Providing Energy Access through Off-Grid Solar: Guidance for Governments
About This Guide

This guide was developed by the Global Off-Grid Lighting Association (GOGLA) with the support of the joint World Bank/International Finance Corporation, Lighting Global Program, the U.S. Government-led Power Africa initiative, Sustainable Energy for All; and the African Development Bank (AFDB). This document reflects our shared views with regards to key policy and regulatory issues in the standalone, off-grid solar sector. We believe the information contained in this publication is derived from carefully selected sources. Thanks go to the World Bank Energy Sector Management Assistance Program (ESMAP) and the UK Department for International Development (DFID) for providing technical advice.

With over a billion people not yet served by modern electricity and just 13 years to go until the 2030 target, achieving universal energy access will be challenging. According to the Sustainable Energy for All (SEforALL) initiative, governments are rising to the challenge, but faster progress is needed. We are committed to supporting governments in their efforts to design pro-investment standalone, off-grid solar policies and regulations. To that end, this guide provides a holistic overview of issues for consideration in the design of policies and programmes intended to deliver on energy access goals.

In developing this guide, we have consulted widely with companies, development partners, civil society and other stakeholders in Africa, South Asia, and around the world. Recommendations are based on unique insight, and presented in a practical way for decision-makers with responsibility for achieving Sustainable Development Goal #7 (SDG 7) – access to affordable, reliable, sustainable and modern energy for all by 2030. We hope to accelerate the creation of a policy and regulatory environment that enables standalone, off-grid solar to fulfil its potential, and play a vital role in the achievement of universal energy access as well as other SDGs.

Inclusion of grid, mini-grid and off-grid solutions in electrification strategies, as part of an integrated approach, is the key to developing effective electricity access solutions. Every national context is unique. The exact policy actions required to support the off-grid sector vary depending on: the stage of off-grid market development; the pace and future potential for grid and mini-grid electrification; availability of funding; broader macroeconomic conditions and government priorities. In addition to pursuing policy and regulatory reform at national level, in close collaboration with the private sector, we encourage governments to work towards regional harmonization of policy and regulatory frameworks. This makes it easier for companies to navigate the policy environment, and to establish operations in multiple neighbouring countries.

Section 1 outlines the role of standalone, off-grid solar in achieving universal energy access, while Section 2 provides a summary of the latest trends in the sector. Section 3 is a set of guidance notes on key policy topics, which have also been published as individual factsheets to inform discussions around specific issues.

The guidance notes will be kept up-to-date by GOGLA and its development partners, and made available online at www.gogla.org. We encourage readers to get in touch with GOGLA if they have any questions or would like more information, at info@gogla.org.

Disclaimer:
The views in this guide do not necessarily reflect the specific policies of the respective development partners. Nothing in this guide is or should be construed as an endorsement by a development partner of any organization, product, service or individual.
About Us

The Global Off-Grid Lighting Association (GOGLA)
GOGLA is the voice of the off-grid solar energy sector. Established in 2012, GOGLA now represents over 100 members and remains a neutral, independent, not-for-profit 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.

About the African Development Bank
The African Development Bank (AfDB) Group is the premier development finance institution in Africa, with a mandate to spur sustainable economic development and social progress on the continent, thereby contributing to poverty reduction. The Bank Group achieves this objective by mobilizing and allocating resources for investment, as well as by providing policy advice and technical assistance. In 2016 the AfDB launched the New Deal on Energy for Africa, a transformative partnership-driven effort with an aspirational goal of achieving universal access to energy in Africa, and a specific target of achieving 75 million new off-grid connections by 2025. Working with governments to provide energy access through promoting standalone, off-grid solar solutions is a central component of the AfDB’s strategy to achieve this target.

About Power Africa
Launched in 2013, Power Africa is a U.S. government-led partnership, coordinated by USAID, that leverages the resources of 12 U.S. government agencies and over 150 private and public sector partners, to achieve two ambitious targets to expand access to power across sub-Saharan Africa by 2030: to increase installed generation capacity by 30,000 MW, and to create 60 million new connections. The Power Africa model focuses on practical solutions, and is uniquely positioned to drive results, because the partnerships Power Africa has forged combine three important elements: deep knowledge of the power sector, a private sector-led engagement approach, and experience working with governments and civil society to improve policies and sector governance.

About the World Bank / IFC Lighting Global Program
Lighting Global is the World Bank Group’s platform to support sustainable growth of the international off-grid solar market as a means of rapidly increasing energy access to the 1.2 billion people without grid electricity. Through Lighting Global, the International Finance Corporation (IFC) and the World Bank work with the Global Off-Grid Lighting Association (GOGLA), manufacturers, distributors, and other development partners to develop the modern off-grid energy market. The Lighting Global program supports market development by working with private companies to lower first-mover risk and mobilize private sector investment through market intelligence, quality assurance, business support services and consumer education.

About Sustainable Energy for All
SEforALL empowers leaders to broker partnerships and unlock finance to achieve universal access to sustainable energy, as a contribution to a cleaner, just and prosperous world for all. SEforALL exists to reduce the carbon intensity of energy while making it available to everyone on the planet. For more information, visit SEforALL.org and follow us at @SEforALLorg.

About the World Bank Energy Sector Management Assistance Program
ESMAP is a global knowledge and technical assistance program administered by the World Bank. It assists low and middle income countries to increase their knowledge and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Denmark, the European Commission, Finland, France, Germany, Iceland, Japan, Lithuania, Luxembourg, the Netherlands, Norway, the Rockefeller Foundation, Sweden, Switzerland, the United Kingdom, and the World Bank.

1 Beyond Connections: Energy Access Redefined, SE4ALL and World Bank ESMAP, 2015
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SECTION 1
The Role of Standalone Off-Grid Solar in Achieving Universal Energy Access
1.1 Faster Progress is Needed to Achieve Universal Energy Access by 2030

Over the last decade, the scale and importance of the energy access challenge has been fully recognized for the first time. SEforALL paved the way for the establishment of SDG 7 in 2015, with the target of ensuring ‘universal access to affordable, reliable, sustainable and modern energy for all by 2030’. It is increasingly recognized that energy has a vital role to play in contributing to other SDGs, with former UN Secretary General Ban Ki-Moon describing energy as the ‘golden thread that connects economic growth, social equity and environmental sustainability’.

The world is not currently on-track to achieve universal energy access by 2030, with remote, rural areas lagging behind and progressing slowly. According to the International Energy Agency (IEA) and World Bank, the energy access growth rate needs to be 4.5 times faster than it was from 2012–2014. Over this period, household electricity access rose just 0.19%—far slower than the required increase of 0.92% per year needed to achieve universal household electricity access by 2030 (Figure 1).

In Africa, household electricity access rates are not keeping up with population growth. 19 million people gained access from 2012–2014, yet the population grew by 25 million, leading to an increase of 6 million unelectrified people. In the Asia–Pacific region, the population grew by 42 million but energy access grew by 47 million, leading to a decrease of 5 million unelectrified people (Figure 2).

In line with GOGLA’s mandate as the voice of the off-grid solar energy sector, this guide focuses on the role of off-grid solar products and services in helping to deliver universal energy access, and the steps governments can take to promote these solutions. As such it does not cover other important energy access issues such as access to clean cooking, electrification through grid extension or mini-grids, which fall outside of GOGLA’s scope.

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1 Global Tracking Framework, SE4ALL, 2013
The most cost-effective way to expand household electricity access varies widely, within and between countries. At a global level, whilst 30% of new household electricity access is expected to come from grid extension, the IEA concludes that “for the large rural population that is distant from power grids, mini-grid or off-grid systems provide the most viable means of access to electricity”\(^4\). It goes on to anticipate that 315 million people in rural areas will gain access to electricity by 2040, and suggests that 25% of household electricity access needs to come from off-grid solar systems (Figure 3). This share may need to be even larger if grid and mini-grid solutions do not develop at the pace required to fulfil their anticipated contribution to the electricity access goal by 2030.

The further a community is from the main grid, the more expensive the cost of grid extension becomes, compared to off-grid solutions. For example, the 2015 Global Tracking Framework finds that, for 100,000 people with no electricity at all, basic solar lighting could be delivered for around $3 million whilst full grid connection with 23 hours supply would cost around $150 million\(^5\). When the cost of grid extension becomes prohibitive, mini-grids or standalone, off-grid solar systems become a more cost-effective solution. Mini-grids are more likely to be viable in areas of high population density or energy-intensive economic activity, while standalone solutions are more cost-effective in more sparsely populated, or poorer areas. Figure 4 illustrates how a range of factors influences the most cost-efficient way to connect communities. These include the size of the community; population density; distance to national grid; terrain and level of economic activity.

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\(^4\) Beyond Connections: Energy Access Redefined, SE4ALL and World Bank ESMAP, 2015

1.3 The Private Sector has a Vital Role to Play in Scaling Off-Grid Solar Solutions

According to the IEA, to achieve universal access by 2030, levels of investment need to increase about five-fold from 2009 levels. Figure 5 shows the increase in average annual investment needed, with suggested sources of financing. Both public and private investment need to increase dramatically. To reach the required investment level, a significant proportion of public funding must be deployed in ways that help to attract private investment.

Where governments lack the resources to deliver universal energy access through subsidized grid extension, the private sector can play a vital role in filling the gap. This is especially true for achieving household electricity access through off-grid solar solutions. Off-grid solar can deliver basic electricity access more quickly than on-grid solutions. With growth rates of over 100% year on year between 2011 and 2013, the sector has proven its capacity to achieve scale if an enabling policy and regulatory environment is in place. Private investment can act as a vital supplement to public investment, helping to accelerate access. Even in countries where the government’s goal is to provide grid-based solutions to the vast majority, off-grid solutions can still accelerate the electrification process. Off-grid solutions can reach more remote households years or even decades earlier than grid extension programmes, thus accelerating economic development in remote areas. A market-based approach to promoting off-grid solar can achieve household electricity access at scale, at speed, and at low cost to government - making it an attractive option for resource-constrained countries.

Figure 5: Average annual investment in energy access, by source of financing - Source: World Energy Outlook, IEA, 2016

Billion dollars (2010)

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Under SDG 7 the complexity of energy access is recognised. A multi-tier framework for defining and measuring energy access was initially proposed in the first SEforALL Global Tracking Framework report, published in 2013. This framework is broader than previous binary metrics, such as whether a household is connected to the electricity grid. Building on this work in Beyond Connections: Energy Access Redefined, ESMAP – in its role as SEforALL Knowledge Hub – defines ‘meaningful’ energy supply as having the following attributes. It must be: adequate in quantity; available when needed; of good quality; reliable; affordable; legal; healthy and safe. The multi-tier framework has now been approved and is being implemented. It recognizes that energy access covers energy for households, productive uses and community facilities, and focuses on both the quantity and quality of energy being accessed.

The tool for goal-setting, planning and tracking progress recognizes that there are many ways to expand energy access – from grid extension to mini-grids, off-grid solar home systems and solar lighting, as well as improved cook stoves and clean fuels. Improvements in supply through generation, transmission and distribution, as well as demand management through energy efficiency, also contribute to energy access. A ‘hierarchy of indices’ is used to show how different kinds of energy access fit under the overall energy access index. Given the nature of standalone, off-grid solar products and services, the sector’s main contribution to energy access will be through improving household electricity access, but it is also likely to play a role in improving access to energy for productive uses and community facilities (Figure 6).

Figure 6: Hierarchy of energy access indices - Source: Beyond Connections: Energy Access Redefined, SEforALL and World Bank ESMAP, 2015

At household level, access to electricity is measured based on technology-neutral Tiers, where successive thresholds are defined by whether energy supply meets requirements across a range of attributes (Figure 7). This is complemented by frameworks for access to electricity services, based on the types of appliances used in the household, and for electricity consumption. Multi-Tier matrices have also been developed for access to cooking, access to space heating, productive uses of energy, street lighting and access in community institutions.

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### Figure 7: Multi-tier matrix for access to household electricity supply – Source: World Bank and IEA

<table>
<thead>
<tr>
<th>Tier 0</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
<th>Tier 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Euro</td>
<td>Power</td>
<td>Very Low Power Min 3 W</td>
<td>Low Power, Min 50 W</td>
<td>Medium Power Min 200 W</td>
<td>High Power 800 W</td>
</tr>
<tr>
<td>AND Daily capacity</td>
<td>Min 12 Wh</td>
<td>Min 200 Wh</td>
<td>Min 1.0 kWh</td>
<td>Min 3.4 kWh</td>
<td>Min 6.2 kWh</td>
</tr>
<tr>
<td>OR Services</td>
<td>Lighting of 1.00 lmhrs per day and phone charging</td>
<td>Electrical lighting, air circulation, television and phone charging</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tier 0</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
<th>Tier 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>House per day</td>
<td>Min 4 hrs</td>
<td>Min 4 hrs</td>
<td>Min 8 hrs</td>
<td>Min 16 hrs</td>
</tr>
<tr>
<td>Hours per evening</td>
<td>Min 1 hr</td>
<td>Min 2 hrs</td>
<td>Min 3 hrs</td>
<td>Min 4 hrs</td>
<td>Min 4 hrs</td>
</tr>
</tbody>
</table>

3. Reliability

<table>
<thead>
<tr>
<th>Tier 0</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
<th>Tier 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>Max 14 disruptions per week</td>
<td>Max 3 disruptions per week of total duration &lt; 2 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Quality

<table>
<thead>
<tr>
<th>Tier 0</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
<th>Tier 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Voltage problems do not affect the use of desired appliances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Affordability

<table>
<thead>
<tr>
<th>Tier 0</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
<th>Tier 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability</td>
<td>Cost of a standard consumption package of 365 kWh per annum is less than 5% of household income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Legality

<table>
<thead>
<tr>
<th>Tier 0</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
<th>Tier 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legality</td>
<td>Bill is paid to the utility, prepaid card seller, or authorized representative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Health and Safety

<table>
<thead>
<tr>
<th>Tier 0</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>Tier 4</th>
<th>Tier 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and Safety</td>
<td>Absence of past accidents and perception of high risk in the future</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The multi-tier framework provides a more nuanced picture of the energy access situation, compared to traditional binary definitions of electrification. The World Bank/ESMAP team is currently carrying out a global baseline survey to collect multi-tier framework data in partnership with the Scaling Renewable Energy Programme (SREP). The survey is carried out through a household questionnaire applied to a nationally representative sample of households. Survey results can be used to analyze what is preventing people from gaining access to higher Tiers of energy access. This kind of ‘gap analysis’ can be a powerful tool for decision-making regarding policy, regulation and investment. In the theoretical example provided in figure 8, for example, colours reflect the different factors preventing households from enjoying a higher tier of energy access. It shows that over 50% of households are held back in Tier 0 because of a lack of any source of electricity. Stand-alone solutions are an important strategy to enable more people to move from Tier 0 to Tiers 1, 2 and 3.

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1.5 Policy and Regulatory Reform: The Key to Accelerating Access through Off-Grid Solar Market Growth

The off-grid solar sector has emerged rapidly over the last decade, with companies developing new technologies and business models all the time. Meanwhile, governments, aid agencies, investors and philanthropic foundations are becoming increasingly interested too. This has made the role of policy and regulation even more critical.

In 2016 the World Bank, in collaboration with SEforALL, ESMAP and the Climate Investment Funds, published the most comprehensive survey of policy and regulation for sustainable energy undertaken to date. The Regulatory Indicators for Sustainable Energy Global Scorecard for Policymakers (RISE) ranks 55 countries, where access deficits exist, on eight core indicators for energy access (Figure 9), as well as for renewable energy and energy efficiency (http://rise.esmap.org/)12. These countries are almost all low-income countries in Sub-Saharan Africa and South Asia.

![Figure 9: Average indicator scores on energy access – Source: RISE Database, World Bank, 2016](image)

The scope of officially approved electrification plans is often limited. Only a few countries worldwide have electrification plans that include off-grid, community and productive load elements, as well as service quality standards. Encouragingly, consumer affordability is found to be less of a constraint than many policy makers have assumed in the past13.

On almost all policy dimensions, Africa shows weaker policy frameworks than other access-deficit regions, particularly South Asia. However, examples of good practice can be found in every region of the world. For energy access, India, the Philippines, Kenya, Uganda, and Tanzania are the top five scorers. In Sub-Saharan Africa, the three East African countries lead, followed by South Africa, Cameroon and Senegal. In South Asia, Bangladesh, India, and Sri Lanka are top scorers. In East Asia and the Pacific, Cambodia and the Philippines are doing well in adopting good practices to scale-up energy access.

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13 “Electricity is considered affordable if annual expenditure on a basic allowance of 30 KwH per month for residential users at the prevailing retail price is at most 5% of gross national income (GNI) per household in the bottom 20% of the population. Electricity is considered unaffordable if costs surpass 10%. Despite widespread price concerns, the RISE indicator suggests that unaffordability may be less common than feared, with subsistence consumption costing less than 5% of GNI in 73% of surveyed countries in 2015; Regulatory Indicators for Sustainable Energy, World Bank, 2016
Countries are rated highly for frameworks for stand-alone, off-grid solar systems if:

- a. there is a national program to promote adoption of stand-alone technologies;
- b. there are subsidies or duty exemptions in place;
- c. there is no legal limit on the price stand-alone home system retailers and service providers can charge;
- d. there is formal adoption of international quality standards and test methods (Figure 10).

These ‘best practice characteristics’ are explored in detail in the guidance notes in section three.

Overall, four countries – Cambodia, Ghana, Kenya, and Uganda – stand out for exhibiting almost all the desirable characteristics for promotion of stand-alone systems. Bangladesh, Cameroon, the Democratic Republic of Congo, Ethiopia, India, Malawi, Myanmar, Nepal, Pakistan, South Africa, and Tanzania also score highly. However overall, just 44% of the 55 countries surveyed have defined and implemented a national program aimed at developing stand-alone systems.

RISE concludes that ‘stand-alone systems... offer an early opportunity for eight countries, because all have yet to establish a framework for off-grid electrification (South Sudan, Chad, Burundi, Central Africa Republic, Burkina Faso, Niger, Nigeria, Sudan). Top RISE scorers do well across three energy supply solutions – grids, mini-grids and standalone systems, suggesting they are not being pursued as substitutes but rather as complements’.

These conclusions align with previous findings from the SEforALL Global Tracking Framework report, that ‘many low-access African countries have yet to create a supportive policy environment for energy access, in particular for off-grid solar home systems’, and ‘where many countries appear to lag is on the regulatory framework to support off-grid access through solar home systems and other distributed resources. Regulations that clarify market entry and exit, define minimum quality standards, and target subsidies and duty exemptions should be considered for supporting off-grid solutions and enabling countries to benefit from the plummeting costs of decentralised solutions based on solar photovoltaics’.

Figure 10: 55 energy access countries answering yes to questions about framework for standalone solutions
- Source: RISE Database, World Bank

- Are there specific financing mechanisms to support operators or consumers?
- Is there no legal restriction on the price retailers or service providers can charge?
- Are there subsidies and/or duty exemptions for standalone systems?
- Are there national programs to support the development of standalone systems?
1.6 Beyond Energy Access: Socio-Economic Impact

According to the World Bank’s 2017 State of Electricity Access Report, a review of all SDG targets indicates that energy is interconnected with 125 (74%) out of the 169 targets, making it crucial for all societies to recognize the key interlinkages of energy and the wider development agenda. The benefits of supporting the off-grid solar sector go way beyond the sector’s contribution to the achievement of energy access goals:

Household Savings
Basic solar lights replace kerosene lamps, battery-powered torches or candles, leading to cost savings of around 4% of total household income for those in the poorest quintile. A recent study in rural Kenya found that, on average, households spend around 3% of income on lighting, rising to 8% ($1.60 per month) for the poorest quintile. With the acquisition of a solar light, the average number of kerosene lamps in use drops from 2.2 to 1.3, and expenditure on energy drops by 40–60% ($0.96 per month on average). Households whose solar lights also have phone-charging capability make additional savings ($0.08 per month), as a result of being able to charge phones for free.

National Savings
As off-grid solar markets grow, for countries that import kerosene, batteries, torches, or candles there will be a positive impact on the balance of payments and on foreign exchange reserves, as these imports are replaced by off-grid solar. For example, according to UNEP e lighten, Kenya imports 853 million litres of kerosene, 464 million candles and 114 million batteries costing around $896 million per year. This is the equivalent to 6.3 million barrels of crude oil energy. A significant portion of this could potentially be saved by adopting off-grid solar as an alternative. For countries that subsidize kerosene for lighting, there will also be significant savings on kerosene subsidies.

Job Creation
The off-grid solar value chain creates far more jobs than value chains for inefficient lighting technologies. In addition, jobs created by the off-grid value chain are more likely to be in the formal economy, thus contributing to tax revenues. According to UNEP e lighten, off-grid solar employs around 30 people per 10,000 people living in rural areas, compared to just one person per 10,000 people in the case of kerosene.

In Bangladesh, the off-grid solar industry already employs an estimated 127,000 people, whilst in India it employs 72,000 people. Globally, the decentralized renewable energy industry, including both mini-grids and standalone solutions, is expected to directly employ 4.5 million people by 2030. There is also likely to be additional economic activity as a result of businesses being able to stay open at night without incurring additional costs.

State of Electricity Access, World Bank, 2017
The Economic Impact of Solar Lighting: Results from a Randomised Field Experiment in rural Kenya, ETH Zurich et al, 2017
http://lnmap.enlighten-initiative.org/
Light and Livelihood: A Bright Outlook for Employment in the Transition from Fuel-Based Lighting to Electrical Alternatives, UNEP, 2014
Renewable Energy and Jobs, IRENA, 2016
Renewable Energy and Jobs, IRENA, 2016
Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
Impact Report, SolarAid, 2015
Access to Mobile and Financial Services
Pay-as-you-go (PAYG) solar technologies and business models enable customers to access higher levels of energy service by paying over time, typically for between 1-5 years. Mobile technologies underpin the PAYG model in three main ways:

1. By enabling customers or agents to make payments via mobile money.
2. By enabling companies to control assets and services remotely, using machine to machine (M2M) connectivity.
3. By enabling communication between companies, agents and customers through mobile, SMS or apps.

Research by the industry association for mobile network operators, the Groupe Spéciale Mobile Association (GSMA), has concluded that PAYG is accelerating adoption of mobile money through helping to scale agent networks in off-grid areas; helping to acquire new customers; facilitating digital financial literacy and generating frequent account activities. It is estimated that globally, PAYG solar generates close to 1.6 million mobile money transactions per month.

The PAYG model enables companies to collect data on customer power, consumption patterns, and create credit history for the unbanked. PAYG-enabled credit scoring is making it possible for customers with no formal financial history to access loans, savings and credit products. Towards the end of their payment term, customers with positive credit ratings have the opportunity to access products such as fuel-efficient stoves, rainwater harvesting tanks, smartphones, TVs, water pumps, bicycles or school fee loans. In the case of M-KOPA in Kenya, positive credit reports have been transferred to more than 160,000 credit bureaus, enabling previously unbanked customers to gain access to institutional loans with low interest rates.

Education, Health, Safety and Well-Being
Research by the UK non-government organization SolarAid finds that access to clean, safe light helps students to study for an extra hour a night. If pupils have access to solar lights, headteachers report improvements in performance, attendance and motivation. In rural areas of Kenya, 75% of headteachers reported that recruiting and retaining teachers was a problem – but 60% said better lighting would encourage teachers to work in remote regions. Over a third of teachers said that they use a solar light for marking, lesson planning and extra classes.

60% of customers who used kerosene lamps before switching to solar associated an improvement in health with reduced use of kerosene, including a reduction in coughing, flu-like symptoms, eye irritation and respiratory illness. Solar lights also reduce the risk of fire and accidents and improve safety and security.

With safer and brighter homes, children studying better at school and with more income available, families have a better quality of life.

1.7 Further Reading

- Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
- State of Electricity Access Report (SEAR), World Bank, 2017
- Global Tracking Framework, SEforALL, 2013
- Global Tracking Framework: Progress towards Sustainable Energy, SEforALL, 2017
- The Economic Impact of Solar Lighting: Results from a Randomised Field Experiment in rural Kenya, ETH Zurich et al, 2017
- Global Kerosene Subsidies: An Obstacle to Energy Efficiency and Development, Lawrence Berkeley National Laboratory, 2017
- Light and Livelihood: A Bright Outlook for Employment in the Transition from Fuel-Based Lighting to Electrical Alternatives, UNEP, 2014
- Renewable Energy and Jobs, IRENA, 2016
- Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
SECTION 2
The Off-Grid Lighting and Electrification Sector
2.1 A Strong Track Record in Delivering Household Electricity Access

The market for quality-verified off-grid lighting and electrification products has grown rapidly, with over 27 million sales worldwide from 2010 to 2016\(^\text{26}\). The market grew almost nine-fold in two years from 2011 to 2013, before slowing to 9% average annual growth between 2014 and 2016 (Figure 11). Growth has been driven by advances in technology, which have led to improvements in performance and reductions in price, combined with the emergence of new business models. Sub-Saharan Africa and South Asia have been the two key markets, with 47% of sales taking place in Africa and 40% in South Asia in 2016\(^\text{27}\).

Figure 11: Sales Volumes, Worldwide, 2014–2016 – Source: GOGLA Sales Reports

There is a connection between off-grid solar market size, and the energy access policy and regulatory environment. Four of the top five markets by sales volume are in the top-performing cluster of ‘green zone’ countries, scoring 67 or more out of 100, according to the RISE scorecard. The rest are all in the mid-performing yellow zone, with only Nigeria in the poorly-performing red zone \(^\text{28}\).

In such a dynamic and fast-moving market, it is helpful to look in detail at factors that have led to a dip in overall sales volumes between July and December 2016. This provides a good indication of the kinds of political, economic and environmental factors which influence market performance. According to GOGLA’s latest July to December 2016 sales data report, these include:

- **Currency devaluation**: Exchange rate fluctuations make it difficult for companies to price products appropriately. This is particularly challenging for companies that offer consumer financing, as customer payments are in local currency, while costs are largely incurred in hard currency.
- **Drought**: During the reporting period, there was a severe drought across East Africa, with devastating consequences for rural populations. With sharp increases in the price of food, coupled with declining agricultural output, the disposable income of many rural customers has been severely constrained.
- **Import tariffs**: In the East African Community (EAC), companies faced a policy change resulting in increased import tariffs on solar products and appliances. While overall sales in EAC still grew, the rate of growth was significantly slower than in previous rounds. A decline in the sales of solar home

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\(^{27}\) Global Off-Grid Solar Market Reports for 2016, GOGLA

\(^{28}\) United Arab Emirates is in the top ten countries by sales volume, but nearly all products entering the country are subsequently exported for sale elsewhere. As the country does not have an energy access deficit, it is not ranked in the RISE report, and thus not colour-coded.
systems was recorded for the first time in East Africa.

- **Demonetization:** In India, demonetization rendered a significant proportion of the nation’s cash invalid, having a major impact on the economy. Distributors of solar products had to focus efforts on making sales and collecting payments in an environment where consumers were suddenly cash-strapped, contributing to a decline in sales.

The slower pace of growth since 2014, and the decline in sales in H2 2016, both point to an urgent need for policy and regulatory reform, if sustained, rapid growth – and thus achievement of universal energy access – is to be achieved. Improvements in the policy and regulatory environment can boost growth, and make the market more resilient in the face of environmental or macro-economic shocks.

Despite headwinds, over the past seven years the sector has built a strong track record in delivering household electricity access. Off-grid lighting and electrification products sold by GOGLA members have reached over 110 million people worldwide. 36.5 million people have now reached Tier 1 energy access and 1.35 million people have reached Tier 2 energy access, according to the latest Global Off-Grid Solar Market report. Products are categorized based on the wattage of the panel, or ‘Watt Peak’, the level of service provided and the level of energy access delivered according to the multi-tier framework (Figure 13).  

**Figure 13: Product categories and levels of energy service** – Source: GOGLA Sales and Impact Reports

<table>
<thead>
<tr>
<th>Overall Category</th>
<th>Capacity, Watt Peak</th>
<th>Categorisation by service provided</th>
<th>Categorisation by Multi-Tier Framework Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solar Lanterns</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1Wp</td>
<td>0-1.5 Wp</td>
<td>Single light only</td>
<td>Partial Tier 1 access for 1 person</td>
</tr>
<tr>
<td></td>
<td>1.5-3 Wp</td>
<td>Single light &amp; phone charging</td>
<td>Full Tier 1 access for 1 person</td>
</tr>
<tr>
<td></td>
<td>3-11 Wp</td>
<td>Multiple Light &amp; phone charging</td>
<td>Full Tier 1 access for 1 household</td>
</tr>
<tr>
<td><strong>Solar Home System (SHS)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;1Wp</td>
<td>11-21 Wp</td>
<td>SHS Entry-Level: 3-4 lights, phone charging, powering radio or fan</td>
<td>Full Tier 1 access for a household</td>
</tr>
<tr>
<td></td>
<td>21-50 Wp</td>
<td>SHS Basic Capacity: As above plus TV, more lights, appliances and capacity</td>
<td>Full Tier 2 access for a household with high-efficiency appliances</td>
</tr>
<tr>
<td></td>
<td>50-100 Wp</td>
<td>SHS Medium Capacity: As above but with extended capacity</td>
<td>Full Tier 2 access with conventional appliances</td>
</tr>
<tr>
<td></td>
<td>100+ Wp</td>
<td>SHS Higher Capacity: As above but with extended capacity</td>
<td>Up to Tier 4 access</td>
</tr>
</tbody>
</table>


30 Data is grouped into product categories based on functionality and capacity. For pico-PV products categories are determined by the level of service, and an indicative wattage range for the PV module is provided in Watt Peak (WP). For solar home systems 11Wp and above, categories are determined by the panel wattage.
With the emergence of PAYG and other innovative solutions to affordability barriers, the sector is steadily delivering greater functionality and higher levels of energy access to customers. As shown in Figure 14, the proportion of sales delivering Full Tier 1 access for a household increased from 9% to 15% between July-December 2015 and July-December 2016, whilst the proportion of products delivering Tier 2-4 for a household increased slightly from 2 to 3%.

A Note on GOGLA Sales and Impact Report Data:
GOGLA sales, revenue and investment data in this section is provided by companies selling products that have been quality verified by the IFC Lighting Global program, nearly all of which are GOGLA members. Submission of data is voluntary and the number of participating companies has steadily increased over time – from 21 in July–December 2014 to 55 in July–December 2016, painting an ever more accurate picture of the latest trends.

The data excludes non-quality verified products. Quality verified products are those that have met the IFC Lighting Global Quality Standards, which are based on IEC Technical Specification 62257-9-5, during the relevant reporting period. The absence of quality verification does not necessarily imply that products are of lower quality, and there are a variety of legitimate reasons for products not to have quality verification. Based on previous analysis by Bloomberg New Energy Finance, we estimate that the data reported here represents approximately 50% of all sales of off-grid solar products in the markets, when also considering non-quality verified products.

Data is only shown if it satisfies the ‘three data point’ rule, meaning that at least three separate product manufacturers have reported data for any single data point. When we have less than three responses, no results are shown. This protects the proprietary interests of the companies who have supplied data in support of this industry report.
2.2 Technology Trends: Performance Enhancements and Cost Reductions

All product categories have undergone significant cost reductions and performance improvements since 2010. The same single light user experience which cost $20 to manufacture in 2010 cost around $4.40 in 2015, a decrease of almost 80%.

Whilst price reductions are not as dramatic for larger solar lanterns, this category has benefited from increased functionality, with phone charging becoming a standard feature. More efficient LED bulbs have replaced compact fluorescent (CFL) bulbs, whilst lithium-ion has replaced lead acid as the dominant battery technology, improving cycle life and efficiency.

Solar home systems are often sold bundled with efficient appliances (such as fans, radios and TVs) giving customers everything they need to enjoy the benefits of basic energy access. If the goal of energy access is to provide access to the services that energy enables – services which improve access to information, boost productivity, and support other positive social outcomes around health, education and entertainment – then both energy-generating technologies and energy-consuming appliances are needed.

Thankfully, efficient appliances already consume 50-70% less energy than mainstream appliances, and by 2020 these are expected to consume up to 80% less (Figure 15). This will enable more consumers to power appliances using off-grid energy systems. The sale of efficient appliances is an important source of revenue for many companies, helping to attract investment to the industry and drive overall market growth.

Figure 15: Estimated power rating (w) of off-grid appliances, 2015 - Source: State of the Global Off-Grid Appliance Market, Global LEAP, 2016

- Improved brushless DC permanent magnet motors
- Improved blade design (e.g. twisted, tapered blades)
- LED improvement, efficient optical films
- Improved panel design
- Improved audio
- Improved compressors
- Better insulation materials (e.g. vacuum insulated panels)

Mainstream appliances
- 12" Table Fans
- 19" Televisions
- <100L Refrigerators

Off-grid appliances 2015
- 40W
- 30W
- 15W
- 10W

Off-grid appliances 2020 (expected)
- 45W
- 30-40W
- 100W

Whilst larger batteries and panels are expected to get slightly cheaper by 2020, savings on bundled solar home systems will mostly come from appliance performance improvements and price reductions, enabling higher levels of service delivery with smaller panels and batteries. In 2014, standard appliances required 121W of PV and 125 Ah of battery capacity, whilst super-efficient appliances delivering the same user experience required just 27W of PV and 27 Ah of battery capacity\(^32\). Further price reductions and enhancements in performance can be expected across all product categories between now and 2020 (figure 16)\(^33\).


A survey of 239 energy access professionals from industry, policy and development sectors, undertaken by the Global Lighting and Energy Access Partnership (‘Global LEAP’ – an initiative managed by the US Department of Energy) found a strong correlation between the level of demand for appliances and their potential development impact (Figure 17). LED lighting ranks #1 for both consumer demand and potential impact. In terms of anticipated consumer demand, the top five household/SME appliances are: LED room lighting appliances, mobile phone charging, televisions, radios, and refrigeration. In terms of impact potential, the top five are: LED room lighting, refrigeration, mobile phone charging, solar water pumps, and televisions. As costs come down and efficiency improves, the sector has the potential to sell aspirational and impactful appliances at scale, making a tangible difference to quality of life for millions of customers.

**Figure 17: Household/SME off-grid appliances – anticipated demand and impact ranking – Source: Global LEAP, 2015**

<table>
<thead>
<tr>
<th>LED Lighting Appliances</th>
<th>Mobile Charging Banks</th>
<th>Televisions</th>
<th>Radios</th>
<th>Refrigeration</th>
<th>Fans</th>
<th>Laptops</th>
<th>Solar Water Pumps</th>
<th>Tablets</th>
<th>Rice Cookers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Demand*</td>
<td>Impact Potential*</td>
<td>Rank</td>
<td>Rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1 (Consumer Demand)</td>
<td>1 (Impact Potential)</td>
<td></td>
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<tr>
<td>1000</td>
<td>2000</td>
<td>2</td>
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<td></td>
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</tr>
<tr>
<td>2000</td>
<td>3000</td>
<td>3</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>3000</td>
<td>4000</td>
<td>4</td>
<td></td>
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<td></td>
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<tr>
<td>4000</td>
<td>5000</td>
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<td></td>
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</tr>
<tr>
<td>5000</td>
<td>6000</td>
<td>2</td>
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</tr>
</tbody>
</table>

**2.3 Business Models: A Broad Range to serve Diverse Customer Segments**

Alongside technology advancements, efficiency gains and cost reductions, new business models have also been critical drivers of growth. They have made it possible to offer a broader range of products and services, at more affordable prices, in new geographical areas. To serve a diverse set of customers around the world, with different income levels and energy needs, a range of models has emerged. These range from rental or perpetual lease models offering a service through to direct cash sales offering products (Figure 18).

**Figure 18: Main business models, offering products and services**

- Rental
- Pre-Payment
- Perpetual lease
- Lease-to-own
- Upfront sales with financing partner
- Direct cash sales

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34 Off-Grid Appliance Survey, Global LEAP, April 2015
In a rental, pre-payment or perpetual lease model, the company continues to own the solar asset and the customer pays for its usage on a temporary basis. In the lease-to-own model, the most common business model for PAYG companies selling larger systems, customers pay over time for a fixed period before owning the asset. Cheaper, more basic solar products are more likely to be sold for cash, or over time via a financing partner such as a microfinance organization. Customers range from those living below the poverty line in rural areas, to those living in urban and peri-urban areas seeking a back-up system for when grid electricity is not available.

The range of business models in the sector is rapidly evolving and becoming increasingly diverse, with specialized companies emerging to solve specific challenges faced in the market. For example, companies such as Angaza Design work with manufacturers to convert basic solar products into PAYG products, which can be switched off remotely if incremental payments are not made. Mobisol offers a software suite and mobile app to other PAYG companies, to help them manage their customer relationships, payments and salesforce.

Most manufacturers employ multiple distribution strategies to maximize their customer reach. The five distribution models identified by Lighting Africa in 2012 continue to be prevalent today:

- **Proprietary Distribution Channels:** The company maintains a proprietary distribution channel in which its products move from manufacturer to in-house storage facilities to a salaried/contracted salesforce, which exclusively delivers the company’s products directly to customers.
- **Distributor-Dealer Channels:** The company sells its products through existing networks of generalist or specialist distributors. This model piggybacks on the traditional private sector supply chain of consumer durables and usually engages a distribution hierarchy of at least two levels (distributor and dealer/retailer).
- **Institutional Partnerships:** The company partners with a relevant institution, for example an NGO, rural financial institution or mobile network operator, to market its products to that institution’s customers or members.
- **Franchise Model:** The company offers franchising packages (often including training, marketing support, and financing) to entrepreneurs who wish to become retailers.
- **Rental / Leasing System:** The company recruits entrepreneurs who either rent products out, or sell lights or batteries without a panel, and offer a fixed fee for charging.

Figure 19: Distribution channels used by 30 companies, 2015 – Source: Interviews with 30 companies for the Off-Grid Lighting Market Trends Report, Bloomberg New Energy Finance, 2016

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Bloomberg New Energy Finance estimates that companies on average derive 30-50% of their sales from distribution partnerships and 50-70% through standard retail channels. Whilst still playing an important role in many early-stage markets, NGOs are becoming a less important distribution channel in more mature markets, as more conventional distribution models become more prominent. Figure 19 illustrates the different distribution strategies used by leading manufacturers.

The GSMA is supporting PAYG companies through its Mobile for Development Utilities programme, to help drive mobile and mobile money adoption. It finds that, like the market for products sold for cash, the PAYG solar market has grown rapidly, achieving average annual growth rates of 140% from 2012 to 2016, and proving to be by far the most attractive market segment for investors. Over 800,000 units, ranging from 4W to 200W+ have now been sold, with 5% of PAYG companies responsible for more than 90% of sales. Each month there are an estimated 40,000 sales, with around $10 million in credit extended to customersords.

Four East African markets – Kenya, Tanzania, Uganda and Rwanda – account for around 730,000 PAYG sales, whilst around 30,000 systems have been deployed in West Africa and 20,000 have been deployed in South Asia. The countries that have benefited most from the emergence of PAYG, apart from Nigeria, are all in the ‘top-performing’ or ‘mid-performing’ clusters of countries according the RISE policy scorecard. The size of the addressable market has been a key factor to consider when launching operations. Other factors to consider include ease of doing business, population density, maturity of mobile payment infrastructure and cost of alternative energy supply.

Lease-to-own business models, where customers pay for the product over time and eventually become the owner of the system, are more prevalent than ‘energy-as-a-service’ models where customers pay on an indefinite basis. This leads the GSMA to conclude that customers appear to value asset ownership over long term engagements. Partnerships with mobile operators are becoming increasingly commonplace, with around 9 out of the 30 PAYG companies being supported by the GSMA cooperating with mobile network operators on distribution. The far-reaching distribution and sales networks of mobile operators, combined with their recognizable and trusted brands, gives providers the opportunity to leverage these assets to reach underserved customers.

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36 Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
37 Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
38 This is estimated by the GSMA based on the number of customers covered by mobile networks, but without access to electricity. The ten countries with the largest addressable markets are found to be India, Nigeria, Bangladesh, Indonesia, Kenya, Uganda, Tanzania, Pakistan, Philippines and Democratic Republic of Congo.
39 Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
40 Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
2.4 Investment Trends: Faster Growth is Needed

Despite a fifteen-fold increase in investments since 2012, access to finance continues to be cited as a major barrier to market growth. According to BNEF, after several years of slow but steady growth, investments accelerated rapidly since 2014 (Figure 20)\(^41\). Investment remains highly concentrated in a small number of companies – the top 10 firms account for 86% of investments.

Whilst most products are still sold for cash upfront rather than on a pay-as-you-go basis, PAYG companies have recently been considerably more successful in attracting investment. When PAYG companies began to emerge in early 2013, cash-sales companies had already attracted almost $40 million. By the end of 2015, PAYG companies had raised almost $250 million, four times as much as the cash-sale segment. This figure had risen to more than $360 million by the end of 2016, according to the GSMA\(^42\). From 2014, ‘pure-play’ investment vehicles such as SunFunder began to emerge – specialist financial intermediaries that invest in off-grid solar companies, such as debt funds, venture capital funds or boutique investors.


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**Figure 21: Number of financial institutions investing in at least one investment round, global, 2008-2015** - Source: Off-Grid Lighting Market Trends Report, Bloomberg New Energy Finance, 2016

Figure 21 shows the types of investors engaging in at least one investment round from 2008–2015. Aid agency funding and social impact investment continues to play a vital role in supporting the sector. Purely profit-oriented investors remain in the minority. Multi-national corporations with a strategic interest in seeing the sector grow, such as Schneider Electric, Orange and SolarCity, have expanded their investments since 2014. Whilst there was a slight decrease in the number of financial institutions participating in at least one funding round from 2014 to 2015, the overall amount of investment increased considerably.

**Figure 21: Number of financial institutions investing in at least one investment round, global, 2008-2015** - Source: Off-Grid Lighting Market Trends Report, Bloomberg New Energy Finance, 2016

- **Donor**
- **Crowdfunding**
- **Government development finance**
- **Strategic corporates**
- **For-profit finance**
- **Impact finance**

\(^{42}\) Mobile for Development Utilities: Lessons from the use of mobile in utility pay-as-you-go models, GSMA, January 2017
2.5 Further Reading

- Global Off-Grid Solar Market Sales and Impact Reports, GOGLA, 2016
- Off-Grid Appliance Survey, Global LEAP, April 2015
- Mobile for Development Utilities: Lessons from the use of mobile in utility PAYG models, GSMA, January 2017
SECTION 3
An Enabling Environment for Off-Grid Solar
Où est-il le passage d'un courant électrique à l'intérieur de l'électrolyte ?

Où est-il le passage du courant dans l'électrolyte ?
3.1 Integrated Electrification Planning: Key to Understanding Challenges and Developing Solutions

The establishment of a robust policy framework for stand-alone solutions helps to create certainty, increase the predictability of the policy environment, and attract investment. The absence of a strong policy framework for stand-alone solutions can create uncertainty and a perception of risk which deters investment. Ambiguous wording of policy, inconsistency in policy statements from individual decision-makers, or lack of clarity around roles and responsibilities of different government agencies can all also contribute to a perception of risk. Sudden changes in policy, especially those which have a direct impact on the cost of business such as changes in taxation, can undermine confidence in a government’s commitment to promoting market growth. In line with the RISE scorecard approach, we encourage governments to:

a. establish national programs to support development of stand-alone systems
b. provide fiscal incentives for stand-alone systems
c. ensure there is no legal restriction on the price retailers or service providers can charge and
d. develop specific financing mechanisms for stand-alone companies or consumers.

These recommendations are elaborated on in other guidance notes in this series. To be effective, these policy measures should build on and be firmly rooted in an integrated national electrification plan that clearly lays out the government’s vision and objectives.

Inclusion of grid, mini-grid and off-grid solutions in electrification strategies, as part of an integrated approach, is the key to developing effective electricity access solutions. Geospatial planning techniques can be used to analyse a range of factors which influence the most cost-efficient way to connect communities – including the size of the community, population density, distance to national grid, terrain and level of economic activity. Based on such analysis governments can make more informed decisions about the appropriate mix of grid, mini-grid and off-grid solutions to deploy, whilst also factoring in other considerations such as availability of funding, broader macroeconomic conditions and government priorities.

Setting targets, based on the multi-tier framework, can send a powerful signal to companies and investors that a government is committed to creating the conditions for off-grid solar market growth. This is especially the case, if targets are timebound and accompanied by geospatial plans showing where grid, mini-grid and standalone solutions are to be deployed. Whilst targets should take account of government ambitions for energy access, it is also important to consider household electricity needs, as well as ability and willingness to pay. Multi-tier framework surveys, outlined in more detail below, can help to set targets in a way that takes account of all these factors.

Monitoring: The World Bank recommends a four-pronged approach to strengthening data for monitoring energy access, and tracking progress. These approaches could be used not only to track energy access itself, but also to track other key metrics such as the level of public and private investment flowing into the sector:

1. Establishment of a multi-tier baseline: A survey is currently being undertaken by the World Bank ESMAP team, covering 15 countries. This could be extended to cover more countries in future.

2. Integration of basic energy access questions into existing household surveys: These might include Demographic and Health Surveys and Living Standards Measurement Surveys. A ‘minimalistic framework’ has been developed by the World Bank ESMAP team specifically for this purpose.

3. Multi-tier framework surveys: All energy access survey efforts can be integrated into one standardized household energy survey, customised to meet individual country needs and conducted every 2-3 years. Such a survey could provide comprehensive energy access diagnostic information to inform strategy and planning.

4. Adoption of the multi-tier measurement approach by programs and projects would provide up to date data in between detailed country-level surveys, as well as making it easier to synthesize monitoring information to track progress at national and international levels. Supply-side measurement can be based on the performance characteristics of solutions supplied, whilst demand-side measurement can be undertaken through household surveys.

Further Reading

- State of Electricity Access Report (SEAR), World Bank, 2017
- Global Tracking Framework, SEforALL, 2013
- Global Tracking Framework: Progress towards Sustainable Energy, SEforALL, 2017
Public funding has a vital role to play in accelerating market growth. Publicly funded awareness campaigns, results-based or concessional financing schemes, tax exemptions, or efforts to promote quality in the market, are all widely supported within the sector. These measures require government investment in the short-term, but deliver a significant pay-off in the long term.

However, if governments subsidize end-user prices or distribute products for free in areas where companies are seeking to sell products, this can distort the market, signalling to customers that they do not have to pay full retail price, or pay at all. Customers may hold out for reduced-cost or free goods in future, and are more likely to default on PAYG products that they have already purchased. This undermines the commercial viability of off-grid companies, and discourages future investment. While there may be short-term benefit for selected users, longer-term adoption of stand-alone solar is likely to be reduced, and could be reversed, if market distortion is not carefully minimized.

Free distribution schemes rarely lead to sustainable outcomes, whilst if customers make a financial contribution to system cost, a sense of ownership is created which supports sustainability in the longer term.

It is useful to differentiate between the ‘commercial’ market and the ‘non-commercial’ market. The commercial market is made up of those who are currently willing to buy in geographical areas that companies are able to serve. The non-commercial market is made up of those that cannot be served on a commercial basis without subsidy. This is either because they are unable to afford off-grid solar, they live in a geographical area that companies are not able to serve, or both. The commercial market expands over time – as companies enter new geographical areas they will first serve wealthier ‘early adopters’. However, as communities become more familiar with standalone solar and as trust in the technology grows, demand and willingness to pay improves amongst lower income groups as well (Figure 22).

Figure 22: The expanding commercial market for off-grid solar – Source: Gogla

Willing to buy

Commercial market
Those willing to buy off-grid solar, in geographical areas customers are able to serve

Potential commercial market
Those willing to buy off-grid solar, in geographical areas that companies will expand into

Potential commercial market
Those not willing to buy now, but who are likely to be willing to buy in time

Unwilling to buy

Non-commercial market
Those who cannot be viably served by the private sector without subsidy

Within geographical reach

Out of geographic reach

44 An important factor in determining the size of the commercial market is the size of the solar system – basic solar lighting products are more affordable, and cheaper to distribute and maintain across a sparsely populated area, than larger solar home systems. Forthcoming research from Humboldt State University and the UN Capital Development Fund finds that the income levels of those choosing pay-as-you-go SHS and those choosing entry-level products do not vary as much as expected. Availability of larger systems may be more important than income in determining the size of system that customers choose. Flexible financing can enable relatively low-income customers, with annual incomes of between $500 and $1600, to purchase a 10–20W SHS as their first solar product. See: Off-Grid Energy Adoption Dynamics in Uganda: Initial Findings and Observations, Jacobsen & Goyal, Humboldt State University, 2017
Public funding should be used to accelerate expansion of the commercial market, to all geographical areas that companies can viably serve, and to all customers that can afford to buy. Figure 23 shows how public funding can be used to build demand and willingness to pay, support consumer choice, ‘crowd in’ private investment, and minimize market distortion. These interventions focus on reducing ‘upstream’ risks and costs for businesses, so that they do not undermine ‘downstream’ consumer price expectations and willingness to pay. They are explored in more detail in other guidance notes in this series.

Figure 23: Best ways to deploy public funding on commercial, potential commercial and non-commercial markets
- Source: Gogla

![Figure 23: Best ways to deploy public funding on commercial, potential commercial and non-commercial markets](http://documents.worldbank.org/curated/en/212451501293669530/Kenya-Off-grid-Solar-Access-Project-for-Underserved-Counties)

**Accelerating off-grid market growth should be the starting point for government intervention.** In general, interventions which seek to accelerate market growth lead to more competition and lower prices for consumers, expanding the proportion of consumers that can be reached by the commercial market. This minimizes the need for end-user price subsidy, which can then be provided only for support those target groups that really need it, at lower cost to government. The need for price subsidies can also be reduced if governments set targets for achieving universal Tier 1 or Tier 2 energy access as a first step, in line with customer needs and willingness to pay, rather than focusing on Tier 5 access immediately.

**End-user subsidies are likely to be needed to reach 100 percent of off-grid customers.** However, due to the risk of market distortion, which can slow down overall electrification efforts, they should ideally be introduced only in the final phases of electrification efforts, once market-based approaches have fully realized their potential. If subsidy programs are implemented in parallel with efforts to expand the commercial market, they need to be designed carefully to minimize the risk of market distortion. It is recommended that such programs be designed and monitored in consultation with the private sector, which is well-placed to track the impact such schemes are having on customer behaviour and business performance. For example, the Government of Kenya consulted extensively with the private sector before designing the Kenya Off-Grid Solar Access Project for Underserved Counties (K-OSAP) programme, which provides debt and results-based financing to companies that agree to enter specific, under-served regions of the country. This both accelerates off-grid market growth and enables poorer communities, in more remote areas, to benefit.

In general, good public funding schemes are simple, predictable, reliable and transparent. They are designed in partnership with industry, and based on a solid understanding of market barriers. They focus on replicating and scaling proven solutions, and are delivered at scale over the long term to ensure they have a meaningful and lasting impact. Technology should be used to minimize administration and transaction costs for businesses, and robust data collection systems should be used to track progress and monitor impact. They phase out over time, leaving a sustainable off-grid solar market.

**Further Reading**
- Industry Opinion on the Role of Public Funding to Mobilise Investment for Access to Energy, GOGLA, June 2016
3.3 Lower Taxation: One of the Most Effective Ways to Improve Affordability

The business case for customers to switch from kerosene, battery-powered torches or candles to solar lighting is compelling. Basic solar lights can ‘pay for themselves’ through savings in around 10 weeks when they replace kerosene lamps. The monthly repayments for many PAYG solar products are similar to, or only slightly more than previous spending on inefficient lighting, whilst offering a far higher level of modern energy service. Despite this, a major barrier to market growth is affordability of standalone solar products, services and related appliances. Basic solar lights are affordable for all but the extreme poor, whilst solar home systems are affordable for only a proportion of those living below the poverty line. Data collected by the social enterprise, SolarAid, in Kenya, Malawi, Tanzania, Uganda and Zambia shows that 82% of customers buying basic $10 solar lights live below the $3.10 poverty line. Looking across five SHS and mini-grid companies, Acumen finds that around 36% of customers live below the $3.10 poverty line. Looking across five SHS and mini-grid companies, Acumen finds that around 36% of customers live below the poverty line.

Consumers across all income brackets are price sensitive – with willingness to pay closely linked to price. VAT and import tariffs on solar products can be as high as 40% of the cost of goods, raising prices and putting off-grid products and services out of reach of the poorer customers who need them most. The increase in uptake due to reduced product prices can be significant. A study in Kenya found that reducing the price of a solar lamp from $7 to $4 increased household uptake from 37% to 69% (Figure 24). Lighting Africa finds that, even after using a product for just one week at home, the price customers said they would be willing to pay tripled.

Figure 24: Take-up ratio at different prices - Source: ETH Zurich et al, 2017

<table>
<thead>
<tr>
<th>Price</th>
<th>Take-up Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4</td>
<td>69%</td>
</tr>
<tr>
<td>$7</td>
<td>37%</td>
</tr>
<tr>
<td>$9 (Market Price)</td>
<td>29%</td>
</tr>
</tbody>
</table>

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47 The Economic Impact of Solar Lighting, ETH Zurich & SolarAid, Feb 2017
In a competitive, price-sensitive market, achieving significant sales volumes – and the economies of scale that come with high volumes – is vital to business success. Competition forces companies to pass on savings from lower taxation, to consumers in the form of lower prices. The temporary or permanent removal of VAT and tariffs – covering the entire product, including any appliances – is one of the most effective ways for governments to support the growth of the standalone solar market, improving affordability, boosting uptake and accelerating energy access. Efficient appliances can make up around 40% of the overall product cost (Figure 25). Tax exemptions on these parts in particular help to keep prices affordable for consumers.

*Efficient appliances can make up around 40% of the overall product cost.*


---

**Figure 25: SHS purchase price based on appliance type**

- **SHS with Standard Appliances (2009)**
- **SHS with Standard Appliances (2014)**
- **SHS with Super-Efficient Appliances (2014)**
- **SHS with Super-Efficient Appliances (2017)**

*Systems provide energy for 4 lights, a 19” color TV, a radio, and mobile phone charging

*Appliance use assumption: lights=4hrs/day, TV=3hrs/day, radio=6hrs/day, mobile phone=1 charge per day

VAT and import tariff exemptions have been a major driver of market growth all over the world. In Africa, Kenya, Tanzania, Uganda and Rwanda have all utilized exemptions to drive growth – these four countries alone account for over 25% of worldwide market share.

GOGLA and its members consider tax exemptions to be preferable to end-user price subsidies, because tax exemptions are less likely to cause market distortion - they benefit all companies equally. They attract more companies into the market, thereby increasing competition, which ultimately benefits consumers.

A common concern around VAT and import tariff exemptions is the loss of revenue for cash-strapped governments. However recent studies suggest that for many countries VAT and import tariff exemptions may deliver a boost to government finances in the long-run, in addition to broader household and macroeconomic benefits. One model in Mozambique found that standalone solar market growth would increase business taxes through enabling businesses to stay open longer, increasing time spent working through improved health, and job creation in the standalone solar supply chain (Figure 26). These findings are corroborated by studies showing that solar lights save households an average of $70 per year over their 3-5-year lifespan, and that savings are invested back into the local economy - spent primarily on food, education and small business development.

For countries that import kerosene, batteries, torches, or candles there is likely to be a positive impact on the balance of payments and on foreign exchange reserves, as these technologies are replaced by off-grid solar. For countries that subsidise kerosene for lighting, there could also be significant savings on kerosene subsidies.

For Further Reading
- The Economic Impact of Solar Lighting, ETH Zurich et al, Feb 2017
3.4 Promoting Investment: How to Use Public Funding to Attract Private Capital

SEforALL estimates that $45 billion a year in new public and private investment is needed to achieve universal energy access by 2030. For 2013-14, financial commitments were $19.4 billion a year – well below the $45 billion target\textsuperscript{51}. Governments should increase the proportion of energy investment spent on energy access initiatives, and on stand-alone solar in particular. Potential sources of funding to support the off-grid solar sector might include resources currently allocated to grid extension, overseas development assistance, climate finance or fossil fuel subsidies.

Most donors and multilateral development banks (MDBs) spend only a small fraction of energy budgets on energy access or on off-grid solutions, although the situation is steadily improving. The Sierra Club and Oil Change International’s analysis of the major development banks’ energy lending portfolios in 2014 shows that the Asian Development Bank had 2.15% of its energy access portfolio invested in off-grid solutions and the African Development Bank had 0.68%. The World Bank and the Inter-American Development Bank score better, with 10.66% and 19.68% of energy access lending focused on off-grid solutions respectively. Encouragingly, many bilateral and multilateral donors are ramping up funding and support for off-grid energy, including DFID through the Energy Africa campaign, the US Government through Power Africa, and the World Bank. The AfDB’s New Deal on Energy for Africa contains a target of 75 million off-grid connections through AfDB-supported activities by 2025\textsuperscript{52}. Governments can take advantage of the growing interest in off-grid energy, amongst development agencies, by seeking funding and support for their off-grid energy programs.

Companies struggle to access finance, because investing in off-grid solar is perceived to be high risk. In the emerging off-grid solar market, many firms are still refining their products and business models, and are yet to demonstrate the track record that investors require. Investors also lack the experience and skills needed to accurately assess risk in the sector. A lack of market data at country-level also contributes to a perception of risk.

Figure 27 below shows the main financing needs of standalone solar companies at different stages of their growth and development. More capital of all kinds is needed at all stages, especially for smaller, earlier-stage firms\textsuperscript{53}. Early-stage equity and grants are particularly critical when firms are at seed stage, whilst at later stages, cash sales companies primarily need working capital financing, whilst PAYG companies need debt to fund on-lending to customers. Companies at all stages need financing in both international and local currencies, to help mitigate foreign exchange risk. ‘Blue’ indicates that sufficient funding exists, but solar companies often lack the track record to be able to access it, whilst ‘grey’ indicates the kinds of funding most needed in the sector.

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\textsuperscript{51} Energizing Finance, SEforALL, 2017
Governments should use public funding to attract private finance, through cost-absorbing or de-risking strategies that encourage investors to enter the market. For example, public funding can be used to cover the cost of undertaking due diligence or preparing for a transaction. De-risking measures could include providing credit guarantees or first-loss facilities, that increase deal flow. Foreign exchange risks can be mitigated if local currency financing facilities are available, and if governments allow companies priority access to international currency when foreign exchange is limited. Companies need to be able to repatriate profits, in order to invest in wider business development, as well as to provide returns to international investors that have taken on risk. Restrictions on profit repatriation dramatically reduce international investment.

National development banks can play a vital role, by developing facilities that either incentivize financial institutions to invest, or that invest directly. For example, in Ethiopia access to foreign exchange was a major bottleneck impeding the import of off-grid lighting products. To address this issue, the Government of Ethiopia established a financing facility in 2013, with support from the World Bank / IFC Lighting Africa program and US$20 million in financing. The fund, administered by the Development Bank of Ethiopia (DBE), provides private sector companies with the foreign exchange working capital to import qualifying solar products that meet Lighting Global Quality Standards, while microfinance organisations can access this line of credit for household-level loans. A Collateral Support Facility provides up to 50 percent of the required collateral for participating companies.

Figure 28 below shows how government and donor supported funding mechanisms can play an essential bridging role, helping companies reach the scale, maturity and track record needed to access mainstream debt and venture capital54. At the same time, these approaches help investors to build the skills and experience needed to analyse risk accurately, and continue investing in the sector once de-risking mechanisms come to an end.

**Figure 28: Donors and impact investors providing grants and loans** - Source: Off-Grid Lighting Market Trends Report, Bloomberg New Energy Finance, 2016

<table>
<thead>
<tr>
<th>Seed</th>
<th>Early</th>
<th>Expansion</th>
<th>Mezzanine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>Donor funding is often risk averse due to reputational concerns</td>
<td>Development Finance</td>
<td>Debt capital</td>
</tr>
<tr>
<td></td>
<td>Government / Donor Investments</td>
<td>Development finance institutions tend to have long due diligence cycles</td>
<td>Venture Capital</td>
</tr>
<tr>
<td></td>
<td>Impact Investors</td>
<td></td>
<td>Venture capital tends to have little appetite for early stage start ups in Africa</td>
</tr>
<tr>
<td></td>
<td>Small grants</td>
<td>Impact investors usually offer amounts too small for expansion</td>
<td></td>
</tr>
<tr>
<td>High Risk</td>
<td>Angels</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Public funding for energy access, including government funding, development assistance and international climate financing, should be deployed in efficient and effective ways to reduce energy poverty and help meet climate change objectives. It is therefore recommended that governments:

- Steadily increase the amount of public funding for energy access, in particular for companies and projects focused on standalone solar solutions, in line with the absorptive capacity of the sector. While more funding is needed, governments should also be mindful of the risk of over-funding the sector, leading to market distortion which can undermine sustainability.
- Use public funding to develop cost-absorbing or de-risking strategies that attract private investment. Such solutions need to be carefully designed and targeted to address the main barriers to growth, and achieve a sustainable impact.
- Collaborate with commercial banks and investors to offer financing through a wide range of financial products, both for consumers and for companies.
- Collaborate across sectors to help to create an enabling environment for business in general.

Further Reading
- Energizing Finance: Scaling and Refining Finance in Countries with Large Energy Access Gaps, SEforALL, 2017
- Clean Energy Services for All: Financing Universal Electrification; Craine, Mills & Guay; June 2014
- Kerosene Subsidies in India: The Status Quo, Challenges and the Emerging Path to Reform, IIISD & Global Subsidies Initiative, May 2017

© Renewit Solar
3.5 Promoting Quality to Protect Consumers

Promoting quality in the marketplace helps to build trust in solar technology, and creates demand. This, in turn, accelerates market growth, delivering energy access, household savings and broader social impact. Low quality products – especially counterfeits or those which falsely claim to provide a level of service which they do not deliver – undermine trust, reducing demand and damaging the market. These products imitate the look and feel of respected brands but use inferior technology, often leading to early failure.

In countries where the market has emerged, but is missing adequate regulation to promote quality, an increased number of low-quality products entering the market can be observed. Non-quality verified products and suppliers benefit from the investment in awareness-raising and distribution chain development made by more reputable companies. They take a significant proportion of market share and contribute to market spoilage. Analysis by the Global LEAP program shows that a missing quality assurance framework has a significant negative impact on market growth and therefore uptake of household solar technologies. Strong growth can only be sustained if there is a robust quality assurance framework.

To protect consumers from poor-quality products and to promote consumer confidence, the World Bank / IFC Lighting Global program maintains a series of quality standards and testing methods for solar lanterns and solar home systems up to 350W. Standards cover five key areas:

- **Truth in Advertising**: Advertising and marketing materials accurately reflect tested product performance.
- **Durability**: Product is appropriately protected from water exposure and physical ingress, has durable switches and connectors and, if portable, survives being dropped.
- **System Quality**: Product passes a visual wiring and assembly inspection.
- **Lumen Maintenance**: 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.

The test methods used to assess the Lighting Global Quality Standards have been adopted by the International Electrotechnical Commission as a reference point for quality assurance of off-grid lighting products (IEC Technical Specification 62257-9-5). A range of governments, inter-governmental bodies and aid agencies require that solar lighting meet this specification in order to benefit from support, or participate in procurement schemes. These include the UN Framework Convention on Climate Change (UNFCCC), Clean Development Mechanism for carbon financing, the UN Refugee Agency (UNHCR) and the multi-donor Energising Development programme. IEC standards have also been adopted by Kenya, Tanzania, and Ethiopia.

Looking at the issue more broadly, according to the RISE report only 33% of 55 energy access countries have adopted some kind of international quality standard, only 20% have adopted international testing methods and only 24% accept testing done in another country (Figure 29).

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*Figure 29: 55 energy access countries answering yes to questions about quality standards and product testing*

- Source: RISE Database, World Bank

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the regulation accepting testing done elsewhere / in another country?</td>
<td>26%</td>
<td>34%</td>
</tr>
<tr>
<td>Has the government adopted international testing methods?</td>
<td>17%</td>
<td>26%</td>
</tr>
<tr>
<td>Has the government adopted international quality standards?</td>
<td>9%</td>
<td>9%</td>
</tr>
</tbody>
</table>

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*55 Potential Future of the Lighting Global Quality Assurance Program, Navigant, 2015*
It is recommended that governments work towards adoption of internationally harmonized quality standards, and the test methods outlined in IEC Technical Specification 62257-9-5, as well as accepting testing done in another country. There are several advantages to adopting internationally harmonized standards and test methods rather than developing a series of regional or national standards. The IEC standards are kept up to date as new technology and new products emerge. It is easier and cheaper for companies and investors to engage with a single standards and testing system for all countries of operation, rather than design products to meet diverse requirements set at regional or national level in different markets. Finally, given the high cost and technical expertise required for thorough product testing, it is cheaper and more efficient to conduct testing through IEC-accredited test laboratories around the world, than to establish new testing facilities specifically for solar lanterns and home systems.

When markets are nascent, governments need not prioritize adoption of harmonized quality standards right away, since the presence and impact of poor quality products is also likely to be small. As a first step, governments can also promote quality-verification through sector support programmes. For example, programmes that create demand or improve access to finance can make support available only to companies that sell quality-verified products. Governments can adopt harmonized quality standards in their own procurement procedures. However, as markets mature the need for harmonized quality standards, and measures to promote quality such as those outlined below, become increasingly important.

Once standards are adopted, governments should implement and enforce them, by developing a mechanism which would only allow those products which comply with standards to enter the market. This would require development of a robust but simple importation procedure, that enables quality to be assessed at the point of entry. Pre-Export Verification of Conformity (PVoC), where governments license companies in exporting countries to very quality prior to importation, is one way that this might be achieved. However, before such measures are introduced, it is vital that governments build the capacity to implement effectively, so as not to cause disruption, delays or increased costs for businesses that could harm the market. Pilots could be undertaken to help to build this capacity before quality-linked policies or regulations are introduced.

Finally, to address issues around counterfeiting, governments should provide a legal framework that enables companies or public authorities to prosecute those caught distributing counterfeit or poor-quality products. Governments should ensure that clear and efficient procedures for patent registration and protection, judicial enforcement and criminal persecution are in place. Fines should reflect the severity of the committed crimes. There is a broader need to improve enforcement efforts by police, border guards and custom authorities.

Further Reading
3.6 Raising Public Awareness to Build Trust and Demand

Consumers and retailers are often not aware of the electricity access solutions now available and the economic benefits they offer. Where a market is in the early stages of development, individual solar product companies rarely have the resources to create this awareness, and those who do attempt to do so risk losing the commercial benefits of this “public good” to other market participants. In more advanced markets, if consumers are not equipped with the knowledge they need to make an informed decision with regard to product quality, they may inadvertently purchase a poor quality or fake product. Whilst data is limited, a report by the consulting firm Hystra in 2017 provided a useful indicative assessment of levels of awareness and trust in leading African markets (Figure 30).

Figure 30: Consumer awareness and trust in solar, selected sub-Saharan African - Source: Hystra Consulting

<table>
<thead>
<tr>
<th>Certified Lantern Sales (H1 2016 in k units)</th>
<th>Awareness of Solar</th>
<th>Trust in Solar Products*</th>
</tr>
</thead>
<tbody>
<tr>
<td>urban and dense rural</td>
<td>remote and rural areas</td>
<td>across all areas</td>
</tr>
<tr>
<td>Kenya</td>
<td>562</td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>191</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td>Rwanda</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Malawi</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Government support can ensure consumers are educated about the benefits of solar, how to use it, and where to buy quality products. Similarly, they can reach out to retailers and distributors, educating them about the benefits of working with quality products, instead of sub-par products that might offer higher margins in the short run, but are not serving consumer interest in the long term. To fully leverage synergies, campaigns can be carried out in cooperation with development partners, NGOs, or trade associations.

Especially in the early phases of market development, consumer awareness campaigns have proven to be catalytic by explaining the economic benefits of buying a solar light or home system. They can play a vital role in expanding the geographic scope of commercial markets. The markets with the highest penetration today have benefited from below the line marketing activities that allow consumers to experience products first hand before making a purchasing decision. These campaigns were first implemented in Kenya by Lighting Africa and SunnyMoney. Today, Kenya is the strongest market in Africa for solar products.

‘Above the Line’ (ATL) marketing activities, such as public announcements via TV, radio, or newspapers. Lighting Africa has increased the general level of awareness and knowledge for solar off-grid household products. As part of a behavioural change campaign in Kenya the topic was also discussed as part of the script in popular soap operas to reach the target audiences.

As the proliferation of smart phones and internet access

56 Reaching Scale in Access to Energy: Lessons from Practitioners, Hystra Consulting, May 2017
57 https://www.lightingafrica.org/what-we-do/consumer-education/
is moving quickly in many markets, digital content can also be very powerful in reaching influencers and early adopters. Governments can play a vital role in above the line marketing activities, by making airtime available on state-owned radio or TV stations, for example.

‘Below the Line’ (BTL) marketing activities, such as engaging school children and their parents, product demonstration at local markets, or ‘van campaign’ with teams going into deep rural areas, complement ATL activities with ‘touch and feel’ experiences for the end-user. SunnyMoney, a distributor owned by the social enterprise SolarAid, is leveraging education networks to increase awareness: via school campaigns they engage head teachers as early adopters and ambassadors and sales agents for solar lighting products. In Senegal, a “light libraries” project allows children to rent out solar lights at a small cost and to share the experience with their parents back home58. By exposing students and parents to solar technologies, awareness for and trust in solar products is increased.

Through “Village Solar Days” the Tanzania Renewable Energy Association (TAREA) is educating rural populations about solar and how to recognize sub-standard products. To attract large audiences, the events are accompanied by a social function, such as a traditional dance or football match59. The IFC’s Lighting Asia/India program ran a van campaign in 2014 and 2015 which reached more than 200,000 people comprising men, women, children and retailers. It reached rural consumers through a 360-degree, integrated media approach using traditional and non-traditional media. This included outreach through mobile van exhibitions, school contact program, community contact program, women group meetings, wall paintings, radio announcements, an audio-visual film, a call centre and a retail connect program to increase rural access through a wider network of retailers60.

NGOs or religious organizations, that have an established presence in rural communities and relationships of trust with opinion leaders, can leverage those relationships to help deliver below-the-line marketing activities, and make it easier for companies to enter and serve rural areas for the first time. Governments can also direct their employees, many of whom are themselves local opinion leaders such as headteachers, nurses or civil servants, to support such activities.

Successful consumer campaigns:

- **Focus on increasing category awareness**: instead of promoting individual off-grid solar solutions, ensure activities concentrate on increasing understanding for the technology in general.
- **Promote quality products**: to protect consumers, any awareness campaign should highlight quality products that have undergone testing and meet minimum quality standards (see chapter on promoting quality and protecting consumers).
- **Ensure demand is met by supply**: distribution readiness of the private sector is key in ensuring awareness is translated into adoption. The rollout and design of the campaign should therefore be closely coordinated with the private sector to ensure that when demand is created it can be met.
- **Target the supply chain across distributors, retailers, and end-users**: which products are available to end-users in rural areas largely depends on which products are selected by distributors and subsequently stocked by retailers. The promotion of quality products should therefore not only focus on the end-user but also on distributors and retailers.
- **Work closely with trusted organisations and individuals with an established presence in communities**, such as non-government organisations, cooperatives and women’s groups, as well as opinion leaders such as chiefs, teachers or religious leaders.

Further Reading

- Reaching Scale in Access to Energy: Lessons from Practitioners, Hystra Consulting, May 2017

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59  http://www.tarea-tz.org/index.php/blog/80-solar-village-day-at-malinyi
60  http://lightingasia.org/india/consumer-awareness/
3.7 Promoting Repair and Recycling to Improve Sustainability

Managing discarded electronic appliances, known as ‘e-waste’ or ‘Waste Electrical and Electronic Equipment (WEEE)’, is a growing challenge for governments and businesses. GOGLA and its member companies are committed, as much as possible, to putting in place robust e-waste management systems. The total volume of discarded solar lights and home systems is still small. According to a study commissioned by DFID in 2016, standalone solar makes an ‘almost negligible’ contribution to e-waste as a whole, providing less than 0.5% of total volumes generated61.

In a more established e-waste recycling value chain, the revenue generated from the resale of valuable recovered materials partially covers the costs of collection and recycling. However, in the case of standalone solar, both the volume of e-waste and the volume of recoverable materials remain low. Recycling facilities capable of extracting all recyclable materials in standalone solar products may be a long way from the customer, increasing transportation costs. Raising product prices to fully cover the cost of collection, transportation, repair, dismantling and recycling of components would have a negative impact on sales in a highly price-sensitive market, and thus on energy access outcomes. Financial incentives are needed either at consumer or company level, to ensure products with low intrinsic value such as solar lights or home systems can be viably included in broader e-waste initiatives (Figure 3162).

GOGLA and its members recognize the importance of adherence to environmental standards, especially if the industry is being supported through tax exemptions or subsidies. In line with the principle of Extended Producer Responsibility, whereby governments hold importers responsible for ensuring products are recycled, GOGLA members are committed to taking voluntary action, as far as possible, to:

1. Develop products that can be easily maintained and repaired. Spare parts must be made available.
2. Develop strategies to take back faulty products, and find ways of recycling products in countries of operation.
3. Identify synergies in the use of resources and materials across the industry, to facilitate separation during recycling and reuse.
4. Build partnerships with other electronic and electrical sectors, to share the cost of collection, repair, transportation, dismantling and recycling.
5. Avoid the use of hazardous substances and, where possible, finding alternatives for them. If there are no viable alternatives, members commit to creating incentives for collection of the parts containing these hazardous substances.
6. Join together to approach ministries, NGOs and other

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61 Electronic waste (e-waste) impacts and mitigation options in the off-grid renewable energy sector, Evidence on Demand, August 2016
62 TOTAL Presentation, GOGLA AGM, 2017
key stakeholders to build awareness that, like all new electronic products, standalone solar technology should be supported by a sound environment of managing end of life products.

7. Join forces, beyond the industry, to build awareness amongst consumers of the value and benefits of handling electronic waste correctly and appropriately.

Regulation around repair and recycling in the off-grid solar sector needs to be commensurate with the small volumes of e-waste generated by the sector. Companies are not yet able to bear the full cost of establishing e-waste value chains, without passing these costs on to consumers, creating the risk that higher prices might undermine market growth. It is recommended that:

- Governments recognize the difference between the small, emerging standalone solar market, where products of low intrinsic value cannot be viably recycled without financial incentives, and larger, more established electronic industries. They can exclude standalone solar from broader e-waste initiatives, or develop alternative frameworks specifically for the standalone solar sector.

- Ensure policy is clear, and implemented in a coordinated way across multiple government ministries. For example, Ministries of Energy need to coordinate with Ministries of Environment, that are often responsible for e-waste legislation.

- Provide financial incentives to customers or companies, so that products with low intrinsic value, such as solar lights and solar home systems, can be collected and recycled as part of broader e-waste initiatives, without imposing significant additional costs on companies and end-users.

- Support consumer engagement efforts, to encourage safe disposal and recycling. For example, government agencies and companies in Kenya are responding positively to contractual arrangements for e-waste disposal.

Further Reading

- Electronic waste (e-waste) impacts and mitigation options in the off-grid renewable energy sector, Evidence on Demand, August 2016

3.8 Collaboration to Accelerate Off-Grid Energy Access

More research and innovation is needed to identify the most effective ways that government and private sector can work together to create and maintain an enabling environment for off-grid solar market growth. However, there is emerging consensus that a robust partnership between government and private sector is needed for stakeholders to work together effectively in pursuit of energy access goals. Governments need to be able to communicate changes in the policy environment to the private sector, and get feedback from companies with regards to how policies and programmes are affecting performance. As noted by SEforALL, “enhanced collaboration between energy ministries and other ministries—such as finance, education, health, rural development and environment [is needed]—to ensure policy coherence across a range of policy areas in the economy”.

Companies in turn need a channel through which they can communicate emerging challenges and opportunities in the market. Regular communication can help to build trust and mutual accountability.

To facilitate collaboration and dialogue, a lead agency within government is needed, that has been clearly mandated to work with the private sector to achieve universal energy access. Such an agency could coordinate activity across all Ministries, Departments and Agencies to support off-grid energy access. On the private sector side, companies can form or join national renewable energy industry associations, and develop joint policy recommendations, to speak with one voice on issues of relevance to the market as a whole.

Off-grid energy ‘task forces’ can be formed to enable government, private sector and other relevant stakeholders to meet regularly, monitor progress and, where relevant, take action in support of off-grid solar market growth (Figure 32). According to the Power for All campaign, based on experience in Sierra Leone: ‘once established and empowered by a country’s head of state, the energy ministry, and the local donor coordination committee (including aid agencies, development finance institutions, and multilateral development banks), a taskforce can become a powerful collaboration tool to bridge the goals of a Rural Electrification Agency and the interests of the National Renewable Energy Association’. The Energy Revolution Taskforce in Sierra Leone was able to drive through implementation of a VAT/tariff exemption
for solar products in 2016 through engaging customs authorities, revenue authorities and the Ministry of Finance. Ideally taskforce meetings would be informed by the latest data from energy access programmes, as well as market sales and impact data, thus helping to build a shared understanding of market performance, as well as the challenges and opportunities companies are facing.

In addition to facilitating dialogue and collaboration between government and the private sector, task forces can be used to engage other stakeholders with a role to play in delivering energy access. For example, civil society organizations with strong links to communities can be engaged to play a role in public awareness campaigns, provide technical assistance to distributors, or provide policy advisory services to government. Mobile network operators, local financial institutions and cooperatives can be engaged to play a role in last mile distribution, or to help overcome affordability challenges through offering consumer finances. Off-grid energy task forces or similar structures can provide a platform through which to engage other stakeholders and enlist their support in the pursuit of off-grid energy access goals.

Figure 32: A multi-stakeholder ‘task force’ can coordinate and accelerate policy reform and programme design to drive market growth - Source: Power for All, 2017