

Pakistan Off-Grid Lighting Consumer Perceptions Study Overview

In Partnership with



UKaid
from the Department for
International Development



LIGHTING ASIA
Catalyzing markets for modern off-grid lighting
PAKISTAN



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About IFC

IFC, a member of the World Bank Group, is the largest global development institution focused exclusively on the private sector. Working with private enterprises in about 100 countries, we use our capital, expertise, and influence to help eliminate extreme poverty and boost shared prosperity. In FY14, we provided more than \$22 billion in financing to improve lives in developing countries and tackle the most urgent challenges of development.

For more information, visit: www.ifc.org

About Lighting Global

Lighting Global is a joint IFC/World Bank program which manages the Quality Assurance (QA) framework and testing for the regional Lighting Asia and Lighting Africa programs. The QA framework and test methods have been institutionalized through, and are now based on, IEC/TS 62257-9-5, Edition 2.0, a technical specification published by the International Electrotechnical Commission.

Lighting Global maintains a set of minimum quality standards which off-grid lighting products must meet in order to access program services. They include:

- Truth in advertising: Accurate consumer-facing labeling (e.g., rated run time, battery capacity, PV power).
- Lumen maintenance: After 2,000 hours, the products light output must not drop below 85 percent of the initial value (alternatively, products may meet this requirement by achieving 95 percent of the initial light output after 1,000 hours).
- Battery: Must be durable and adequately protected.
- Health and safety: Batteries may not contain mercury or cadmium.
- Durability and quality: Products are designed and manufactured to avoid early failure.
- Warranty: Products have a consumer-facing warranty with at least one year of coverage.
- Key Statistics: Manufacturers will be required to report performance information, such as run time and light output, on the product packaging.

For more information, visit www.lightingglobal.org

About Lighting Pakistan

Lighting Pakistan works to promote the development of a sustainable, clean, and affordable commercial market for modern solar lighting products in Pakistan. The Program targets households, businesses, and micro-enterprises that are underserved by the grid. Lighting Pakistan's approach is based on the same multi-stakeholder framework that IFC has successfully used in other markets.



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EXECUTIVE SUMMARY

For the last decade, Pakistan has been in the grip of a severe energy crisis. More than 144 million people across the country do not have reliable access to the grid, either because they are not connected or because they experience daily blackouts which often last over 12 hours per day.

The power shortfall has severely hampered economic development and job creation across the country and it has only become more severe over the last five years. As a result, Pakistanis use a mix of technologies to light their homes and businesses. They spend an estimated \$2.3 billion a year on everything from candles, to kerosene lamps, to battery-powered torches.

This study explores the potential of another option: solar-powered lighting. Through a combination of market research and household surveys, it found that there is potentially a robust market for solar lighting solutions, which run the gamut from simple solar-powered desk lamps to large systems that can power multiple appliances. These systems are safer, more reliable, and, over the

long run, cheaper than many of the technologies in widespread use today.

Right now, only about 4 percent of Pakistani households tap into solar power and there are several barriers to its widespread adoption. They include a lack of consumer awareness, limited supply chains, and a shortage of consumer financing, which is key given the relatively high up-front cost of some solar products.

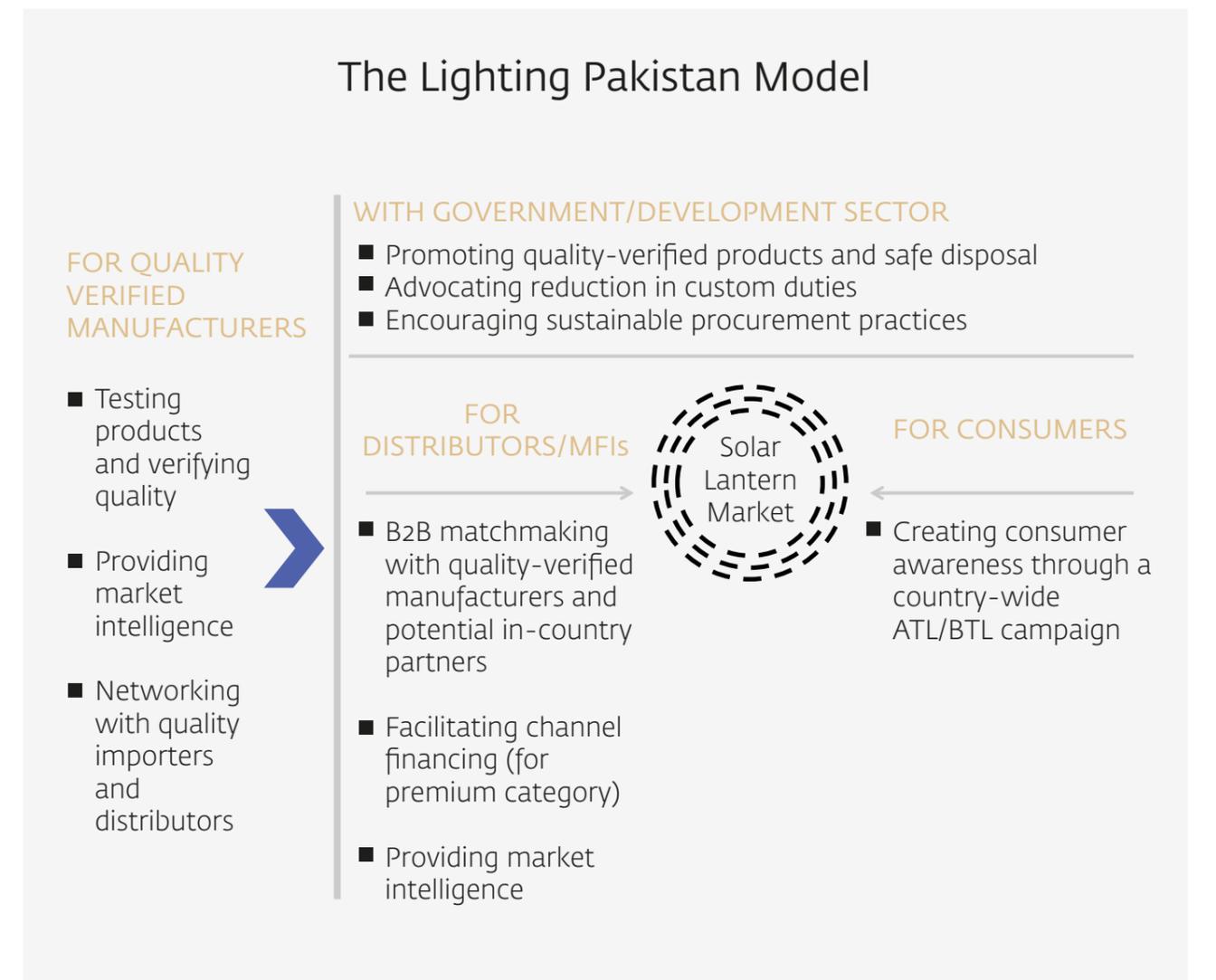
However, these issues are surmountable. Below-the-line marketing can help raise awareness. Lenders, especially microfinance institutions, can be enlisted to help provide credit. And programs like IFC's Lighting Pakistan can help certify the quality of solar-powered lighting products, creating confidence among consumers.

Most importantly, this study finds there is a tremendous opportunity for industry players that can deliver high-quality, cost-effective products to consumers. The market is both massive and largely untapped, presenting an excellent opportunity for first movers.



THE LIGHTING PAKISTAN APPROACH

The Lighting Pakistan program works with solar manufacturers, distributors, governments financiers and other market players to scale up quality verified solar devices in Pakistan.



Lighting Pakistan program aims to facilitate access to lighting and associated services for 1.5 million people in Pakistan by 2018 through:

Quality Assurance:

The Quality Assurance component will consist of initial product testing and quality verification. For a company to become a client of the lighting program, its products must pass a quality assurance process. This will allow distributors and consumers to easily differentiate between poor-quality and high-quality products.

Market Intelligence:

Throughout the life of the program IFC will be releasing market intelligence reports based on field research with consumers, focus group discussions and supply chain analysis of the market for solar devices.

Business-to-Business Connections:

IFC will make direct connections between quality-assured manufacturers and distributors, as well as microfinance institutions. The purpose of these direct connections is to lower market entry costs for manufacturers and assist distributors in developing a viable off-grid lighting sector.

Public and Consumer Awareness:

Lighting Pakistan will launch a broad consumer awareness campaign to develop confidence in the benefits of off-grid solar products, while showing consumers how to identify and buy quality-assured products.

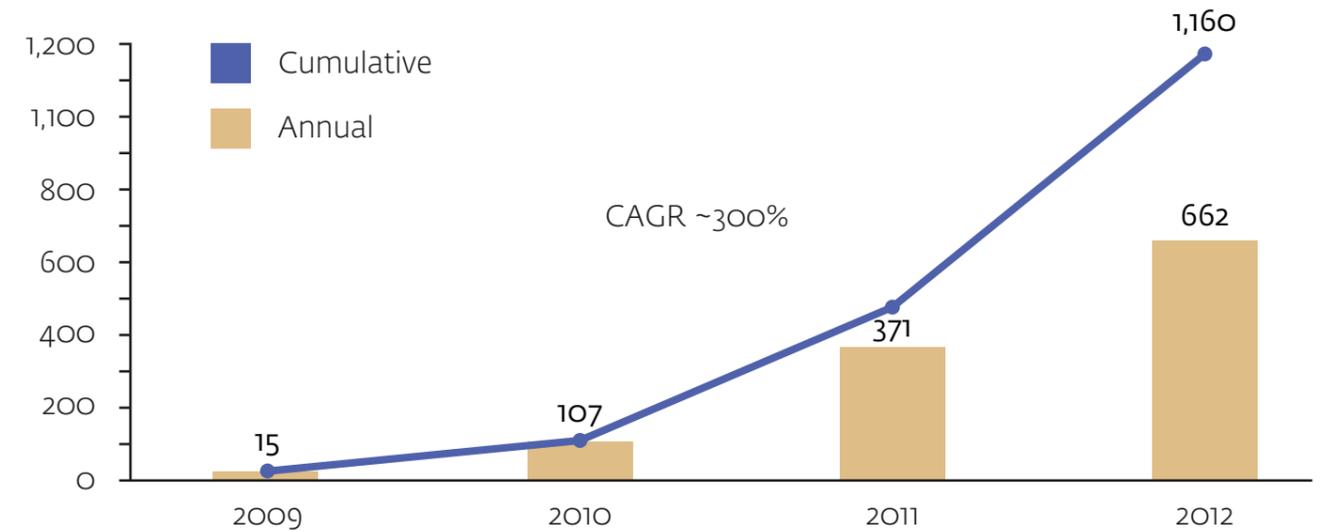


The Story of the African Off-grid Lighting Market

There are about 600 million people in Africa with no access to grid electricity, a number expected to rise to about 700 million by 2030. These people rely on polluting and dangerous sources of lighting such as kerosene lamps, candles and battery-powered torches. Fuel-based lighting is generally of low quality and expensive, impeding learning and economic productivity.

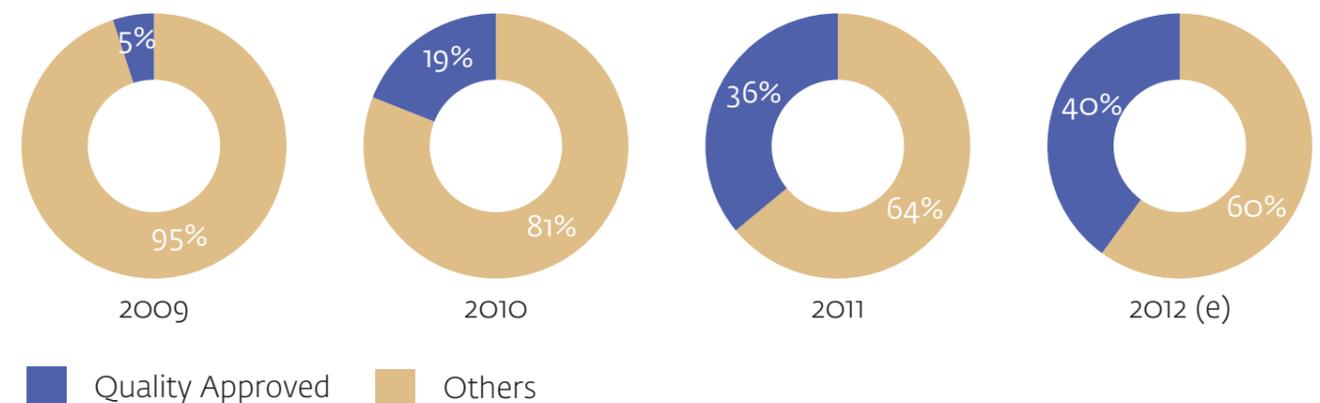
The Lighting Africa program was launched in September 2007 with the goal of catalyzing markets for clean, modern off-grid lighting products to light up the homes and businesses of 250 million people by 2030. Since inception, the *African market has seen 300 percent growth with more than 7.7 million people across Africa enjoying clean, affordable, solar-powered lighting.*

Sales of quality-approved SPLs In Africa



The success of the program in Africa has been driven by the growth of quality verified solar devices, whose share of the overall solar market rose from 5 percent to 40 percent between 2009 and 2012. The key driver of this growth was increased awareness on behalf of African consumers about quality verified products and the value of a warranty.

Market Share of Quality-Approved SPLs



(Source: Lighting Africa Market Trends Report 2012)

How to become a Lighting Pakistan associate

This overview is a snapshot of a larger consumer insights study into the Pakistan off-grid lighting market. The said study, labeled Pakistan Off-Grid Lighting Consumer Perceptions Study, is currently available to IFC's Lighting Pakistan Associates and those market players who distribute/finance their products.

Lighting Pakistan associates are manufacturers who have been quality assured by IFC Lighting Global Quality Assurance framework and have signed onto the Lighting Pakistan program. If you are interested in becoming a Lighting Global Associate please contact the Lighting Pakistan team.

INTRODUCTION



Objectives

The Pakistan Off-Grid Lighting Consumer Perceptions Study was conducted to provide insights into the Pakistan lighting market for industry players and other stakeholders, including policy makers, providers of consumer finance, such as banks and microfinance institutions (MFIs), as well as manufacturers of quality solar devices.

The Pakistan Off-Grid Lighting Consumer Perceptions Study focuses on the key findings of IFC's market research and field research conducted by consultants Grant Thornton Pakistan. This report also provides recommendations for industry players looking to enter the Pakistan market and achieve scale.

Scope

For the purpose of this study, solar lighting appliances are broadly grouped into two categories: Pico Solar Lighting Systems (PSLS) and Solar Home Systems (SHS). PSLS are characterized by the portability of the device, with the battery in the same casing as the luminary. On the other hand, SHS are characterized by the presence of a separate battery pack that can be attached to multiple luminaries and/or other direct current (DC) appliances (for example fans and televisions). They also typically have a higher wattage than PSLS, and tend to cost more. Both PSLS and SHS can be further classified into different product categories. Figure 1.1 defines and provides an overview of each of these categories. [Products included in the figure belong to Lighting Pakistan's current associates].

Lighting Pakistan Solar Lighting Categories

Pico Solar Lighting Systems (PSLS)



Solar Task Light

Solar task lights are designed for specific purposes (such as reading or as a flashlight). They have a low-wattage surface-mounted LED which requires low current and hence provides a low lumen output.

- D Light – S2
- Greenlight Planet – Sun King Eco
- Niwa – Uno 50



Basic PSLS

Basic PSLS are simple (little or no additional features) multi-purpose lanterns geared towards portability. They draw limited power from low-capacity PV panels resulting in low lumen.

- D Light – S20



Multifunctional PSLS

Multifunctional PSLS combine portability with additional features (such as phone charging). They usually have higher lumen and greater wattage of PV panels and bulbs.

- GLP – Sun King Mobile & Pro2
- Niwa – 300 & 100
- Omnivoltaic – Pilot & Beacon
- D Light – S300

Solar Home Systems (SHS)



Basic SHS

Basic SHS are relatively low-wattage systems (<10w) which have one or more detachable lights. Basic SHS may or may not have other value-added features.

- D Light – D20
- Niwa – Office 200 & Home 400
- Omnivoltaic – Marathoner 380



Advanced SHS

Advanced SHS are higher wattage systems (>10w) which have multiple detachable lights and also come bundled with multiple consumer orientated features.

- Niwa – Modular Solar System

METHODOLOGY

This report highlights the findings of quantitative and qualitative surveys regarding the cost of lighting, patterns and usage of electricity and other lighting instruments, awareness and experience of solar products, and willingness-to-pay for specific solar lighting products. About 6,000 households were enumerated, covering both on-grid and off-grid households across the four provinces of Pakistan.

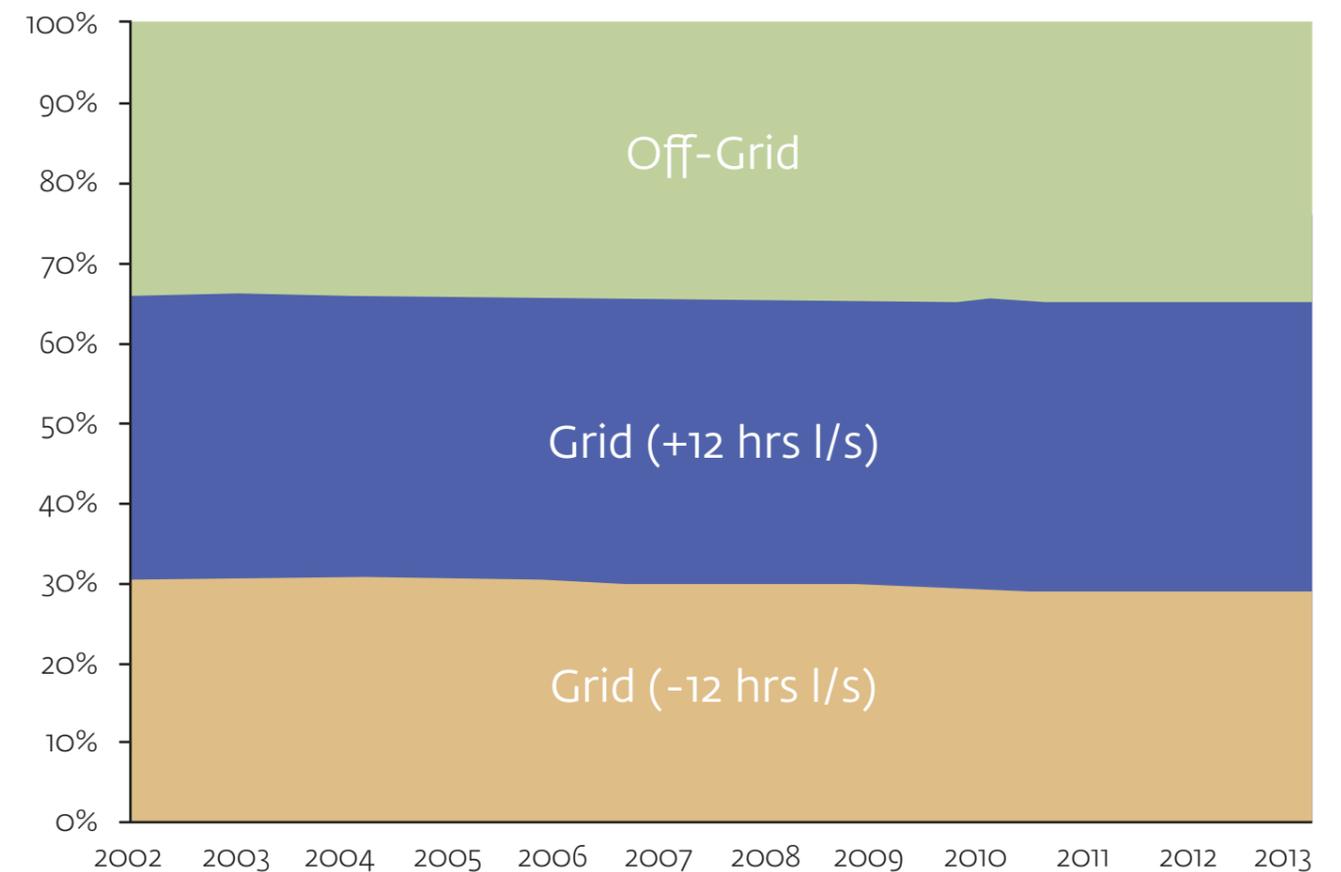


KEY FINDINGS

There are 144 million people in Pakistan who are currently off-grid or underserved by the grid

The need for solar-energy-based home lighting systems in Pakistan is clear. At a conservative estimate, **over 144 million people** in Pakistan are currently either off-grid or suffering severe under-electrification (those who have working grid connections, but do not receive adequate supply). This equates to a market of almost **22 million households** for solar lighting products in Pakistan.

Electrification rate in Pakistan



(Source: World Bank Development Indicators Database; IFC Consumer Perceptions Study Field Research)

The energy crisis in Pakistan has been brewing since 2007, and has further deepened since 2013, hampering economic growth and job creation. The power sector has been plagued by high transmission and distribution losses, the development of a black-market for power, and declining revenue collection. This has led to persistent accumulation of debt and several related problems, including:

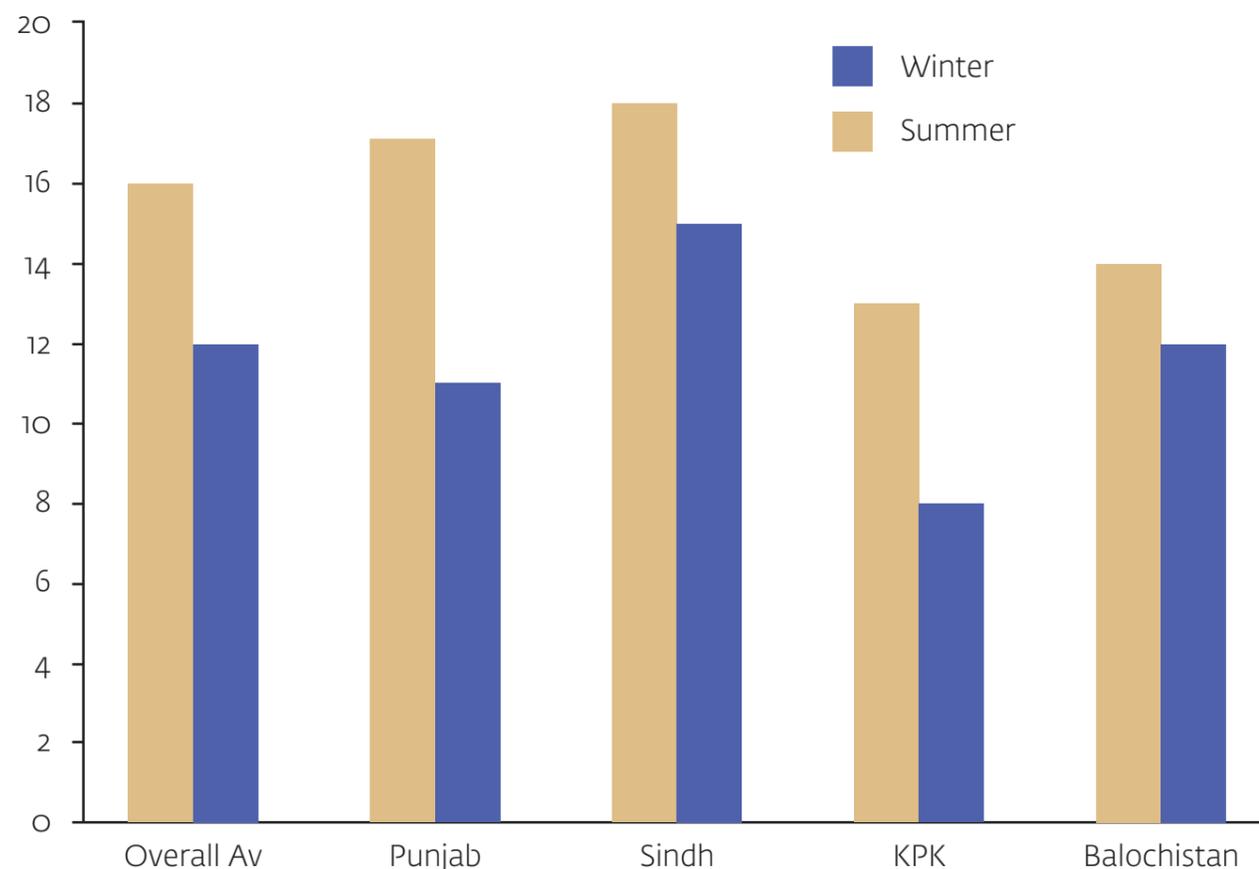
A supply-demand gap. The demand for electricity far outstrips the current generation capacity, leading to gaps of up to 4,500 – 5,500 megawatts. Such an enormous shortfall has led to daily load shedding of 12-16 hours across the country, particular during summer months. The supply-demand gap has continued to grow over the past five years.

A budgetary crunch. Pakistan's current energy mix is heavily skewed towards thermal- and fossil-fuel-based power generation sources. The bulk of the thermal sources consist of furnace oil and natural gas. Because of rapidly depleting local natural gas reserves and the price of imported furnace oil, power generation is very expensive and subject to price vulnerabilities.

An inefficient power transmission and distribution system. The system currently records losses of 23 to 25 percent due to poor infrastructure, mismanagement, and theft of electricity. The cost of delivering a unit of electricity to the end consumer has been estimated at 14.70 Pakistani rupees by the National Electric Power Regulatory Authority (NEPRA).

As a result, over 55% of those surveyed experience over 12 hours load shedding a day:

Load Shedding in Pakistan: Provincial Breakdown

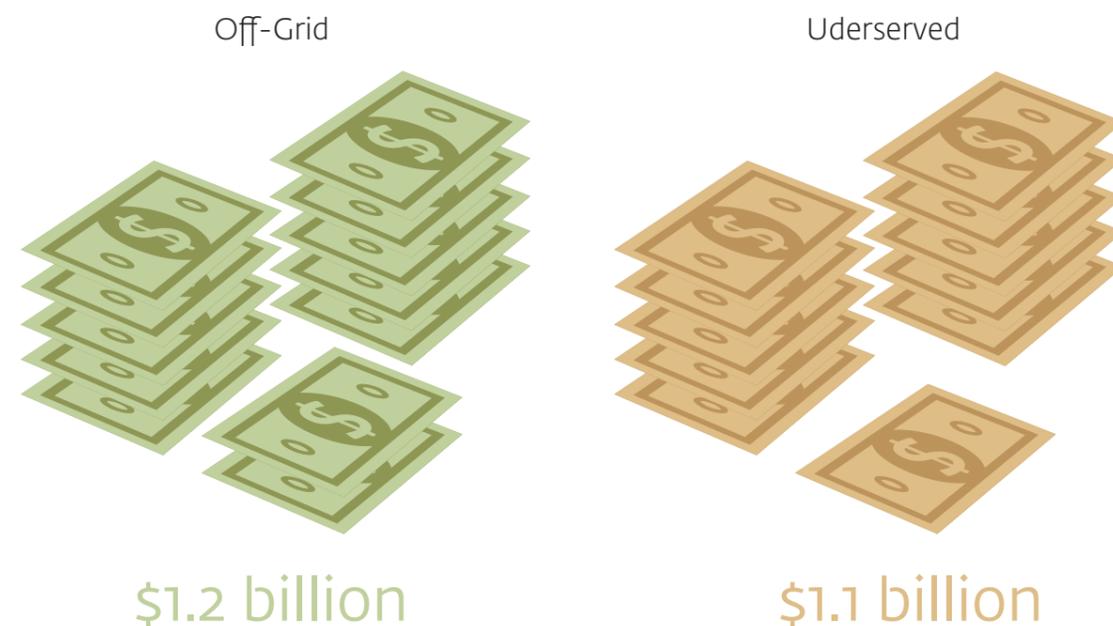


(Source: IFC Consumer Perceptions Study Field Research)

Pakistan consumers spend \$2.3 billion annually on alternative lighting products

Given the level of load shedding as well as the significant off-grid population, most households rely on a mix of technologies to meet their lighting needs. Pakistan's 144 million off-grid lighting consumers – both off-grid and on-grid - invest an estimated **\$2.3 billion annually** in securing lighting for their homes. Households spend on average \$8.90 per month.

Annual Spending on Off-Grid Lighting Products in Pakistan



(Source: IFC Consumer Perceptions Study Field Research)

Kerosene and Battery-Powered Torches are the Major Competitors to Solar

The largest spending on off-grid products comes on kerosene, battery-powered torches, and candles, with households spending on average 14 percent of their monthly disposable income on alternative lighting. They are the major competitors to PSLs and SHS products. There are, however, big variations between lighting technologies used by on-grid households and those off-grid.

On-Grid Households

Kerosene, candles, and battery-powered torches are the three most widely used lighting devices across the country with the exception of Sindh, where the use of dry battery torches is negligible.

Grid-Connected Household Lighting Technology: Provincial Breakdown

RANK	Lighting Technology	Overall Av.	Punjab	Sindh	KPK	Balochistan
1	Candle	37.3%	38%	51.4%	20.2%	26.9%
2	Dry battery Torch	24.2%	31.9%	1.0%	48.8%	17.8%
3	Kerosene	20.5%	6.9%	35.7%	22.4%	28.9%
4	Generator	13.7%	8.7%	17.4%	17.8%	16.5%
5	Gas Light	10.5%	6.5%	13.5%	6.4%	21.4%
6	UPS	5.7%	13%	0.1%	0.8%	0.4%
7	Neighbors	2.5%	1.6%	4.4%	3.6%	0.7%
8	Rechargeable Lights	2.5%	5.2%	0.0%	0.0%	2.1%
9	Solar	0.3%	0.1%	0.0%	0.6%	1.4%

(Source: IFC Consumer Perceptions Study Field Research)

Off-Grid Households

Although Kerosene and candles are the most widely used form of lighting in off-grid households, battery-powered torches are also used as often as gas lights, generators and rechargeable lights across all provinces.

Off-Grid Household Lighting Technology: Provincial Breakdown

RANK	Lighting Technology	Overall Av.	Punjab	Sindh	KPK	Balochistan
1	Kerosene	54.6%	49.9%	65.5%	33.5%	64.1%
2	Candle	51.2%	47.3%	59.3%	45.1%	51.9%
3	Dry battery Torch	12.4%	13%	11.9%	15%	9.5%
4	Generator	6.4%	1.2%	17.6%	0.0%	4.3%
5	Solar	3.8%	2.5%	0.0%	23.1%	0.5%
6	Rechargeable Lights	2.5%	0.2%	0.4%	20.5%	0.0%
7	Gas Light	1.1%	2.3%	0.0%	0.4%	0.5%
8	UPS	0.5%	0.2%	0.2%	2.9%	0.0%

(Source: IFC Consumer Perceptions Study Field Research)

This is particularly the case amongst off-grid Pakistanis, who often travel into electrified towns and pay small business owners to charge their phones. There are also significant regional variations in the amount off-grid households pay for lighting technologies, often due to the remoteness of the province. In Balochistan, for example, off-grid households pay 2,194 Pakistani rupees (\$21) per month on lighting and phone charging compared to only 789 rupees (\$7) in KPK.

Price (PKR) Paid for Solar Products Across Pakistan

	Average Monthly Expenditure on Lighting	Average Monthly Expenditure on Phone Charging	Total
Overall Av.	889	400	1,289
Punjab	1005	240	1,245
Sindh	485	650	1,135
KPK	639	150	789
Balochistan	1594	600	2,194

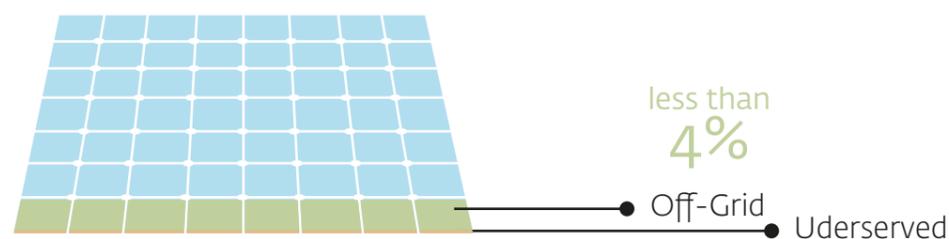
(Source: IFC Consumer Perceptions Study Field Research)

One of the barriers to the uptake of solar is the tendency for households to make several small purchases instead of one large one. Consumers usually spend about \$3 a week on batteries, a litre of kerosene or a box of candles which makes the upfront purchase price of a solar device with phone charging more difficult. Nevertheless, the amount households pay for lighting products, both on- and off-grid, suggests households can save significant money through the purchase of PLS and SHS products. That would negate the need for weekly incremental purchases of kerosene, batteries, and other lighting devices.

Solar is used by less than 4 percent of households in Pakistan

Despite solar's relative affordability, the market is still in a nascent state with penetration below 4 percent of the potential consumer base. This represents a tremendous opportunity for the development of the solar lighting appliance market (both for Pico Solar Lighting Systems/Solar Lanterns and Solar Home Systems), theoretically with a market over \$1 billion.

Households Using Solar %



(Source: IFC Consumer Perceptions Study Field Research)

According IFC field research, of those who bought solar products, almost 90 percent made their purchase within the last 12 months, which underlines solar's recent introduction to the market. Interestingly, 41 percent of those who purchased a solar product have gone on to buy other devices to help cover their lighting needs, meaning there is significant potential for multiple purchases from underserved households.

Ninety-three percent of those who bought solar products purchased them from a nearby city, meaning last-mile distribution chains are yet to be set up in Pakistan. The retail price for these products is highly volatile, especially for Pico Solar Lighting Systems.

Price (PKR) Paid for Solar Products Across Pakistan

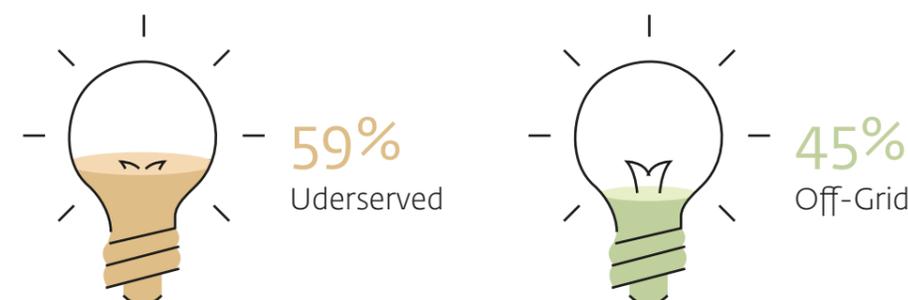
	Overall Av.	Highest Price	Lowest Price
Solar Task Light	1,655	3,860	763
Multi-functional PLS	3,286	1,749	3,523
Basic SHS	11,561	17,838	9,701

(Source: IFC Consumer Perceptions Study Field Research)

The biggest concern consumers have about solar products is that they will break down without adequate after sales service. Many have bought faulty devices, which suggests the products distributed so far are likely of relatively poor quality.

Fifty-two percent of underserved and off-grid households are aware of solar power

One of the other barriers is that general awareness of the solar lighting category is relatively low and the lack of specific knowledge of and confidence in solar lighting appliances clearly hinders sales. Consumers commonly cited reasons such as "worried it could break", "do not know enough", and "bad reputation" for not purchasing solar lighting appliances.



(Source: IFC Consumer Perceptions Study Field Research)

Currently both under-served and off-grid households obtain their information about solar largely from word of mouth. This means below the line marketing activities could be highly effective. but also there is a risk that word of mouth regarding poorer quality products could lead to market spoilage.

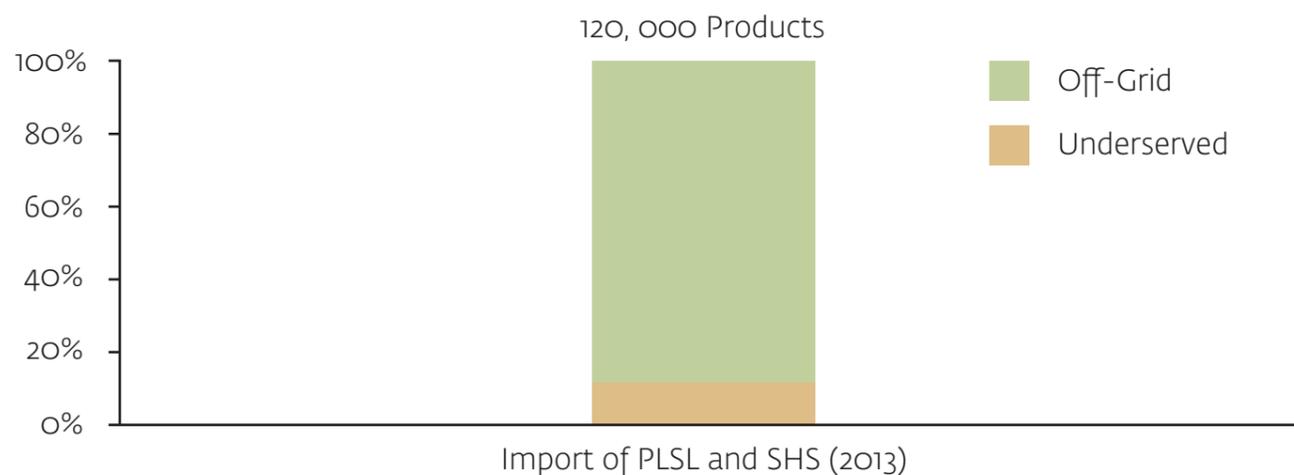
How Consumers Hear about Solar Technologies

	Overall Av.	Punjab	Sindh	KPK	Balochistan
Electronic Media	8.7%	4.6%	10.1%	6%	21.2%
Internet	4.7%	8.4%	0.7%	4.0%	2.4%
Print	5.6%	8.6%	0.8%	3.6%	8.3%
Word of Mouth	44.5%	50.2%	24.7%	59.4%	49.3%

(Source: IFC Consumer Perceptions Study Field Research)

Poor quality products have started to enter the market

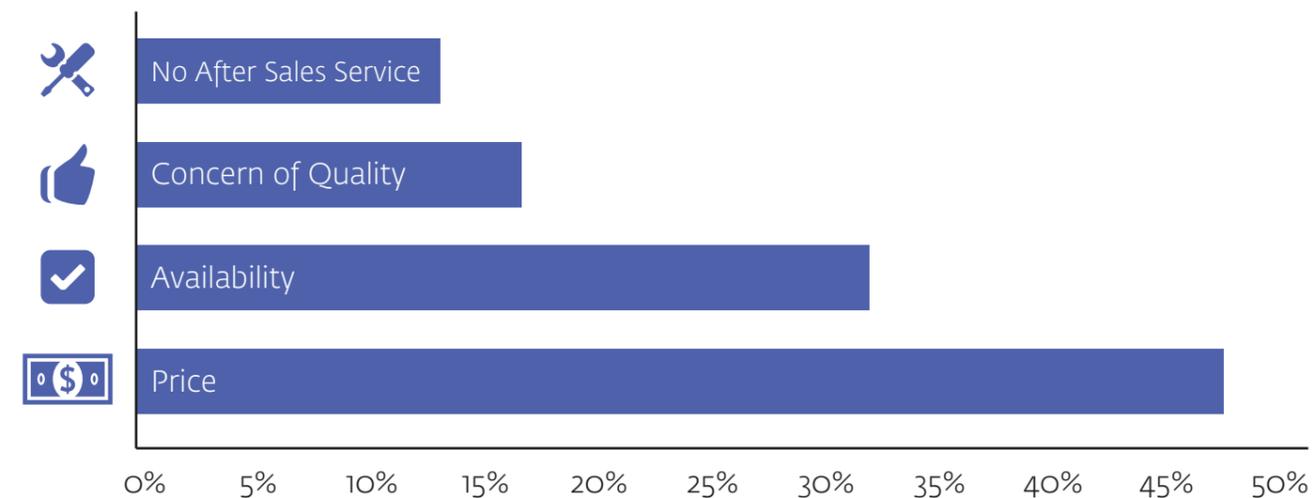
Whilst solar penetration is low, IFC has found solar products starting to be sold in key markets. PSLs and SHS are most prevalent in KPK and to a much lesser extent Sindh and Punjab. In 2013, IFC estimates over 120,000 solar products were imported into Pakistan, the majority of which were unbranded, no-warranty PSLs and SHS. Of these, only 11 percent were quality-verified products.



(Source: IFC data collation based on importer interviews)

Cost Perception is the Major Barrier to Uptake of Solar by Consumers

Why People are not Buying Solar Products



(Source: IFC Consumer Perceptions Study Field Research)

Despite relatively good awareness about solar products, consumers are yet to take up solar as a technology for their lighting needs. IFC field research indicates that cost perception is the major challenge for the scale up of solar devices. Many of the survey respondents indicated that their purchasing habits involved small, incremental purchases of candles, kerosene, and batteries for their lighting needs rather than larger upfront purchases required by current retailers of solar devices.

This indicates that manufacturers and distributions of solar devices are going to have to focus on building business models which help consumers purchase products on an installment plan or even pay-as-you-go basis. It will also mean forming innovative partnerships with microfinance institutions and rural support networks to extend credit to households.

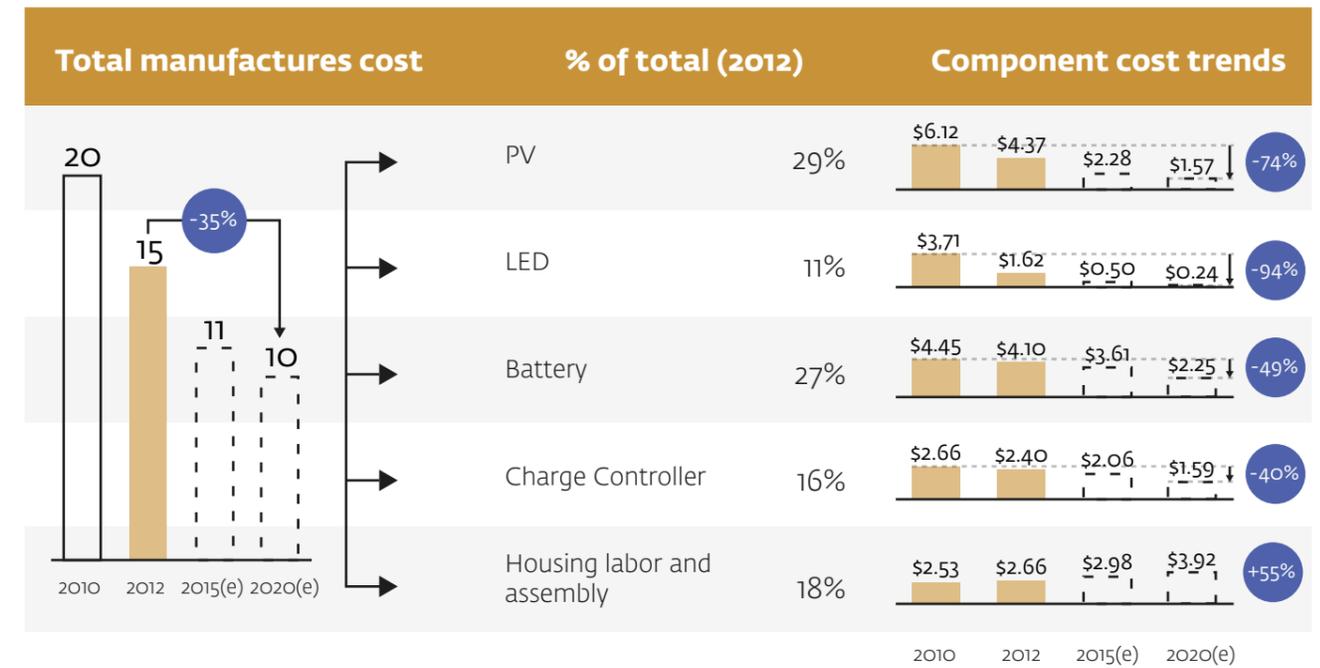


CONCLUSIONS

Given the low base of solar penetration in Pakistan as well as the high recurrent spending by underserved households, the solar market is poised for strong growth. This growth in the market will be driven largely by two factors – increasing affordability, and the rapid strengthening of the value proposition through the development of innovative business models which better meet the needs of Pakistani consumers.

A broader global market trend that will work in Pakistan's favor is that the cost of solar is rapidly declining as the cost of major components parts (PV, LED, battery) comes down. The theoretical manufacturing cost (holding performance constant) has fallen almost 25 percent since 2010 and is expected to tumble another 33 percent by 2020. Our estimates suggest that the median lantern in 2020 will exhibit twice the battery life and up to five times the brightness of solar products today.

Decomposition and forecast of the median lantern component cost USD, 2010 - 2020



(IFC Lighting Africa Market Trends Report 2012)

However, the quality-verified solar market will not grow simply through cost reductions over time but requires market players to develop strategies that are designed to overcome critical market barriers to the growth of the solar market, including:

- The price sensitivity in the Pakistani market
- A shortage of last-mile distribution chains
- The emergence of poor quality products
- A lack of financing opportunities for consumers

For market players, there are three main strategic imperatives to overcome these barriers

The first is to develop the right product range that maximally captures the market. It is important to understand that Pakistan is two distinct markets – underserved households and off-grid households – who have differing product preferences, different lighting needs, and separate pricing points. Manufacturers, distributors and microfinance institutions are likely to gain initial market traction with a new product range by marketing to under-served households who have greater willingness to pay and better access to key markets. Over time, expansion is likely to occur by developing last mile distribution chains that meet more remote off-grid consumer needs.

Second, in order to tackle the issue of affordability, market players need to continue to innovate their distribution strategies, by forming partnerships with microfinance institutions, non-governmental organizations, and telecommunications companies. Market expansion will occur not just through the introduction of more affordable entry-level appliances, but by making available higher-performing appliances that present a more compelling value proposition to potential customers and backing this up through innovative payment strategies. This will likely mean developing installment plans for consumers or investing in pay-as-you-go products. (see below box).

The Potential for Pay-as-you-Go in Pakistan

Pay-as-you-go (PAYG) technology has played an important role in extending energy access in Africa over the last two years. PAYG solar devices generally use mobile payments combined with PLS or SHS, which are GSM-technology enabled, meaning the product can be switched off remotely. This means consumers can make small payments towards the cost of a product over a longer period of time whilst reducing risk for financiers and distributors.

PAYG could be pivotal to the lighting market in Pakistan given consumer price sensitivity and the country's robust microfinance sector. PAYG platforms can capitalize on the trends in Pakistan regarding mobile phone and mobile banking infrastructure to remove the upfront price barrier to solar and other modern sources of energy.

PAYG has been particularly effective in Kenya where Dlight partnered with MKO. Over 100,000 products were sold with \$18.5 million of financing. The payment structure involved \$33 upfront with 365 payments of \$0.44 via mobile money, usually daily. PAYG is now being rolled out across different markets, including some parts of Pakistan.

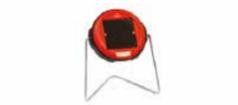
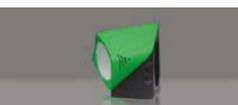
Third, to tackle the growth of poorer quality products, market players will have to develop a more informed customer base over time and back this up by providing a positive brand experience. This will involve placing special emphasis on consistent and timely after-sales service. Robust after-sales service mechanisms are important to attract distribution partners such as microfinance institutions, who are often reluctant to serve as distribution partners if they are left carrying the product risk associated with the sale. Assurance on quality through warranties (either repair or replacement) will also help generate the demand required to quicken the move of the solar lighting category from "push" products to wholesale and retail based "pull" products.

It is this mix of strategic imperatives that will help generate the demand required to move the solar lighting devices from being narrowly distributed, often subsidized "push" products to widely preferred, retail-based "pull" products."



Lighting Global Verified Products

as of January 2015

Products		Products	
	Azuri - Indigo		Freeplay Energy - Solar Energy Centre
	Barefoot Power - Firfly Mini		Futura - Energy Station
	Barefoot Power - Firfly Mobile		Greenlight Planet SunKing Pro2
	Barefoot Power - Connect 600		Greenlight Planet SunKing Eco
	Barefoot Power - Go 250		Greenlight Planet SunKing Mobile
	D Light Design - S2		Greenlight Planet SunKing Solo
	D Light Design - S20		GS Yuasa - AKARi Solar Light Kit
	D Light Design - S300		GS Yuasa - Yuasa Mini Moshi
	D Light Design - D20		India Impex - Sunlite
	ECCO Diva		Kingfisher - Sunlite Solar Light G3
	Fosera Pico Solar Home System 7000		Little Sun
	Fosera SCANDLE 200		Micromark-Compact LED Solar Light

Lighting Global Verified Products

as of January 2015

Products		Products	
	Niwa - Multi 100		One Degree Solar - BrightBox2
	Niwa - Multi 300		Orb - Solectric 15
	Niwa - Uno 50		Orb - Solectric 30 with 4 lights
	NIWA - MSS Home Run 400-X3		Panasonic - SolarLantern
	NIWA - Office 200 x2		Philips - SHLS
	NIWA - MSS MODULAR SOLAR SYSTEMS		Schneider - Awango
	Off-Grid Solutions - Waka Waka Light		Sinoware - Solar Lamp
	Omnivoltaic - Marathoner_MB2-090		Solar Works! - Solar Kit Lithium
	Omnivoltaic - Marathoner_MB2-200		Solar Works! - Solar Rooflight
	Omnivoltaic - Marathoner_MB2-290		Trony - Sundial
	Omnivoltaic - Marathoner_MB2-380		
	Omnivoltaic - OvPilotX		

* The list published here is not valid after products lapse. For the most current list of products that have passed Lighting Global Minimum Quality Standards, visit www.lightingglobal.org/specs

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March 2015

LIGHTING ASIA
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