to four times higher than for the core market. To do so, the government has announced it will compensate QV SHS providers for market entry, operational and opportunity costs. Outcomes will be assessed through the verification of SHS installation by facility managers, third party audits and consumer feedback gathered through a cell phone survey.<sup>59</sup> To ensure its efficiency and given the uncertainty of these new markets, this project aims to remain flexible and adapt to market conditions and customer needs. By doing so, KOSAP expects to serve 1.2 million people with new or improved electricity services by 2023.

It is worth noting that this approach is anchored in a long-term strategy: applicants have to commit to a sustainable market presence (compensated by KOSAP) and funders have planned to launch a debt fund beyond the RBF scheme to support participating companies in scaling up in underserved areas.

51 [GPOBA \(2016\), Improving rural energy access through SHS in Ghana, Note #12, June 201D](#)

52 [EnDev website \(2019\), Benin page](#)

53 [Particip \(2018\), RBF for Rural Market Development of PicoPV Solar in Tanzania, Impact study](#)

54 [DFID \(2018\), East Africa Local manufacturing of off-grid lighting and electrification sector: commercial analysis](#)

55 [World Bank \(2017\), Kenya: Off-grid Solar Access Project for Underserved Counties](#)

56 [LG \(2018\), Kenya OGS Access Project for Underserved Counties](#)

57 [KOSAP website \(2019\), Standalone Solar Systems for Households RBF Facility](#)

58 [KOSAP website \(2019\), Standalone Solar Systems for Households RBF Facility](#)

59 [KOSAP website \(2019\), Standalone Solar Systems for Households RBF Facility](#)

### 3.1.4 More generally, proposing more fora for discussion between government and the OGS sector would enhance synergies and improve efficiency

Interviews with both policymakers and private companies indicate that some level of misunderstanding is hampering collaborative efforts between the two parties. On the one hand, policymakers can sometimes suspect quality players of inflating prices to increase their margins and putting brand premiums on their products. On the other hand, private companies often express frustration about public subsidies, criticising the priority given to the grid – and kerosene – over OGS.

To curb this detrimental distrust, there is a need to create more fora where dialogue can happen between all stakeholders involved in the energy sector. Partnering with local industry associations is an important first step that allows national governments to engage with local industry. An example of such a partnership is seen between the Sierra Leone revenue and customs authorities, The Ministry of Finance and the Energy Revolution Taskforce, who are partnering to ensure that tax exemptions are being issued appropriately.<sup>60</sup>



Photo: GOGLA

Globally, events like GOGLA Community of Champions are very useful for this purpose as they are facilitating “interactive and open dialogue amongst government decision-makers, industry and the international donor community.”<sup>61</sup> They give public officials an opportunity to get a better understanding of global trends, issues and solutions that are being applied, and to share best practices and learnings from successes and failures in other countries. Investing in better understanding private and public perspectives is indeed key to encouraging collaboration and creating a better environment to achieve universal energy access in Africa. This, in turn, helps in identifying more areas of improved efficiency and cost savings in the deployment of quality products at the local, national, and regional level.

## 3.2 LOWERING UPSTREAM COSTS BY LOWERING TAXATION AND EVOLVING REGULATIONS

### 3.2.1 Lowering taxation is one of the most effective ways to improve affordability

East Africa remains a global leader in the market size, penetration and impact that its OGS sector has on the regional energy access challenge. Much of the industry’s early growth and continuing success in East Africa has been strongly enabled by the early provision of import tariff and VAT exemptions, over much of the last decade. While these incentives have recently been eroded, the East African experience strongly validates the role and importance of keeping taxes low, particularly for products intended to reach low-income, difficult to reach populations.

This is not only beneficial to consumers but also to the government; a study in Mozambique cited by the OGS Market trend report<sup>62</sup> found that, over a ten-year period, tax exemptions will be more than compensated by the increase of business taxes from OGS players.

It is the recommendation of GOGLA members that tax exemptions should not be limited to finished products, but rather extend to the core components of OGS systems, i.e. panels, batteries, charge controllers, lights and the necessary connecting cables. Furthermore, consumer appliances that can significantly contribute to social and economic developments goals, e.g. irrigation pumps, fridges and other cooling systems, should also be considered for support. For example, the Government of Rwanda introduced some VAT exemptions in 2014 on solar lighting products certified by LG, hence providing incentives for consumers to choose longer-lasting products. Going one step further, governments may simply prevent products not meeting certain quality standards to enter their markets. This is the case for a

60 GOGLA (2018), *Providing Energy Access through OGS Guidance for Governments*

61 GOGLA (2019), *Community of Champions webpage*

62 Dalberg Advisors and LG (2018) *OGS Market Trends Report 2018*

growing number of governments in ECOWAS and in East Africa that are developing standards based on the IEC specifications, aligned with LG standards.

Another option for lowering taxes is to couple exemptions with quality standards. In this case, a sound policy and regulatory environment needs to be complemented by sound implementation processes. This ensures that only products compliant with quality standards and tax exemptions enter the market.

Components of such a system include:

- The development of a robust but simple importation procedure that enables quality to be assessed at the point of entry. One way to achieve this is through Pre-Export Verification of Conformity (PVoC) requirements, such as those implemented by Kenya, where by governments require verification in the exporting countries prior to importation<sup>63</sup>
- Activities to both raise awareness about and ensure compliance with the quality standards among industry players
- A legal framework that enables companies or public authorities to prosecute those caught distributing counterfeit or poor-quality products
- Improved enforcement efforts by police, border guards and custom authorities. Indeed, a number of policymakers interviewed have expressed their need for support in increasing the resources and capabilities of market surveillance teams

Interestingly, quality assurance may also happen further down the value chain, with accredited vendors that only sell quality products. For example, the Kenya Renewable Energy Association has developed and promoted a voluntary accreditation system for solar dealers.<sup>64</sup>

GONGLA and its members consider tax exemptions to be preferable to consumer price subsidies, because tax exemptions are less likely to cause market distortion as they benefit all companies equally. They also attract more companies into the market, thereby increasing competition and lowering prices, which ultimately benefits consumers.

### **Case Study:**

#### **How Kenya implemented a national fiscal, standard and conformity policy for the OGS**

The Kenyan Ministry of Energy has identified OGS as the most cost-efficient option for 1.96 million households in the Kenya National Electrification Strategy.<sup>65</sup> In 2017, the Kenyan government adopted mandatory standards for solar lanterns (below 10Wp) that are fully aligned with the IEC and LG standards. These mandatory standards are applicable to all solar lanterns imported and sold in the Kenyan market. LG Associates account for 65 per cent of solar lantern sales and 61 per cent of SHS sales in Kenya<sup>66</sup>. Kenya is the leading country in the region at keeping non-quality-verified products off the market; a feature of a vibrant formal private sector and a policy and regulatory environment that promotes good quality.

This reflects the Government's commitment to quality and consumer protection.

Noteworthy efforts include:

- Adoption of LG product quality standards for solar lanterns
- Implementation of Pre-Export Verification of Conformity using the quality standards
- Fiscal incentives to boost good quality products

63 SGS (2018), Kenya Pre-shipment Verification of Conformity to Kenya Standards, Guidelines for the Trade

64 UNDP Kenya (2019), Cellphones based solar dealer accreditation initiative

65 Kenya, National Electrification Strategy (2018)

66 Dalberg Advisors and LG (2018) OGS Market Trends Report 2018

### **3.2.2 Clarity on the scope of exemption should go hand in hand with lowering taxes to limit access to non-quality products**

While the need to develop supportive fiscal policies is usually well understood by policy-makers, the need to clarify their scope is often underestimated – even though this largely undermines policymakers’ fiscal efforts.

The Uganda Solar Energy Association (USEA) noted that although exemptions provided within the EAC Customs Management Act have enabled progress in expanding solar energy access, inconsistent interpretation of policy has hampered the OGS industry.<sup>67</sup> The lack of clarity and certainty in importation processes, requirements and qualification for exemption has resulted in significant costs and delays for many OGS companies. In addition, inconsistent applications of exemptions have affected product pricing.

Efforts such as the 2016 directive by the Commissioner for Customs in the EAC that sought to provide clarity in the interpretation of the applicable statutes are steps in the right direction, but differing interpretations and applications by individual authorities in the different partner states persist. This lack of consistency has contributed to misunderstandings between solar energy players and different tax and customs authorities in a number of countries, with legal cases witnessed in Kenya and Uganda.

The development of guides/handbooks can help provide the required clarity on the applicable customs, tax, regulations and treatment of various solar products, parts and accessories. They should target the OGS industry (OGS companies and clearing and forwarding agents (C&F)) and government officials involved in the importation and export of goods. They should include guidance on the importation process (including importation guidelines), requirements and qualifications for exemption for all relevant products. These should be developed in collaboration with customs, tax and standards authorities to ensure they are reflective of the legal status for a specified period of time.

Supporting market surveillance teams in better fighting counterfeits, sub-standard products or lack of truth in advertising goes a long way in ensuring the promotion of quality products. The simplicity and consistency of the guidelines over time are critical to ensure their utility and efficiency, and ultimately support quality players in reducing consumer prices.

## **3.3 LOWERING DOWNSTREAM COSTS BY FUNDING EDUCATION AND TRAINING, MAKING FINANCING LESS EXPENSIVE, AND SUPPORTING LAST MILE DISTRIBUTORS**

### **3.3.1 Backing quality products with more endorsement by relevant authorities would efficiently create awareness on quality products and reduce marketing spending**

Lighting Africa reports a “strong correlation between the markets where OGS is on a sharp growth trajectory and those where consumer education campaigns are carried out.”<sup>68</sup>

The extensive Overseas Development Institute (ODI) review of consumer education efforts performed in 13 SSA countries indicated that across countries, consumer education is particularly necessary in three cases<sup>69</sup>:

- To increase awareness of the solar sector as a whole and the economic benefits associated with solar products. This is the case in countries like Nigeria and Somalia, as well as some parts of Tanzania and Zambia where OGS products are not known well enough as an alternative to more hazardous and costlier kerosene or candles

<sup>67</sup> Uganda Solar Energy Association (2019), Handbook on Solar Taxation

<sup>68</sup> Lighting Africa, [Consumer Education](#)

<sup>69</sup> ODI (2016), Accelerating access to electricity in Africa with OGS. Country briefing: Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, Somalia, Tanzania, Uganda, Zambia, Zimbabwe

- To educate consumers on how to use solar products correctly and on the importance of paying the associated loan tranches on a regular basis. The ODI report noted that in some countries where there had been free distribution of products, like in Rwanda “customers may not wholly understand the true cost of the product or role they must play in respect of basic maintenance<sup>70</sup>”
- To fight against the mistrust generated by the availability of low-quality products and counterfeits that make consumers turn away from OGS products overall, and quality products more particularly. In this case, informing consumers on how to recognise quality and the corresponding long-term benefits is key.

Private companies rarely have the capabilities and resources to handle these awareness campaigns by themselves. SSA African governments could help, in partnership with non-governmental organizations (NGOs), development agencies and quality players – with the following key points in mind:

- Ensuring that campaigns are not creating market distortion in favor of individual brands, yet are specific enough for consumers to make informed purchasing decisions, so that awareness translates into sales<sup>71</sup>
- Defining cost-effective communication tools and channels. These need to be adapted to awareness levels, and local cultural context, and may typically range from roadshows in places like schools or open markets, to product endorsement from local policymakers, to retailer training. Because consumers have more and more access to digital and social media, there could be opportunities to create or leverage peer-to-peer platforms for customers to provide ratings, and report quality issues or counterfeits. Inspiration may come from other industries, for example pharmaceutical companies that put in place verification systems whereby purchasers of drugs can check and report whether they have bought the real products (for example, the Tambua app, developed in partnership with the Pharmacy and Poisons Board of Kenya and Cosmos Pharmaceutical Company)<sup>72</sup>

These campaigns could help reduce quality players’ marketing spends, thereby allowing them to reduce their product prices.

#### **Case study:**

#### **How the Tanzanian Renewable Energy Association (TAREA) targets both influencers and consumers in its educational campaigns**

TAREA, which brings together various stakeholders to promote the accessibility and use of renewable energies technologies, organises numerous awareness campaigns.

Interestingly, it targets both influencers and consumers. Influencers including financiers, local councils, local governments and community leaders are trained on the benefits of quality solar products with tailored workshops, conferences and dedicated economic forums.<sup>73</sup> For consumers, a large range of below and above the line activities have been developed. This includes lecture programs for schools and universities, village demonstrations coupled with social events (e.g. football matches or traditional dances<sup>74</sup>) and visits to renewables sites. TAREA also organises radio and TV live talks, writes newspapers articles and distributes leaflets. This way, consumers learn about the solar energy benefits and how to differentiate quality products from non-quality products.

To complement its educational campaigns and provide evidence of OGS benefits, TAREA distributes solar products and installs solar systems for communities.

70 ODI (2016), *Accelerating access to electricity in Africa with OGS. Country briefing: Rwanda*

71 Past Hystra research has found that awareness campaigns in encourage the purchase of life-improving products such as clean cookstoves or irrigation pumps could often be successful in terms of customer understanding yet

72 [UNDP Kenya \(2019\), Cellphones based solar dealers accreditation initiative](#)

73 [TAREA magazine SunEnergy \(2015\), Identifying substandard/ counterfeit solar Photovoltaic Panels](#)

74 [TAREA website \(2019\), News](#)

### 3.3.2 Training more qualified technicians or pooling after-sales service would lower the costs of after-sales

As the “Powering job census 2019” report notes, if countries want to meet their electrification goals and reach the 7th SDG by 2030, they need to start developing the skills of their future workforce now.<sup>75</sup> Providing more vocational training on renewable energy should be a priority for policymakers. This would be beneficial to both private and public stakeholders. On the one hand, it would help companies lower their recruitment and training costs by creating a pool of young talents. On the other hand, this is a great opportunity to galvanise the economy through the creation of local, future-fit jobs.

The ODI has referenced a few examples that can be used as sources of inspirations for policymakers.<sup>76</sup> In Uganda, for instance, a solar PV training module has been added to all technical training institutions. In Nigeria, the Lagos Energy Academy was established to deliver vocational training on the “Power Sector Value Chain.” At a larger scale in India, the government’s Suryamitra program has been able to certify over 20,000 electricians in the country since 2016.<sup>77</sup> Through its Household Solar Workforce Development Challenge, USAID is helping finance the delivery of such training by awarding funding to scalable, innovative third-party organizations that focus on training workers for the SHS sector.<sup>78</sup>

As the “Powering job census” report notes, the role of policymakers does not only lie in creating vocational training, but also in spreading information about the available resources. Indeed, “many companies are not aware of the training resources available for their staff or even where to source trained technicians.”<sup>79</sup> Policymakers could provide a clear source of information for companies to learn where and how to access trainings and certified technicians across the country.

More generally, proposing or encouraging systems that pool aftersales (e.g., a multi-brand customer care service, or shared technicians across several brands) would enable distributors to lower the costs of enforcing their warranty programs and provide quality service to their clients.

### 3.3.3 Collaborating with donors could help lower the cost of financing

Access to finance remains a key challenge to the solar industry, affecting the sector all along the supply chain. National governments, development partners and other stakeholders must explore opportunities to increase access to finance both for industry players and off-grid customers.

Beyond providing direct funding to OGS players through RBF and other financing schemes, policymakers have an opportunity to help lower the costs of financing from other traditional sources so that quality players can in turn offer more affordable financing options to their consumers. Concretely, as explained in section 2.b, a good part of this cost comes from the FOREX risk linked to these companies’ country of operations.

A FOREX de-risking fund for a selected range of products from the OGS sector would be an interesting opportunity to explore for policymakers. Such a fund could oversee swapping hard currency — like USD — funding into a local currency loan, hence making business much more predictable for companies.

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75 Power for All (2019), Powering job census 2019: The Energy Access Workforce

76 ODI (2016), Accelerating access to electricity in Africa with OGS. Country briefing: Nigeria, Uganda

77 Power for All (2019), Powering job census 2019: The Energy Access Workforce

78 USAID (2019), Competitions for Development, Household Solar Workforce Development Challenge

79 Power for All (2019), Powering job census 2019: The Energy Access Workforce



### Case study:

#### How the World Bank has helped imports through eased access to FOREX in Ethiopia

The Development Bank of Ethiopia, funded by the World Bank, has been tackling the FOREX issue since 2013 through the “Market Development for Renewable Energy & Energy Efficient Products” Credit Line. This financing scheme of \$40 million is partly used to offer a pool of priority FOREX working capital to import products meeting LG Quality Standards. The objective is to sell 2.8 million solar lanterns and 214,000 SHSs by 2020. LG reports<sup>80</sup> that during the first 18 months of activities, over 850,000 QV products were imported using this financing scheme.

As they are projected to save 1,105,075 tons of CO<sub>2</sub><sup>81</sup>, all the products eligible to the credit line are also eligible for World Bank’s Carbon Initiative for Development. According to LG, the revenue that will be generated by the Certified Emission Reduction could be reinvested in enabling measures for the OGS sector, such as discounting SHS battery replacement costs, tracking warranty systems and subsidising certified SHS technicians.

There are indubitably more opportunities for innovative financing schemes and de-risking mechanisms yet to emerge. Encouraging the local financial sector to provide financing in local currency would also help limit the FOREX risk on the working capital used to order products in USD before selling in local currency.

Policymakers could work with the overall energy support ecosystem to think through these and help fund the vibrant quality OGS market at lower costs.

#### 3.3.4 Supporting local distributors in improving their offerings and operations could help lower the costs of serving the last mile

In recent years, hundreds of local companies selling solar products have emerged across Africa. Because many of these companies are small and self-financed, they have developed lean distribution models, and could have the potential to offer quality products to consumers at affordable prices including in last mile areas.

These local players, although they might be part of national renewable energy associations, are often under the radar of the development and investor communities. They face a number of challenges, for example in accessing working capital funding, developing scalable sales and aftersales networks, or procuring quality products with acceptable conditions.

A number of initiatives are emerging to support them in building quality offerings. For example, VentureBuilder<sup>82</sup> was launched in October 2019 with a focus on “scaling African-owned and managed OGS enterprises,” supporting them with patient capital and technical expertise. The Global Distributors Collective<sup>83</sup> was formed in 2018 as a one-stop shop to address the distribution, financing and procurement challenges of last mile distributors, and to give them a voice in the ecosystem.

These initiatives would benefit from further and complementary support from governments, in particular in ensuring that the policies or plans that support the emergence of OGS markets are not disproportionately in favor of the established international players, and in fostering a local ecosystem, including investors and supporting national champions



Photo: Mobisol

80 LG (2018), [Country briefing: Ethiopia](#)

81 Development Bank of Ethiopia (2016), [Helping Energy Access Program with RBF and Transitioning to Post 2020 World](#), African Carbon Forum

82 [Venture builder website](#) (2019)

83 [Global Distributors Collective website](#) (2019)

# CONCLUSION

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This report started off from a simple observation: quality OGS products are a widely acclaimed solution, but still not as widespread as non-quality products. It raised two questions: what drives the cost of quality? And what could be done to reduce these costs to make quality products more accessible to the masses in SSA Africa?

The report identified the costs drivers of quality 1Wp solar lanterns and 50Wp SHS, with the caveat that these analyses are indicative of trends, not reflective of a given product or country, and that there are wide variations in both quality and price points within the quality and non-quality categories. A great portion of quality premiums (up to 70 per cent for SHS) comes from the costs of quality components on the upstream, and from distribution, after-sales service and financing on the downstream. These costs all bring critical durability, accessibility and affordability benefits to consumers.

For most of these premiums, we have identified solutions or trends that will help lower the cost of quality in the coming years, including: technological development reducing the cost of batteries and improving appliances' efficiency; leaner and modular product design; and distribution and after-sales services leveraging existing local communities or sharing costs across brands. All provide inspiring examples for OGS manufacturers and distributors.

Governments also have a range of tools at their disposal that could be used to promote quality or bring down end-consumer costs. Lowering taxes and better enforcing regulations on quality standards remains an effective way to make quality products more affordable.

In addition, policymakers have further opportunities to support the OGS sector, especially by improving communication with suppliers and consumers. Enhancing public-private collaborations could help better integrate off-grid poor, rural consumers into electrification plans through OGS. Further, governments can conduct consumer awareness campaigns to promote the adoption of quality products. Other public levers include technical training of the workforce, and support to adapted funding schemes for OGS players.

Further research would be needed to analyse in greater detail which of the costs identified in this report bring most value to consumers and how manufacturers and distributors can further minimise the costs of quality products. We hope that this report will be a starting point in helping the sector enhance its efficiency and the value for money it provides to consumers, ultimately increasing its impact at affordable costs.

# POLICYMAKER PITCH

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Quality matters: it is a necessary condition for bringing social and financial benefits to families and enabling a sustainable expansion of OGS. Yet, quality also comes at a cost: quality products are generally more expensive (to varying extents) than non-quality products offering similar *functionalities* (vs. *similar quality*). A great portion of quality premiums (up to 70 per cent for SHS) comes from the costs of quality components on the upstream, and from distribution, after-sales service and financing on the downstream. These costs all bring critical durability, accessibility and affordability benefits to consumers.

**Three potential areas of intervention emerge for policymakers to make quality products more affordable to consumers.** These options were discussed by GOGLA and Hystra on October 2019 in Dakar, with policymakers from 15+ SSA countries, at one of the Community of Champions events regularly organized by GOGLA:

**1. How to enhance public-private collaborations and develop electrification plans more likely to encourage access to quality solar products?**

- a. Integrate quality products in electrification planning and ensure better data-sharing to help solar distributors adapt their extension plans, and conversely use pay-as-you-go (PAYGO) data to inform policymakers' planification
- b. Leverage result-based financing (RBF) to encourage quality solar to focus on areas where on-grid electrification does not make economic sense
- c. More generally, propose more fora for discussion between government and the OGS sector to enhance synergies and improve efficiency

**2. How to lower the costs incurred by companies upstream by designing and better enforcing appropriate regulatory frameworks and tax exemptions?**

- a. Lower taxation is one of the most effective ways to improve affordability
- b. Clarity on the scope of exemption limits access to non-quality products

**3. How to lower the downstream costs with awareness campaigns, training programs, support of efficient, local distribution models, and reduction of financing costs?**

- a. Back quality products with more endorsement by relevant authorities to efficiently create awareness on quality products and reduce marketing spending
- b. Train more qualified technicians or pooling after-sales service to lower the costs of after-sales
- c. Collaborate with donors to lower the costs of financing for local distributors
- d. Support local distributors in improving their offering and operations to lower the costs of serving the last mile

## SOURCES

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**Agbaegbu** (2018), Solar Import Duty and Tariffs. To exempt or not?, Techpoint.africa, September 6 2018

**Alibaba.com** (2019), OGS components price benchmark as of August 2019

**Blimpo, Moussa P., and Malcolm Cosgrove-Davies** (2019), Electricity Access in SSA Africa: Uptake, Reliability, and Complementary Factors for Economic Impact, Africa Development Forum series

**Bloomberg and Lighting Global** (2016), OGS market trends report 2016

**Cilliers** (2018), Made in Africa: manufacturing and the fourth industrial revolution, Institute for Security studies, Africa in the world report 8, April 2018

**Dalberg Advisors and LG** (2018) OGS Market Trends Report 2018

**Development Bank of Ethiopia** (2016), Helping Energy Access Program with Result-Based Financing and Transitioning to Post 2020 World, African Carbon Forum

**DFID** (2018) Energy Africa – Kenya, Uganda, Ethiopia, Local manufacturing of off-grid lighting and electrification sector: Commercial analysis, April 2018

**Efficiency for Access website** (2019), LEIA Programme

**Endev website** (2019), Benin page

**EnDev** (2017), Driving markets to scale, Lessons learned from stimulating energy access markets with results-based financing, March 2017

**Ethiopia**, National Electrification Program 2.0 Integrated Planning for Universal Access (2019)

**FAO statistics** (2016)

**Fetter & Phillips** (2019), The True Cost of Solar Tariffs in East Africa, Nicholas Institute for Environmental Policy Solutions, Duke University

**Global Distributors Collective website** (2019)

**Global LEAP Awards** (2019), Winners company profiles

**GOGLA** (2017), Quality Assurance: A Guide for GOGLA members, March 2017

**GOGLA** (2018), Affiliates' sales data

**GOGLA** (2018), Providing Energy Access through OGS Guidance for Governments

**GOGLA** (2019), Community of Champions webpage

**GOGLA** (2019), Country Profiles: Benin, Ethiopia, Kenya, Lesotho, Madagascar, Niger, Nigeria, Rwanda, Togo and Uganda

**GOGLA** (2019), E-waste Toolkit Module 3, Briefing Note

**GOGLA and Altai consulting** (2018) Powering Opportunity, The Economic Impact of OGS

**GPOBA** (2016), Improving rural energy access through SHS in Ghana, Note #12, June 2016

**Hystra** (2009), Access to Energy for the Base of the Pyramid

**Hystra** (2017) Reaching Scale in Access to Energy: Lessons from practitioners

**Ipsos** (2016)– cited in Dalberg Advisors and LG (2018) OGS Market Trends Report 2018

**Jaglin** (2019), Off-grid Electricity in SSA Africa: from rural experiments to urban hybridizations

**Kenya Climate Innovation Center** (2016), Kenya Solar PV Market Assessment

**Kenya, National Electrification Strategy** (2018)

**KOSAP website** (2019), Standalone Solar Systems for Households Results-Based Financing (RBF) Facility

**Lighting Africa** (2013), A Growing and Evolving Market for Off-grid Lighting: Market Presence of Off-Grid Lighting Products in the Kenyan Towns of Kericho, Kapkugerwet (Brooke), and Talek

**Lighting Africa** (2019), Consumer Education webpage

**LG** (2012), Quality Assurance Protocols

**LG** (2015), Quality Communication: The Rise of Solar: Market Evolution of Off-Grid Lighting in Three Kenyan Towns

**LG** (2018), Country briefings: Ethiopia; Kenya; Nigeria; Rwanda; Senegal; Tanzania; Uganda

**LG** (2018), Kenya OGS Access Project for Underserved Counties

**LG** (2018) Pre-shipment conformity assessment for Pico-PV Products

**LG** (2018), Quality Matters, Technical notes issue 27, August 2018

**LG and GOGLA**, Global OGS Semi-Annual Market Report (January-June 2018 and July- December 2018)

**LG** (2019), Quality Assurance Program pricing

**Mangoo** (2019), product profiles

**Navigant consulting** (2015), Analysis of the Potential Future of the LG Quality Assurance Program

**Nygaard, I., Hansen, U.E. and Larsen, T.H.** (2016) The emerging market for pico-scale solar PV systems in SSA Africa: From donor-supported niches toward market-based rural electrification, UNEP DTU Partnership

**ODI** (2016), Accelerating access to electricity in Africa with OGS. Country briefing: Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, Somalia, Tanzania, Uganda, Zambia, Zimbabwe

**Particip** (2018), RBF for Rural Market Development of PicoPV Solar in Tanzania, Impact study

**Power for All** (2019), Powering job census 2019: The Energy Access Workforce

**Rateng** (2019), Mobile app identifies approved medicines, drugstores, blog, SciDev.Net, 14 March 2019

**REA Energy database** (2019)

**Rwanda, Rural Electrification Strategy** (2016)

**Rom, Gunther, & Harrison** (2017), The Economic Impact of Solar Lighting

**SGS** (2018), Kenya Pre-shipment Verification of Conformity to Kenya Standards, Guidelines for the Trade

**TAREA website** (2019), Our Work

**TAREA magazine SunEnergy** (2015), Identifying substandard/ counterfeit solar Photovoltaic Panels

**The Lumina Project** (2013), The dynamics of Off-grid Lighting Adoption, Technical report #12

**Uganda Off-Grid Energy Market Accelerator** (2018), fiscal policy analysis, An assessment of the tax and subsidy options to accelerate SHS in Uganda, November 2018

**USAID** (2007), Confidence in quality: Harmonization of CFLs to Help Asia Address Climate Change

**USAID** (2019), Competitions for Development, Household Solar Workforce Development Challenge

**Uganda Solar Energy Association** (2019), Handbook on Solar Taxation

**UN statistics** (2019)

**UN** (2018), Affordable and Clean Energy: Why It Matters

**UNDP Kenya** (2019), Cellphones based solar dealer accreditation initiative

**UNEP** (2015), Developing effective off-grid lighting policy, Guidance not for governments in Africa

**United Nations Development Program** (2019), sustainable development goals, goal 7

**Venture builder website** (2019)

**World Bank** (2017), Kenya: Off-grid Solar Access Project for Underserved Counties

**World Bank Group** (2015), Measuring Energy Access; Introduction to the Multi-tier Framework

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