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Webinar: State of the Off-grid Appliance Market 2019

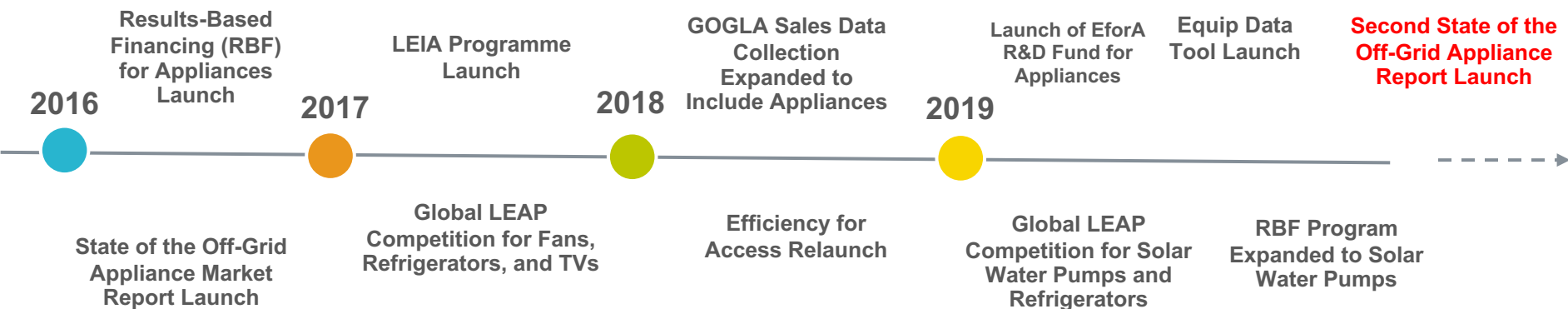
September 24th, 2019



The 2016 Global LEAP State of the Off-Grid Appliance Market Report was the first ever snapshot of off-grid appliances

2016 conclusions and insights

- **Off-grid appliances hold significant promise** for improving socio-economic outcomes; but it is critical to **think beyond lighting and cooking**
- **Early movers are beginning to provide proof points** for the potential of this market; but continued product innovation, quality improvements, financing efforts, and supply chain development are crucial to realizing this potential
- **Governments, donors, and private investors alike have a critical role to play** to strengthen this market and realize its social impact potential



The 2019 report seeks to continue to build the fact base of the off-grid appliance market, and chart potential pathways to growth

OBJECTIVE

Elevate and accelerate investment and action in the off-grid appliance space by putting forward an analysis of where the market is today and what is needed to move it forward

SCOPE

Appliances: Household appliances, with a deep focus on TVs, fans, and refrigerators

Geographic: Focus on representative markets in Africa and South Asia, including India, Myanmar, Kenya, Uganda, Ethiopia, Nigeria, Cote d'Ivoire, and Sierra Leone

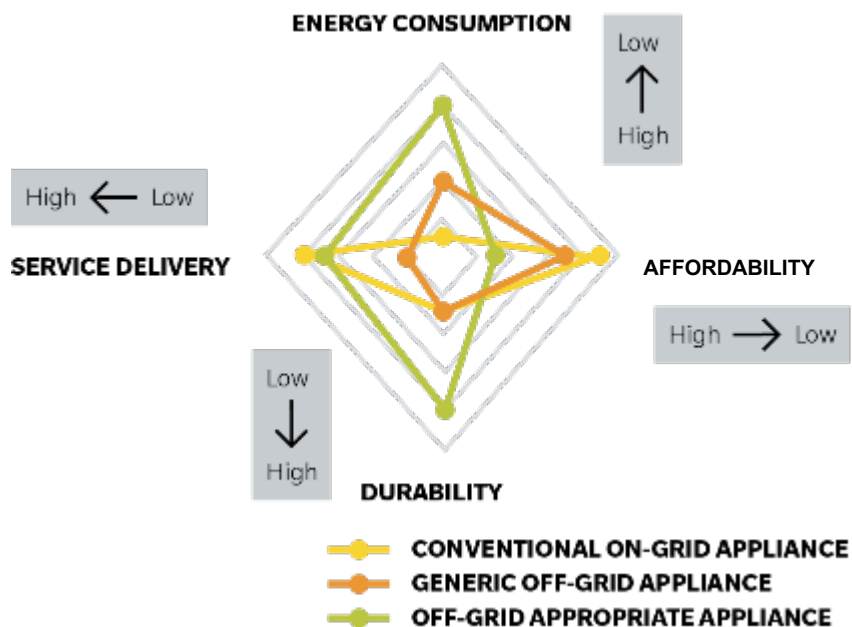
AUDIENCE

Industry players (manufacturers, distributors, and finance providers) in the off-grid appliance market

Policymakers, donors, investors

The report focuses on off-grid appliances for the household - both *generic* off-grid and off-grid *appropriate* appliances

FEATURES OF APPLIANCE TYPES



CONVENTIONAL ON-GRID APPLIANCE

Domestic appliance that is powered by mains electricity (AC power supply) and are used in on-grid households, typically with stable and constant electricity supply.

WEAK- AND OFF-GRID APPLIANCES

GENERIC WEAK- AND OFF-GRID APPLIANCE

Generic, unbranded solar appliances are sold in grey market and are substandard in terms of performance and quality.

WEAK- AND OFF-GRID APPROPRIATE APPLIANCE

High-quality and efficient off-grid appliances that are intentionally-designed for end users living in energy-constrained environment and advertised for use with a PV module or a solar home system.

The 2019 report takes a deeper look at the market sizing, how the market has evolved since 2016, and what is needed for it to grow further

- **Off-grid appliances are a critical catalyst for energy access** – allowing people to enjoy the full benefits of electrification and, in turn helping drive demand for off-grid and mini-grid connections
- **Overall appliance penetration remains low, significant untapped demand.** Rural appliance penetration (grid and off-grid) across Sub-Saharan Africa – 17% TVs, 6% refrigerators, 6-8% fans.
- **Market uptake of off-grid appliances has continued to grow**, driven by technology advances, increased market entrants (especially with DESCO/PAYGO distribution), and competition – rough estimate of 5-10 million off-grid TVs, refrigerators, fan in market, but only small share branded
- **Rapid off-grid market growth** – 30-80% y-on-y, very wide range of estimate due to gaps in data
- Product development toes the line between **efficiency and affordability**, as scale of production increases it is hoped that more efficiency can be achieved at a lower production cost.
- While **smaller appliances such as fans and to a certain extent televisions are demanded for household use**, the suitability of larger more expensive and energy consuming appliances such as refrigerators may be more suited to small business productive use at this stage in the market
- **Affordability remains a key constraint to market growth.** Given the high upfront cost of off-grid appliances, and low incomes of target customers, there is a need for creative ways to increase affordability and access: smart subsidies, public funding, consumer financing
- More **innovation and competition is needed** to move the space forward.
- Government and donors can do more to support the sector and chart a sharper growth trajectory – in particular by **integrating off-grid appliances into national electrification plans, supporting policies (e.g., taxes/tariffs), and investment into quality standards**

By providing access to electricity services, appliances support a number of SDGs – especially for marginalized communities



How do Household Off-Grid Appliances Contribute to the UN Sustainable Development Goals?



All off-grid appliances expose households to new, time- and energy-saving products, which they may use to improve their productivity and incomes.



Refrigerators, electric cookstoves, and solar water pumps free up time for women in the home, allowing them to pursue an education and income-generating activities.



Off-grid refrigerators preserve food and reduce waste. **Solar water pumps** improve irrigation and extend the growing season.



Solar water pumps increase access to clean water and reduce the risk of water-borne disease and illness.



Refrigerators reduce the risk of food contamination. **Fans** improve comfort in the home. **Electric cookstoves** reduce indoor air pollution.



All off-grid appliances accelerate access to clean, affordable energy and allow households to climb higher on the energy ladder.



Televisions and IT devices provide access to educational content and news.



All off-grid appliances promote sustained, inclusive and sustainable economic growth and full and productive employment for all.

TECHNOLOGIES

Lighting

Fans

Televisions

Electric Cookstoves

Solar Water Pumps

Refrigerators

Computers

Hair Clippers

Internet of Things

This presentation will provide a short snapshot of the forthcoming report

SIZE OF THE OPPORTUNITY

SUPPLY MARKET DYNAMICS & BUSINESS MODELS

PRODUCT & TECHNOLOGY TRENDS

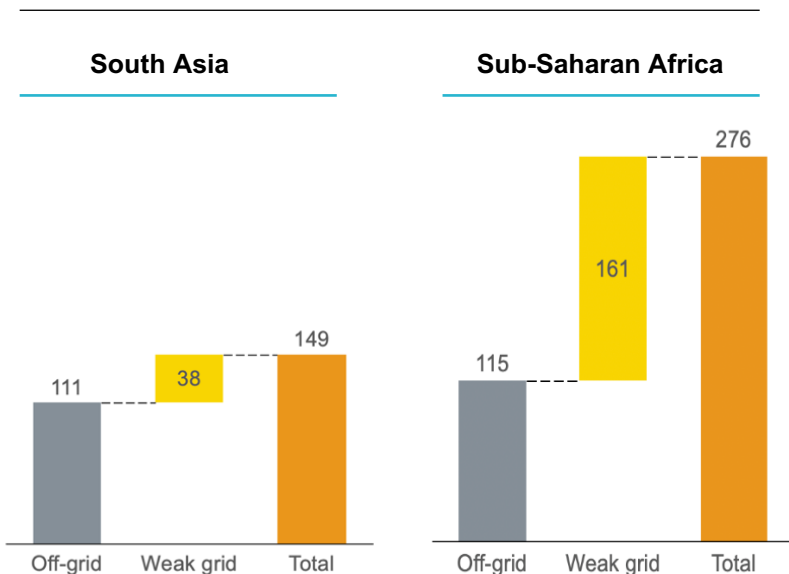
CONSUMER INSIGHTS

CONDITIONS FOR MARKET GROWTH

PATH FORWARD

Globally, 475 million households are off-grid or have weak-grid connections, but uptake of off-grid solar and mini-grids is growing

Estimated number of off- and weak- grid households (Millions of Households, 2018)



The large and growing off-grid and weak-grid populations are the foundation of and primary engine for the growth of off-grid appliance demand

Large off-grid and weak-grid populations that are continuing to grow

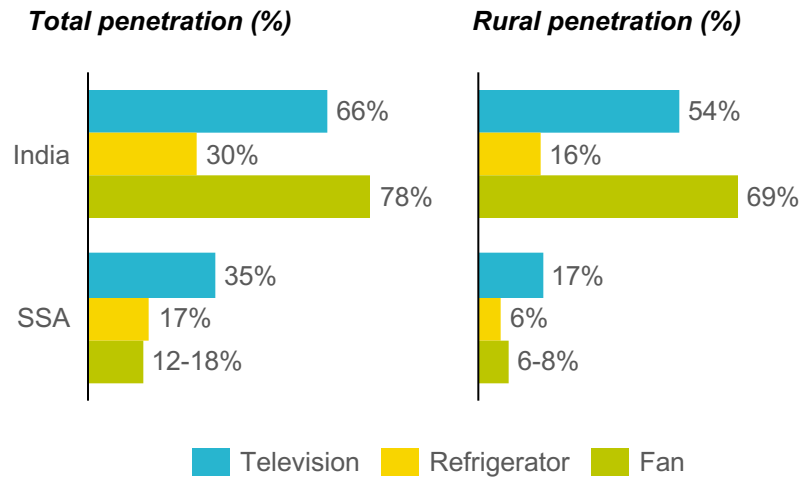
- Of 475 million off-grid and weak-grid households, 90% in South Asia and SSA
- Weak grid (225 million) almost as big as off-grid (250 million)
- Off-grid and weak-grid market will remain large over next decade, particularly in SSA as grid extension lags population growth

.. off-grid appliance opportunity growing with off-grid and mini-grid growth

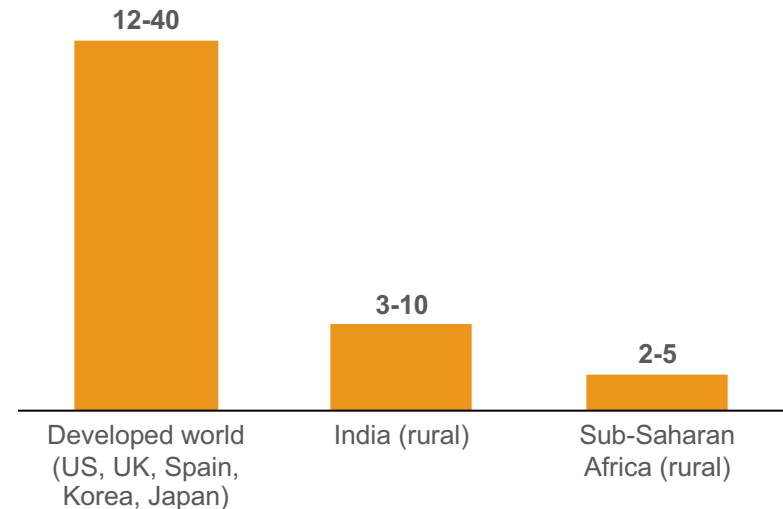
- 73 million HHs, 360 million people, with off-grid solar by EOY 2018, with SHS segment growing at >60% y-on-y
- 10 million HHs connected to mini-grids (mostly in Asia); WB projects 100-120 million households (500 million people) on mini-grids by 2030

Low levels of appliance use in Sub-Saharan Africa and South Asia relative to higher income countries; immense latent demand

Appliance ownership rates in Africa and South Asia (% of HHs with appliance)



Number of appliances per households – Africa vs. South Asia vs. High Income

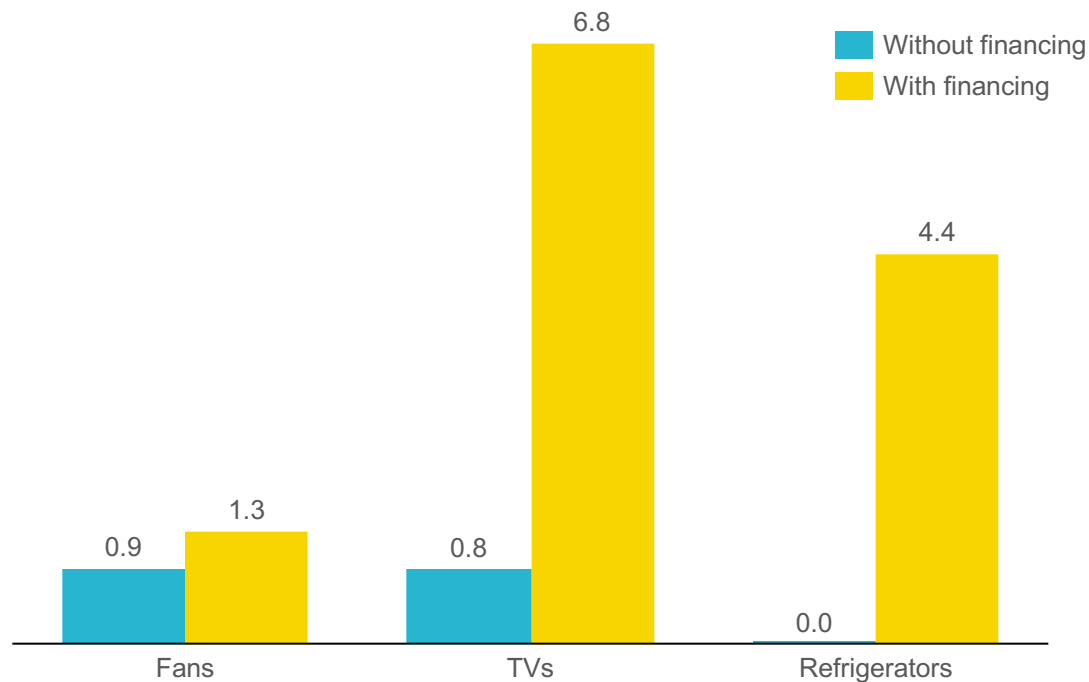


High levels of unmet household demand for energy and appliances

- HH energy consumption in US and Europe is 5-10 times greater than for avg. India HH, 10-20 times greater than for Nigeria HH, and 20-200 times greater than rural Africa HH
- Japan with 1/10 the people of SSA region, has 25% more refrigerators (47 million vs. 35 million for SSA) and TVs (105 million vs. ~80 mil for SSA)
- Across 10 SSA countries, 28% of off-grid households (18-35%) intend to purchase a television and 14% (6-24% range) have interest in purchasing a refrigerator upon gaining access to electricity

The high up-front cost of off-grid appliances limits the market size if only cash sales are considered

Estimated market size of off-grid appliances, globally, based with cash sales and with financing, 2018 (Bn USD)

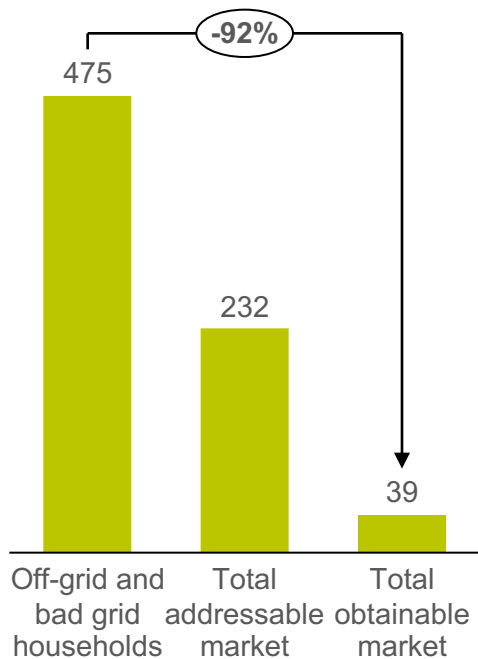


Without financing: Full cost of appliance paid with 2 months saving

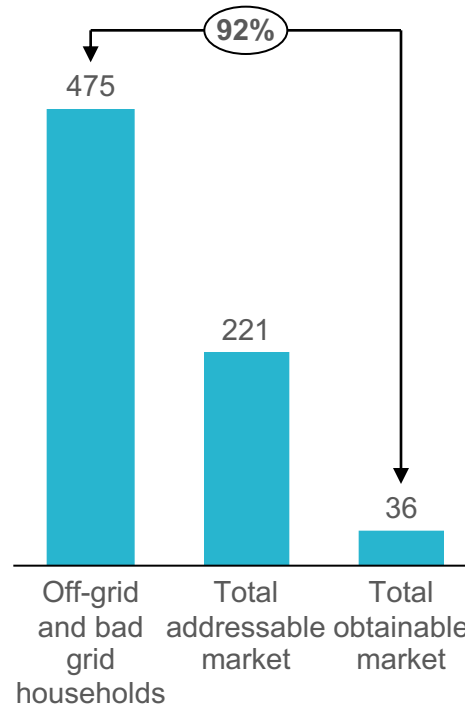
With financing: 28-month repayment period, a 10% down payment and a 70% mark-up for servicing and financing

Up to 50% of off- and weak-grid households can afford off-grid appliances with financing, but the obtainable market is smaller

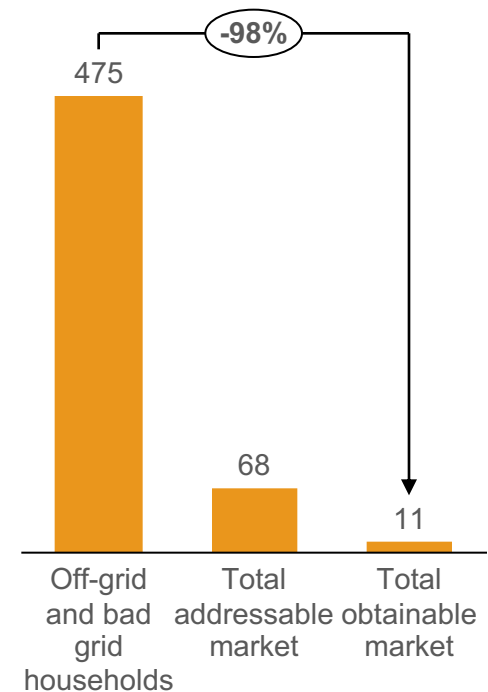
Households fan market 2018 (Mn)



Households TV market 2018 (Mn)



Households fridge market 2018 (Mn)



■ Households in the fan market (Mn)

■ Households in the TV market (Mn)

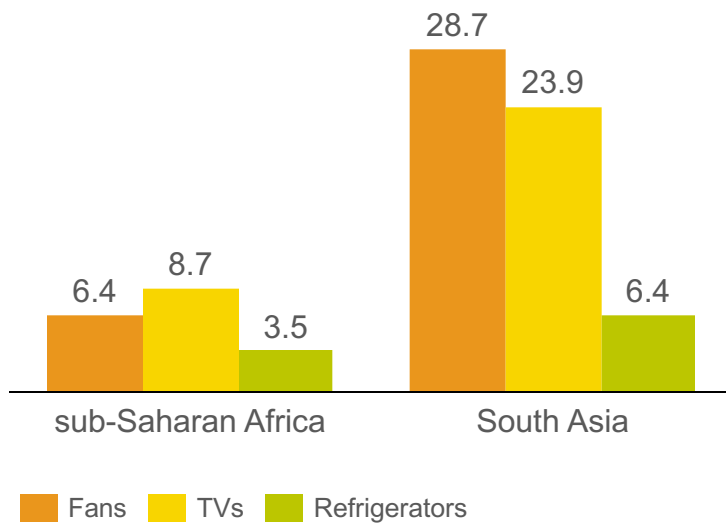
■ Households in the fridge market (Mn)

Addressable market: Includes all households that can afford an appliance with financing (2 months of saving, 10% down payment, 28 months repayment, 70% mark-up for financing)

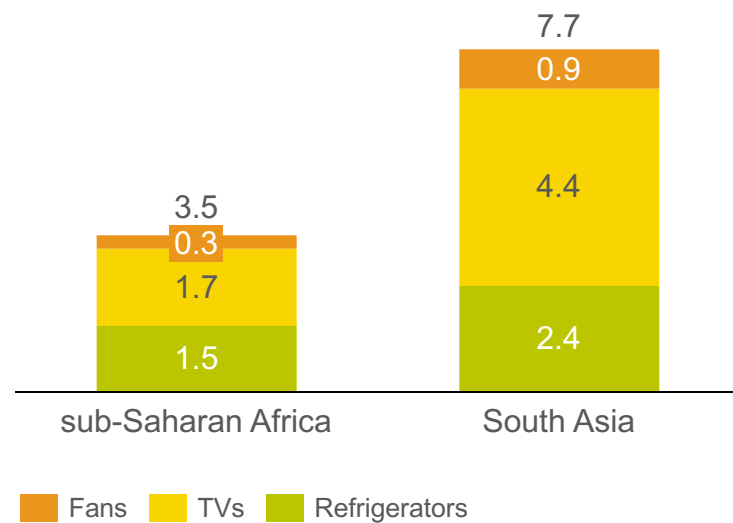
Obtainable market: Accounts for access to financing (mobile money or financial inclusion) and rural access (World Bank Rural Access Index)

The obtainable market size in South Asia and sub-Saharan Africa is 12.6 billion USD

Obtainable households for off-grid appliances, by region, 2018 (Mn)



Obtainable households for off-grid appliances, by region, 2018 (Bn USD)



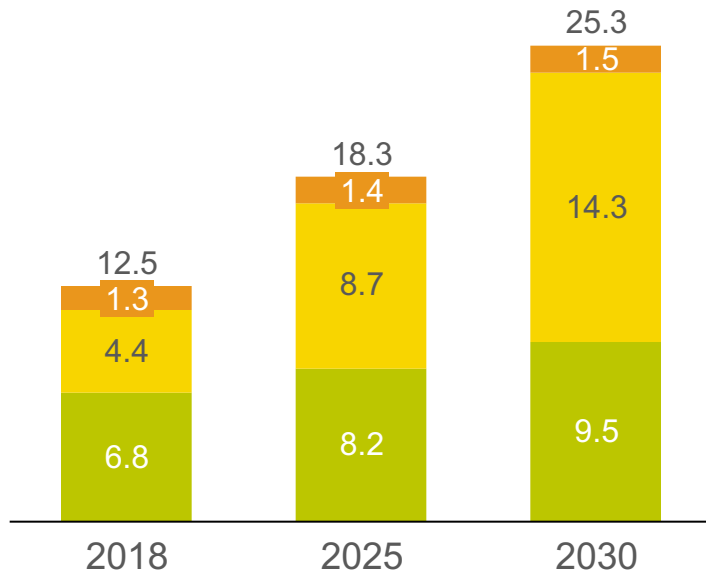
The following assumptions were used to reach a representative and obtainable market size:

1. Consumer financing (10% up-front payment, 28 months financing, accounting for up to 70% mark-up due to financing and after-care service)
2. Financial inclusion (% of population with mobile money or access to a bank account)
3. Accessibility (World Bank Roads Index)

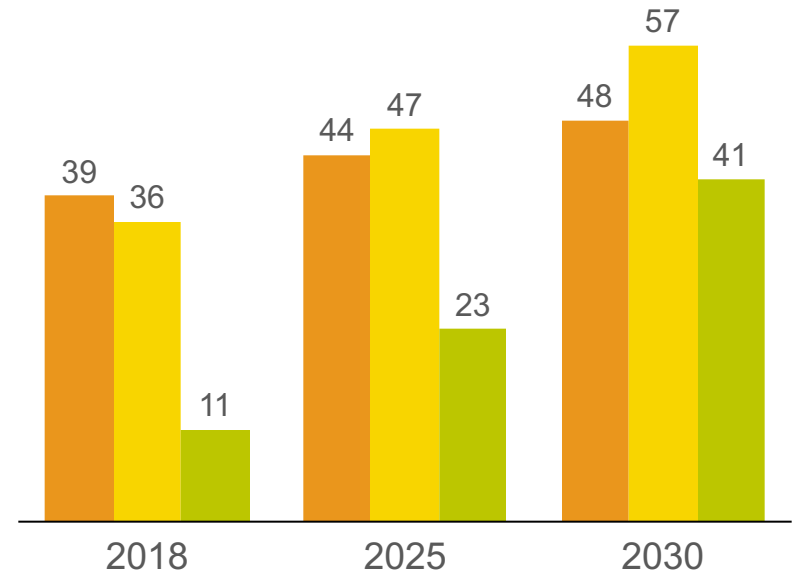
Looking ahead to 2030, the off-grid appliance market could reach 25.3 billion USD as higher value appliances come onto the market

Fans TVs Refrigerators

Cumulative market potential (USD Bn)



Cumulative market potential (HHs Mn)



The most important growth drivers accounted for:

- Population growth
- Increase in income levels
- Lower product costs
- Improved financial and mobile infrastructure

Countries are developing in different ways, based on their grid penetration, access to finance, and policy support

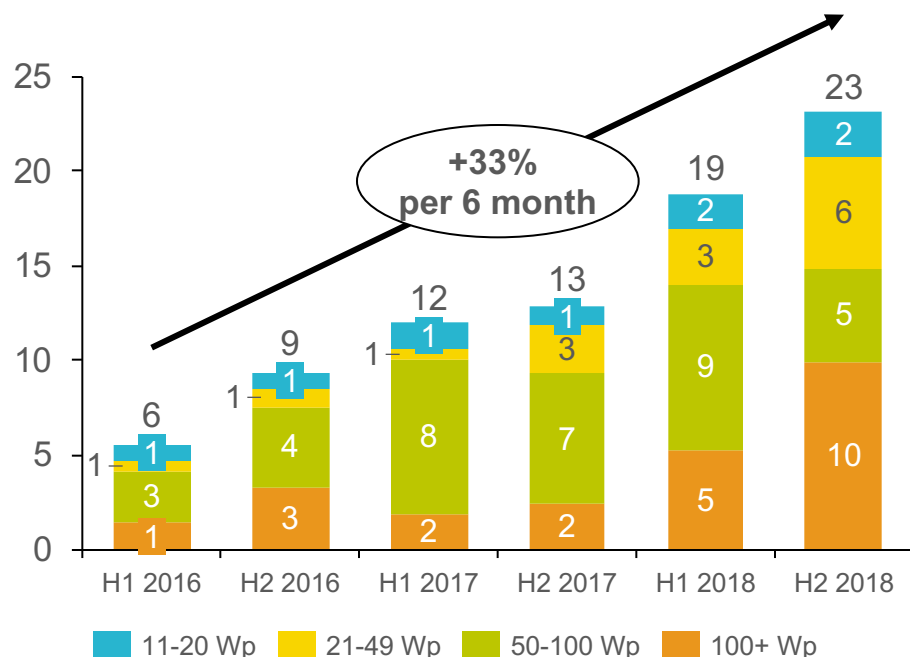
Early categorization of some of the off-grid appliance markets indicates

- **Ready for scale**: Larger potential market, more mature solar sector, high and growing A2F, strong government support
- **High potential markets**: Large potential market, nascent A2F, growing but unconsolidated government support
- **Nascent markets**: Medium market size, accelerating A2F, unconsolidated government support

Country	Market potential (Mn USD, 2030)	Financial inclusion (mobile money / account ownership)*	Government Support (Favorability)
India	9387	80%	Explicit VAT exemption on SHS
Kenya	264	73%	VAT exemption on SHS, but mixed application
Nigeria	929	40%	Reduced VAT on SHS
Myanmar	221	26%	VAT exemption on SHS
Côte d'Ivoire	127	34%	Reduced VAT on SHS
Uganda	39	51%	Explicit VAT exemption on SHS
Ethiopia	234	35%	VAT exemption on SHS, but mixed application
Sierra Leone	10	20%	Duty waivers on SHS, but limited success

While data is incomplete, it is clear that the off-grid appliance sector is already substantial and growing, driven by televisions and fans

Growth in newly installed global SHS capacity, by SHS size (MW installed)



3-4 lights, phone charging, radio, fan

3-4 lights, phone charging, radio, fan, TV

Medium capacity with extended capabilities

High capacity with extended capabilities

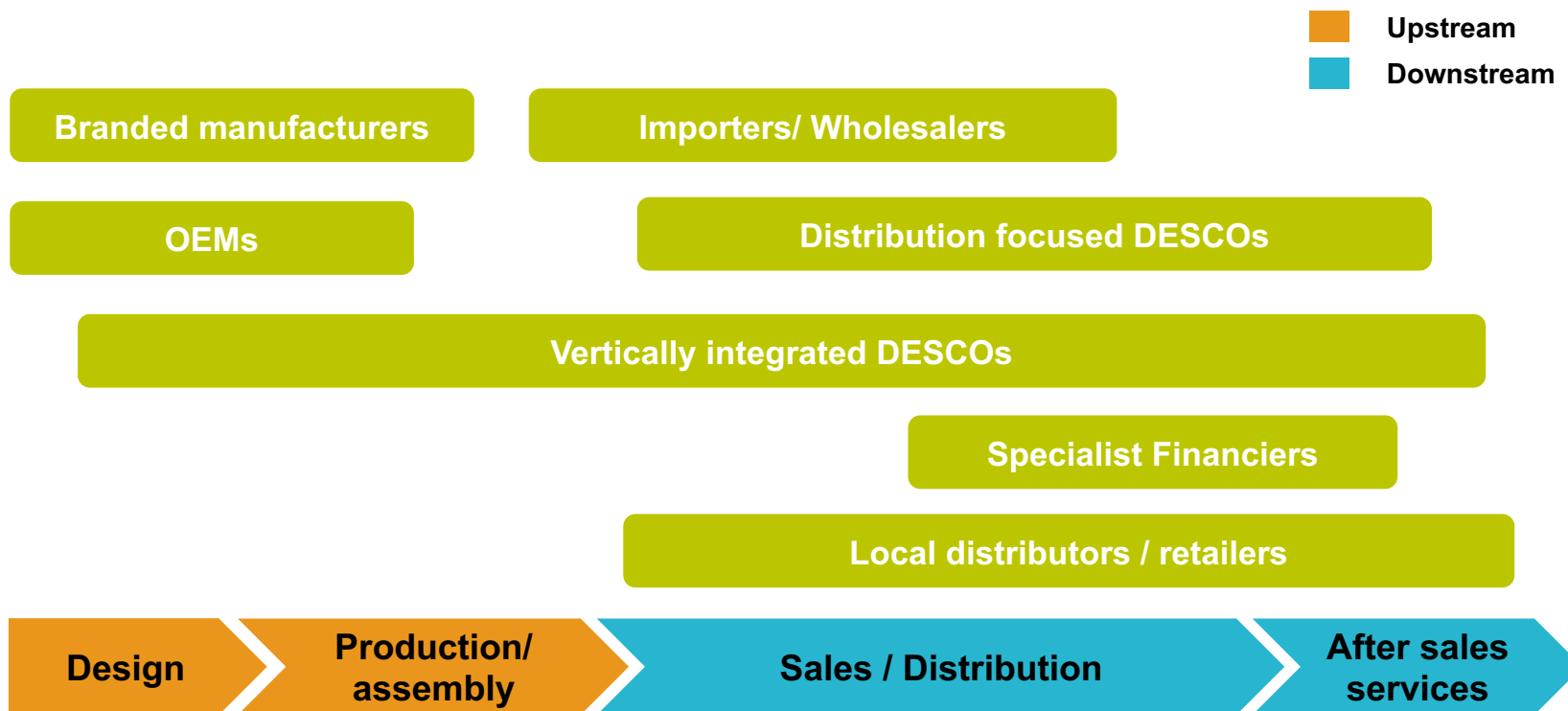
Growing off-grid appliance sales

- We estimate aggregate off-grid TV, refrigerator, fan penetration of 5-10 million units globally
- Vast majority are generic (non-branded) products (70-90%), most sold in Asia to date, particularly Bangladesh
- Based on GOGLA H2 2018 data, which is highly incomplete: 175,000 fans, 147,000 televisions (50% in Kenya), and 5,900 refrigerators
- 30-80% growth in sales (compare with 33% per 6 month or 80% y-on-y growth for 50Wp+)
- 25-85% of PAYGO today sold bundled with off-grid appliance

H2 of 2018 was the first time GOGLA collected appliance sales data, this data set is expected to grow over time to provide the industry with more trends and insights

The supply side for off-grid appliances shows varying levels of integration and partnerships are required to drive sales

Primary actors in the off-grid appliances value chain



Consumer financing models have been a major driver of uptake by reducing affordability constraints for off-grid households

Financing unlocks the up-front affordability barrier that prevent customers from purchasing off-grid appliances. **In East Africa, 99% of survey respondents purchased their off-grid television on credit**

The three most common forms of financing for off-grid appliances are:

PAYGO

DESCOs are leading efforts to add appliances to their PAYGO offerings. This can increase demand for the system as a whole, however it can increase their financing portfolio risk profile.

MFI

In areas where mobile money has low penetration MFIs are providing financing for off-grid appliances. This is prevalent in India, and is being tested in more nascent countries like Myanmar.

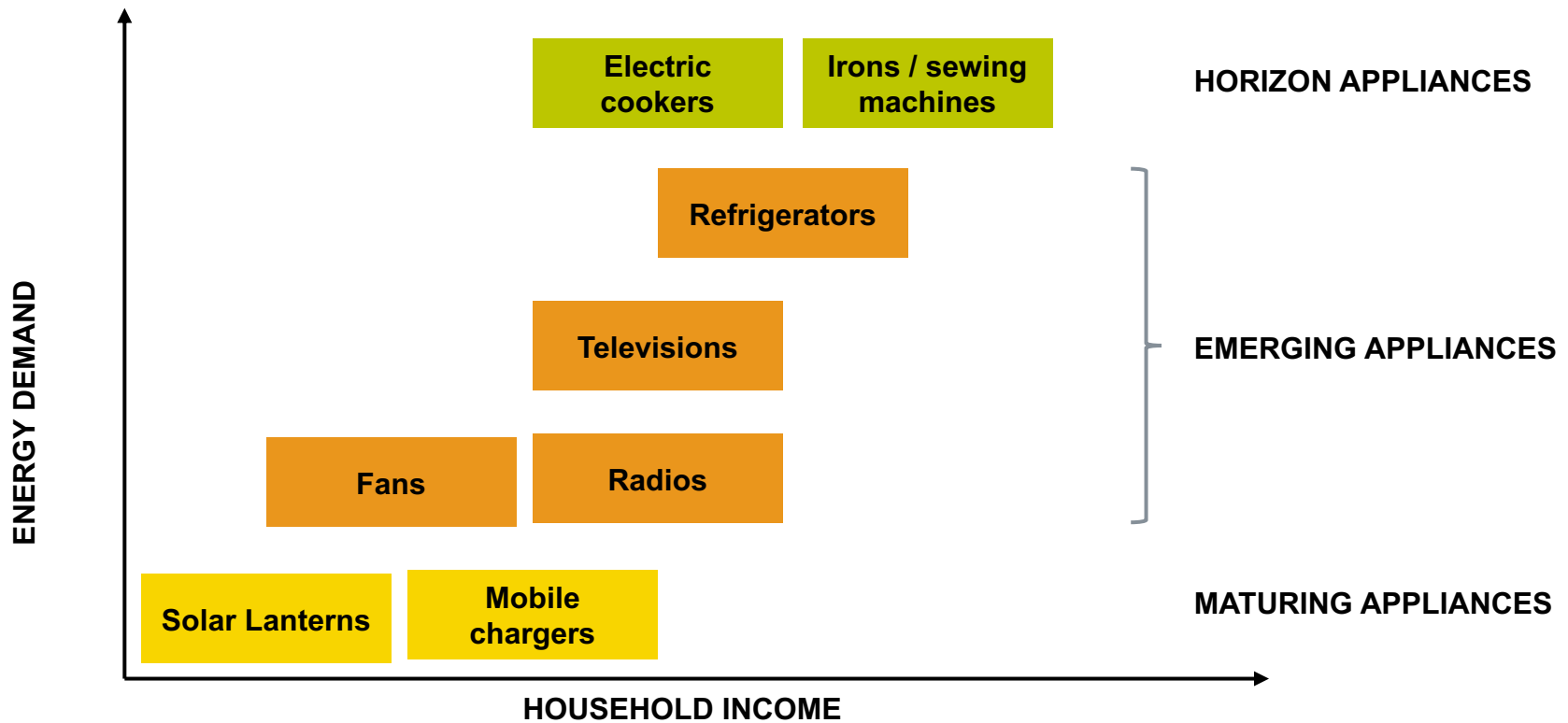
Alternative financing

Local distributors have tested alternative models of financing such as rent to own financing, or installment payments, often in partnership with finance providers.

Financing is only one of the factors that will enable uptake of off-grid appliances

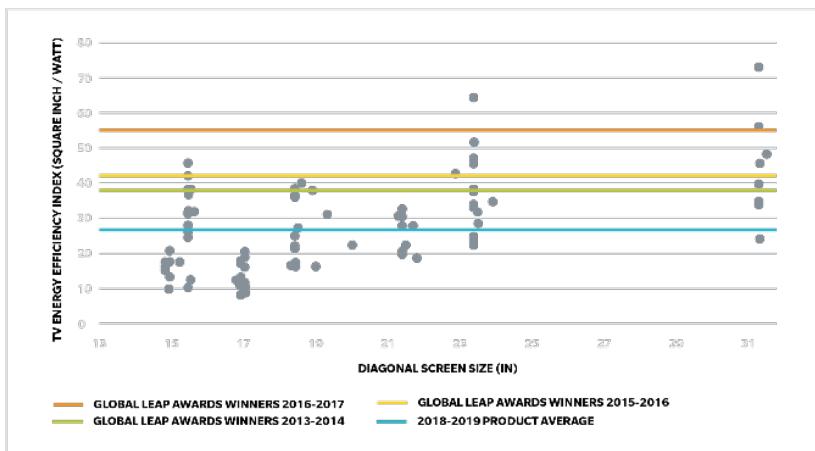
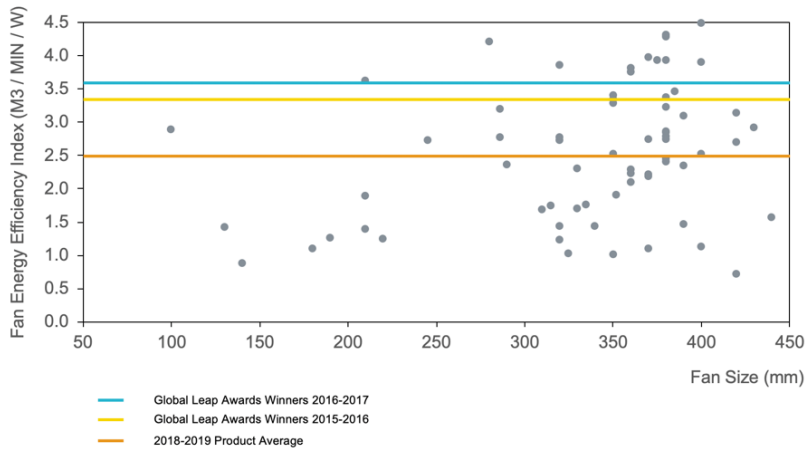
There is a portfolio of appliances both on the market and at the horizon of innovation

ENERGY STACK OF OFF-GRID APPROPRIATE HOUSEHOLD APPLIANCES FOR BOP CUSTOMERS



There is rapid evolution in off-grid appliance energy efficiency ratings, costs, and product diversity

Fan and TV energy efficiency over time based on Global Leap Awards data



Increasingly diverse product eco-system with product variety, improved efficiencies, and falling product prices for some categories

- Number of off-grid appliance enterprise and products growing quickly – 3-5 branded manufacturers for each product in 2013 grew to 11 TV, 8 TV, 7 off-grid fan quality product mfg by 2017 in Global LEAP across dozens of products
- Efficiency rising (45% improvement in TV efficiency from 2014-2017), but very big disparity between average off-grid appliance and best in class (1.5-3x)
- Still big potential for efficiency improved, e.g., 50% for average TV with improved insulation, materials, motors
- Prices falling (23% decline in TV prices from 2015 to 2018, will be 30%+ by 2023)

Future technology trends for fans and televisions are moving beyond affordability, however for refrigerators it remains the key challenge



- **Blade design.** Blade design has the potential to have significant impact on efficiency, however there is less R&D invested in this field
- **BLDC.** BLDCs are recognized to be one of the most significant technologies that can improve a fan's efficiency however despite efforts they remain relatively expensive for the price point at which an off-grid fan is attractive for a customer



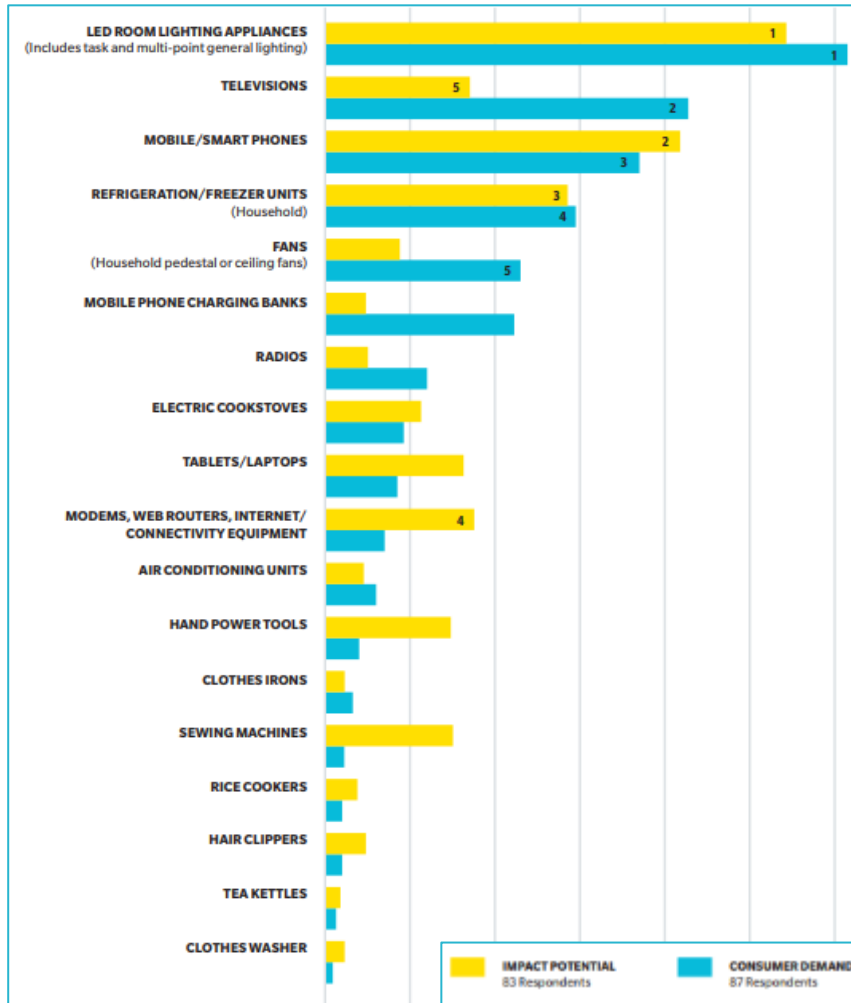
- **Content.** Entertainment and access to information are primary purchase drivers for off-grid televisions, manufacturers and distributors are looking for ways to enable access to more content – both in the hardware and through partnerships
- **Luminance.** Due to televisions in off-grid areas often being the primary source of light and therefore used in areas without other sources of light, manufacturers have found that screens can be dimmer and therefore more efficient
- **Durability.** Televisions in off-grid environments are often moved around a house, therefore product designers are looking for ways to make the television more durable and portable, especially for appliances bought on 2+ years credit



- **Phase Change Materials.** PCM is used by some manufacturers in their off-grid refrigerators to help thermal management when power is intermittent or unavailable, however the materials tend to have higher energy efficiency
- **Controllability.** Manufacturers are working to improve controllability of the refrigerator's temperature, to allow the product to remain cool when other off-grid appliances are drawing on solar home system power
- **Smart inverters.** Inverters that make refrigerators dual use (for off-grid and weak-grid) are currently being tested for the market

Consumer demand is not driven by impact potential, as increasingly diverse and affordable products are available

2018 Household Use Appliance Demand & Impact



Entertainment, news, and sports are the top three purchase drivers for a television in East Africa

Almost 60% of the respondents bought the refrigerator to improve their business and attract more customers. Only 2% use them purely for convenience

Comfort is frequently cited as being the most important purchase driver for fans

Source: LEIA; Acumen Lean Data, 2018, Television Baseline report

There are a number of conditions, beyond policy, that are important in the enabling environment to support market growth

Financial incentives

Access to finance for consumers, suppliers, and distributors is crucial for enabling both the demand and supply of off-grid appliances. This can be supported with grants, concessional financing, and RBF programs.

Policy

The supply of energy access has historically been a government led initiative, however they have not always engaged on promoting the demand of energy through appliances. This is particularly relevant as countries expand their electrification using off-grid technologies.

Consumer Awareness

Given the early stage of the industry, there is low consumer awareness of solar technology and off-grid appliances as an alternative to the grid and conventional appliances. Independent surveys have shown that customers are likely to purchase from people they know, indicating a potential route to increase awareness.

Innovative Distribution

The diversification of players in the market, and other innovative means of distribution, ensures locally relevant distribution mechanisms. Partnerships will continue to be important to ensure distribution of appliances reaches those consumers who can most benefit from appliances.

There are diverse levers needed to ensure the off-grid appliance market reaches its potential and has maximum impact

- **Policy:** Governments should increasingly recognize the importance of driving energy demand through off-grid appliances as part of electrification initiatives, and could implement corresponding policies around taxes and, as the market matures, quality assurance
- **Finance:** More dedicated financing for off-grid appliances should be made available—with an emphasis on customer-tailored solutions
- **Knowledge sharing:** More research on consumer habits should continue to be collected and disseminated across the industry to inform product design and business models, while more information should also be shared with customers to increase their awareness of off-grid appliances
- **Market Stakeholders:** Global on-grid conventional appliance players should be encouraged to enter the off-grid market, potentially through public-private partnerships
- **Technology:** An ongoing focus should be placed on improving the efficiency of off-grid appliances to be able to reduce panel array and energy storage requirements, as well as increasing product durability, quality, and the availability of aftercare services

A number of levers, by a variety of actors, can be used to improve affordability of off-grid appliances and drive market growth

Industry

- Increased economies of scale in production and distribution
- Technological advances

Donors

- Subsidy (to customer or distributor)
- Results based financing schemes

Government

- Tax exemptions
- Inclusion of off-grid appliances in electrification strategy

Questions? Comments?

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