


The Off-Grid Solar Energy Services Market: Leveraging the Power Of a Dynamic Industry

Russell Sturm
Global Head
Energy Access
IFC Advisory Services

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Shedding Light on the Darkness...

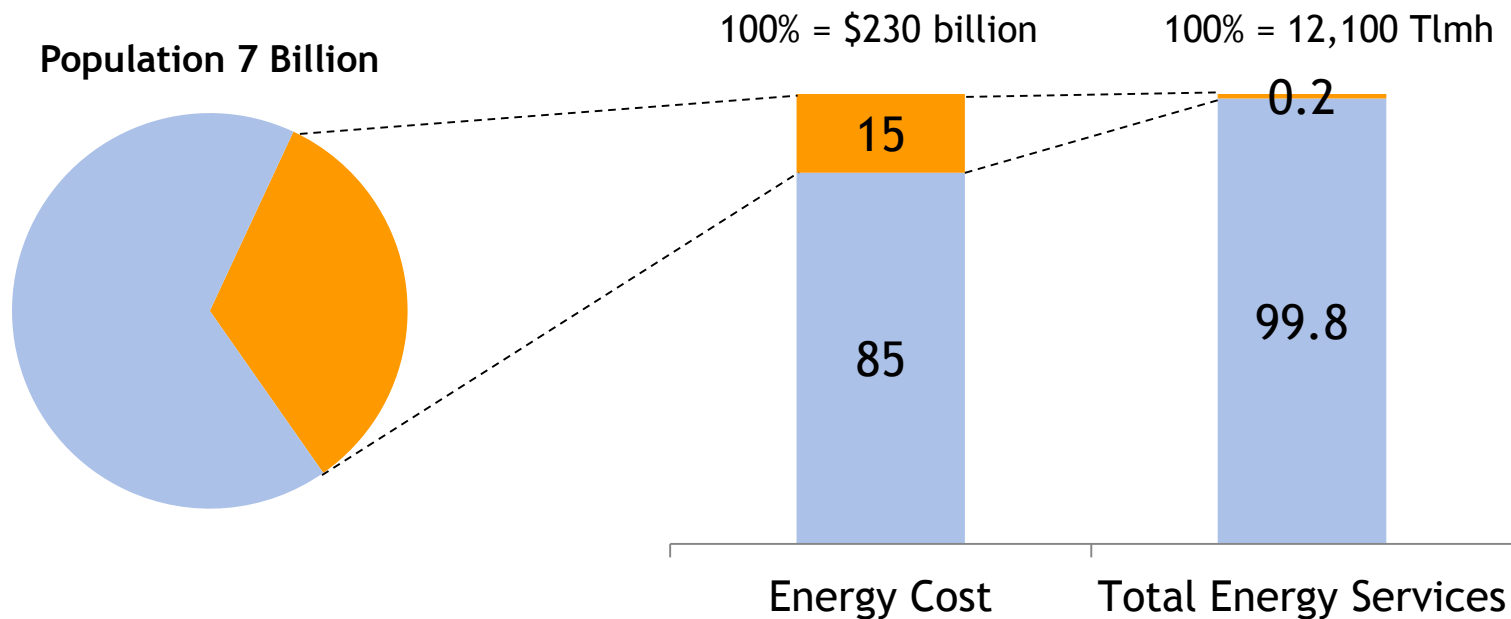
Leveraging Market Forces

The Key to Rapidly Scalable and
Sustainable Economic Development

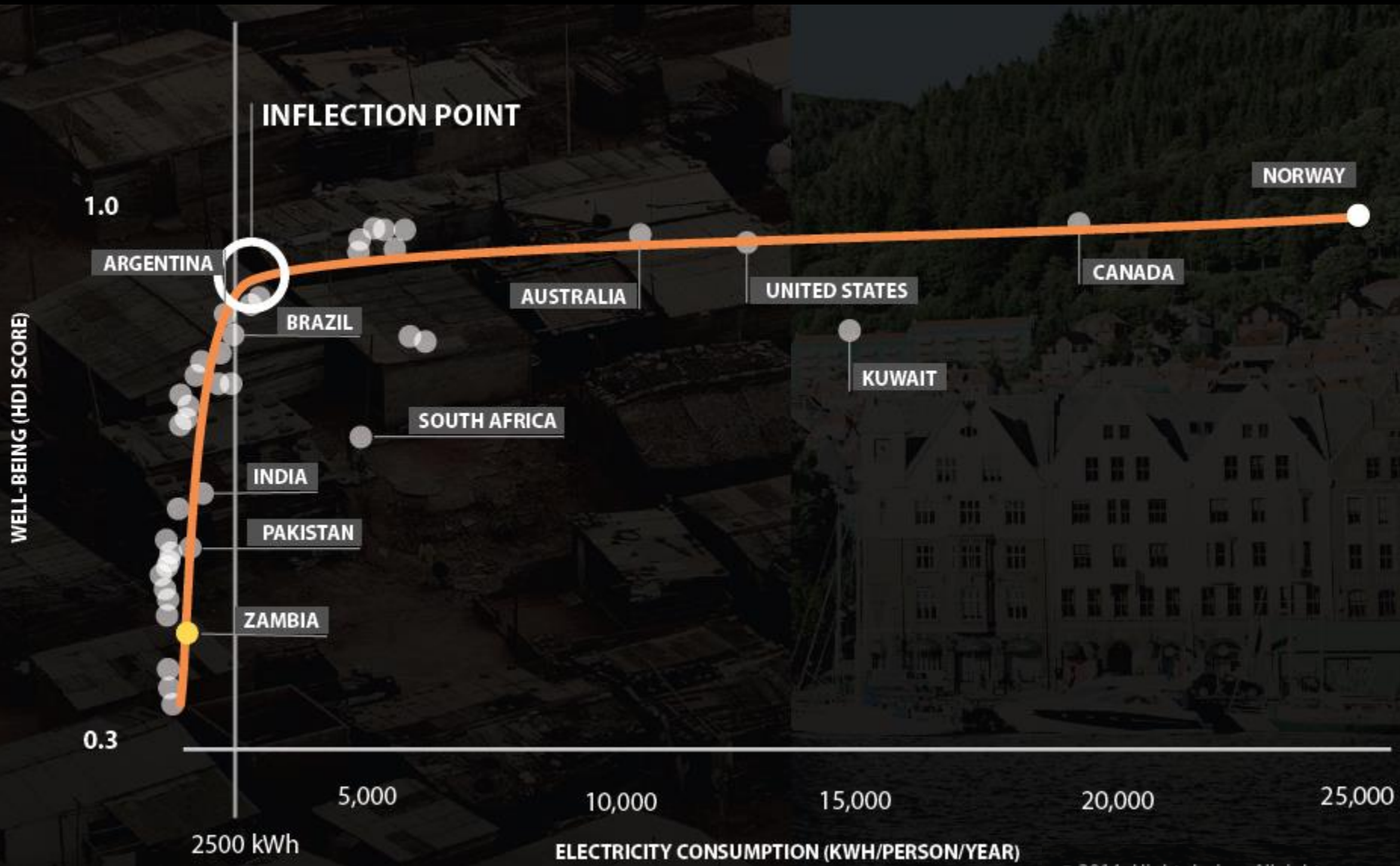
Lighting Equity

Although one in three people obtain light with kerosene and other fuels, representing about 15% of global lighting costs, they receive only 0.2% of the resulting lighting energy services

■ Kerosene or other Fuel
■ Electricity



Source: Evan Mills, Lawrence Berkeley National Laboratory



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A woman is walking away from the camera on a wide, reddish-brown dirt road that stretches into the distance. She is carrying two large, light-colored plastic water pots balanced on her head. She is wearing a patterned, sleeveless top and a long, light-colored skirt with green and yellow designs. The road is flanked by lush green grass and dense trees under a clear sky. The overall scene depicts a rural, natural environment.

85%

live in rural areas

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DENSE POPULATION
SHORT DISTANCE



LOW DENSITY
LONG DISTANCE

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Segmenting the market

Varied needs and diverse users imply different models of delivery

Improved Cook Stoves



Solar and rechargeable lanterns



Solar Kits



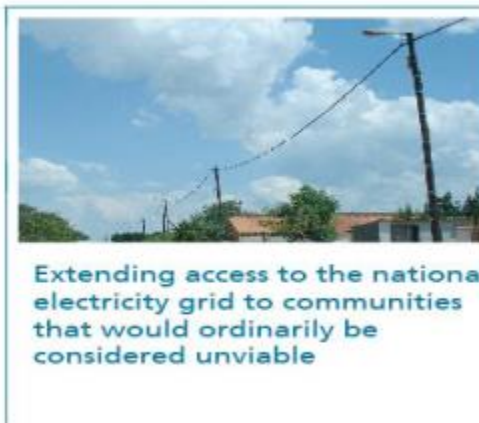
Solar Home Systems



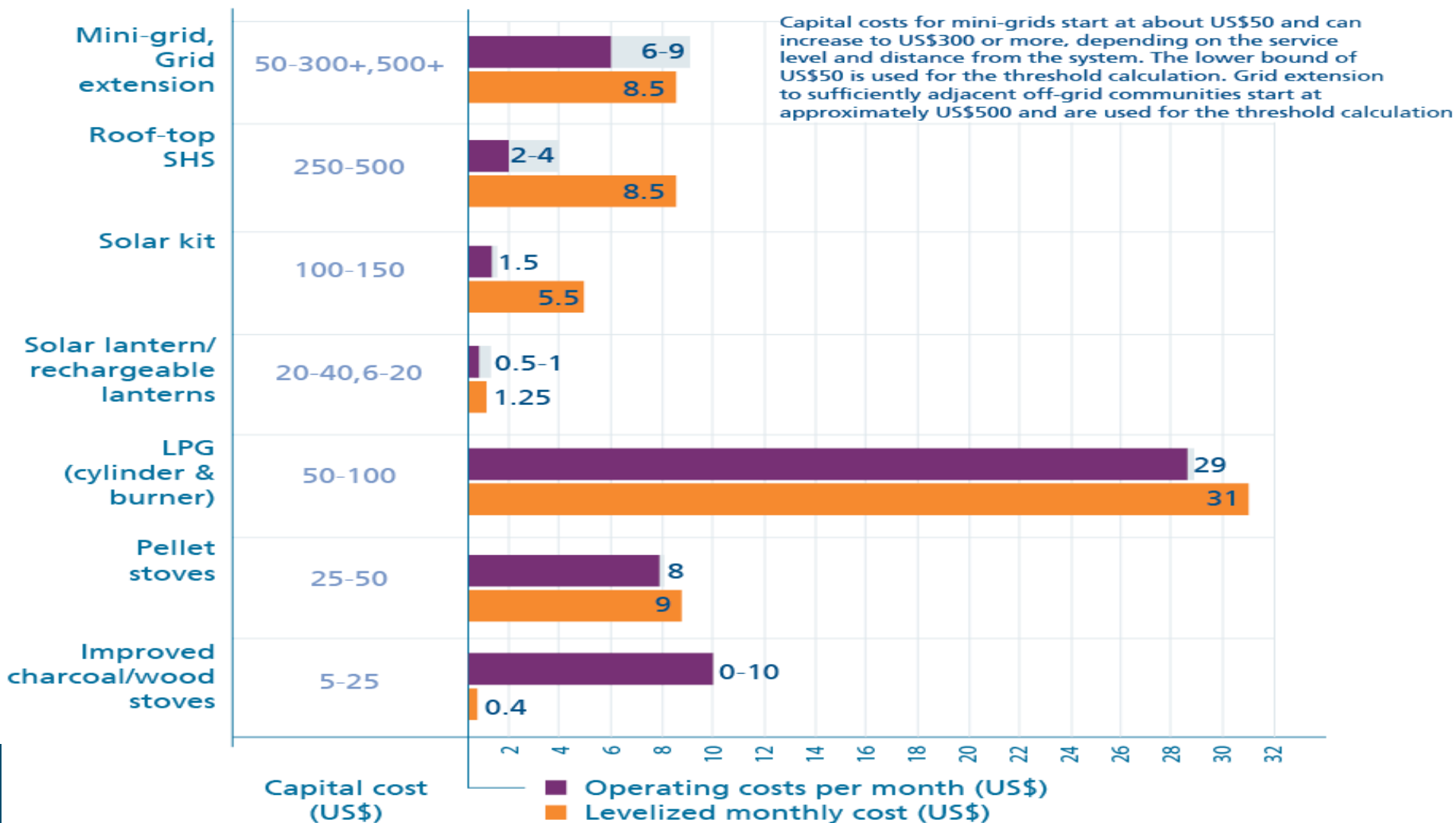
Mini-Grid



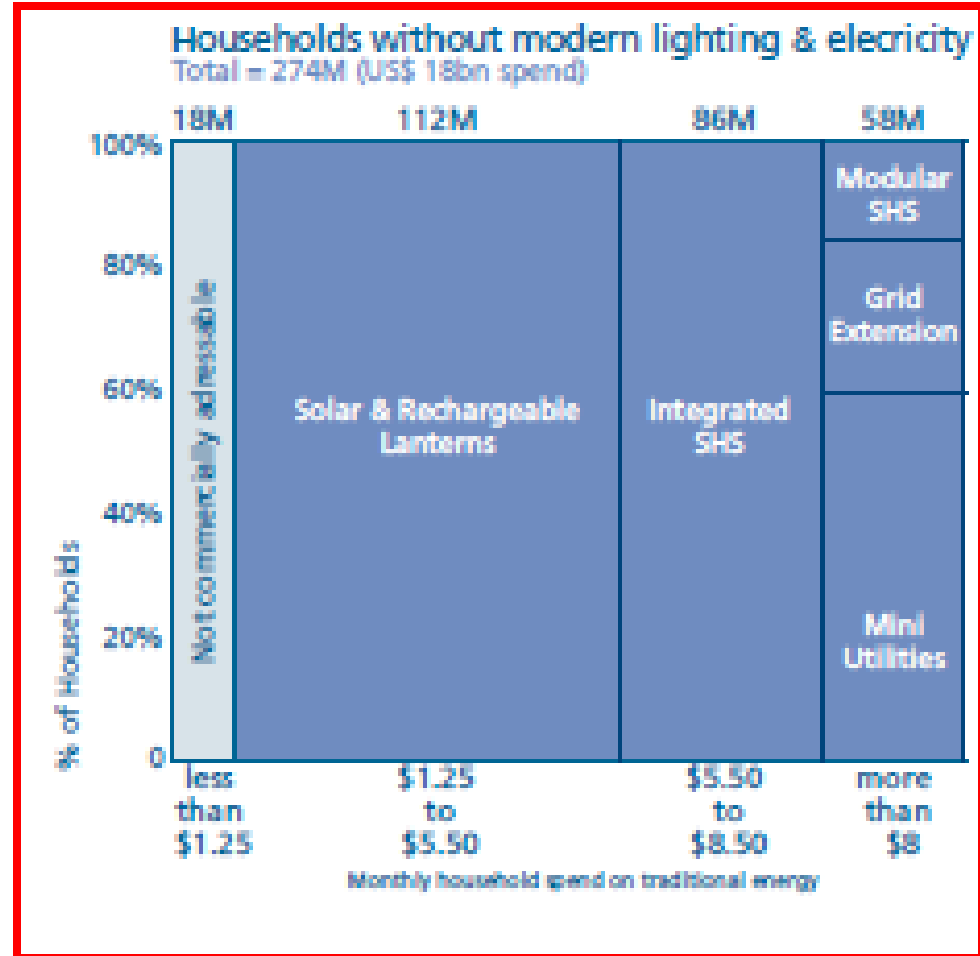
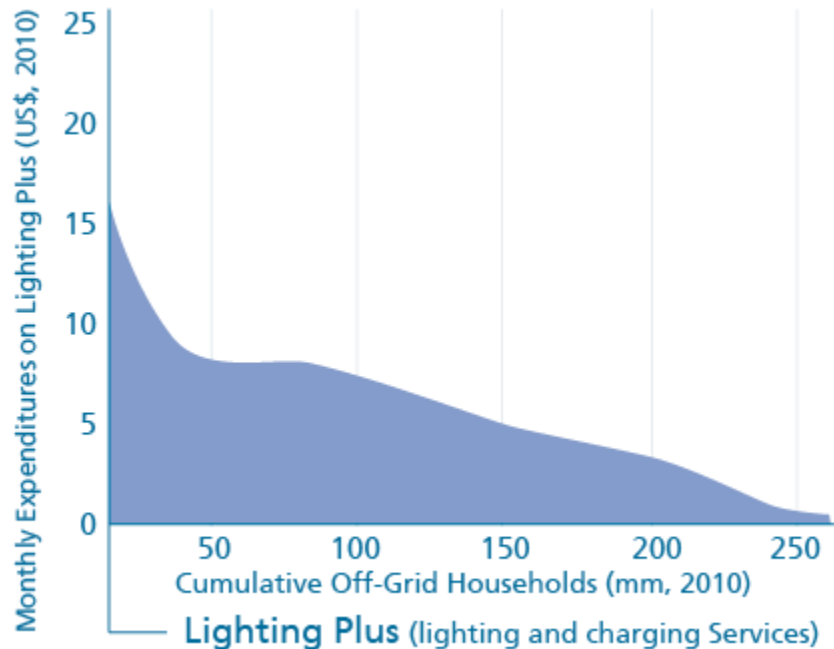
Grid Extension



Matching technology to the market segments: Commercial price of delivering modern energy services



Segmenting & Sizing the market: Example: modern lighting services



A set of dynamic markets & active players

ENERGY ACCESS BUSINESS MODELS COMPARED	Improved Cookstoves and Fuels	Solar Lanterns	Solar Home Systems and Solar Kits	Mini-Utilities	Grid Extension
Commercial, enterprise-based (fully or nearly financially-viable; product sales or fee-for-service)	<ul style="list-style-type: none"> Tizazu, Ethiopia Toyola, Ghana Sonolis, India First Energy, India Prosol, Tunisia 	<ul style="list-style-type: none"> d.Light, India NEST, India Greenlight Planet, India Total, West Africa, Indonesia Barefoot Power, India Mosar Baar, India Nuru Energy, Rwanda Sanyo, Kenya 	<ul style="list-style-type: none"> Grameen Shakti SHS, Bangladesh Sundaya, Indonesia TataSP, India Deng, Ghana Solar PV, DR Technosol, Nicaragua SELCO, India 	<ul style="list-style-type: none"> Husk Power India - IFC DESI Power, India VEE, Cambodia PowerSource, Philippines REPRO, Rwanda Batdeong, Cambodia 	<ul style="list-style-type: none"> CODESA, Colombia COMASEL, Senegal North Delhi Power Limited, India Ahmedabad Electricity Company, India
Quasi-Commercial (partially subsidized, using CSR or PPP approach)	<ul style="list-style-type: none"> Envirolit, India Katano Kadli, Mali GIRA, Mexico KSG, Tanzania 	<ul style="list-style-type: none"> Phillips Solar, India Schneider, India TERI, India Osram, Kenya 	<ul style="list-style-type: none"> ONE, Morocco PERMER, Argentina KES, South Africa Nura, South Africa 	<ul style="list-style-type: none"> Bonny Utility Company, Nigeria SEEDS, Sri Lanka CERIAL, Brazil Korayé Runimba, Mali 	<ul style="list-style-type: none"> ONE-PPP, Morocco CEMAR Brasil Guatemala, Distribution Company PPP
Non-commercial (primarily publicly-funded; Government or donors)	<ul style="list-style-type: none"> Jiko Stove, Kenya Indonesia, LPG Brazil, LPG 	<ul style="list-style-type: none"> USAID, Afghanistan 	<ul style="list-style-type: none"> Light Hard, Haiti UNDP/GEF, Botswana World Bank, Ethiopia Pacific Islands 	<ul style="list-style-type: none"> Nepal Community Utilities Community mini-grids Bolivia Practical Action, Peru 	<ul style="list-style-type: none"> South Africa Vietnam China

Number of devices sold/customers connected to the system:

~10 000

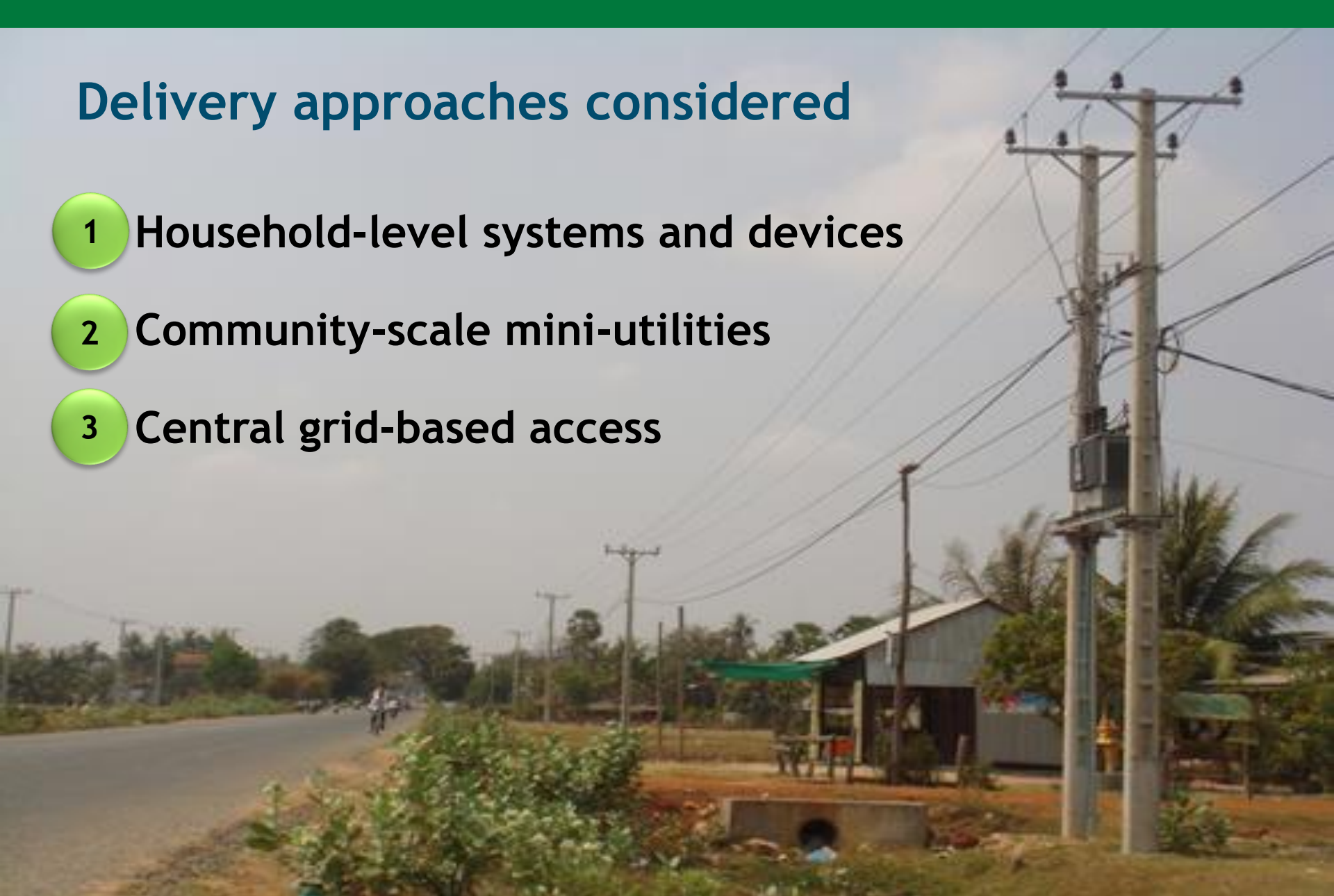
50000+

100 000+

500 000+

Delivery approaches considered

- 1 Household-level systems and devices
- 2 Community-scale mini-utilities
- 3 Central grid-based access

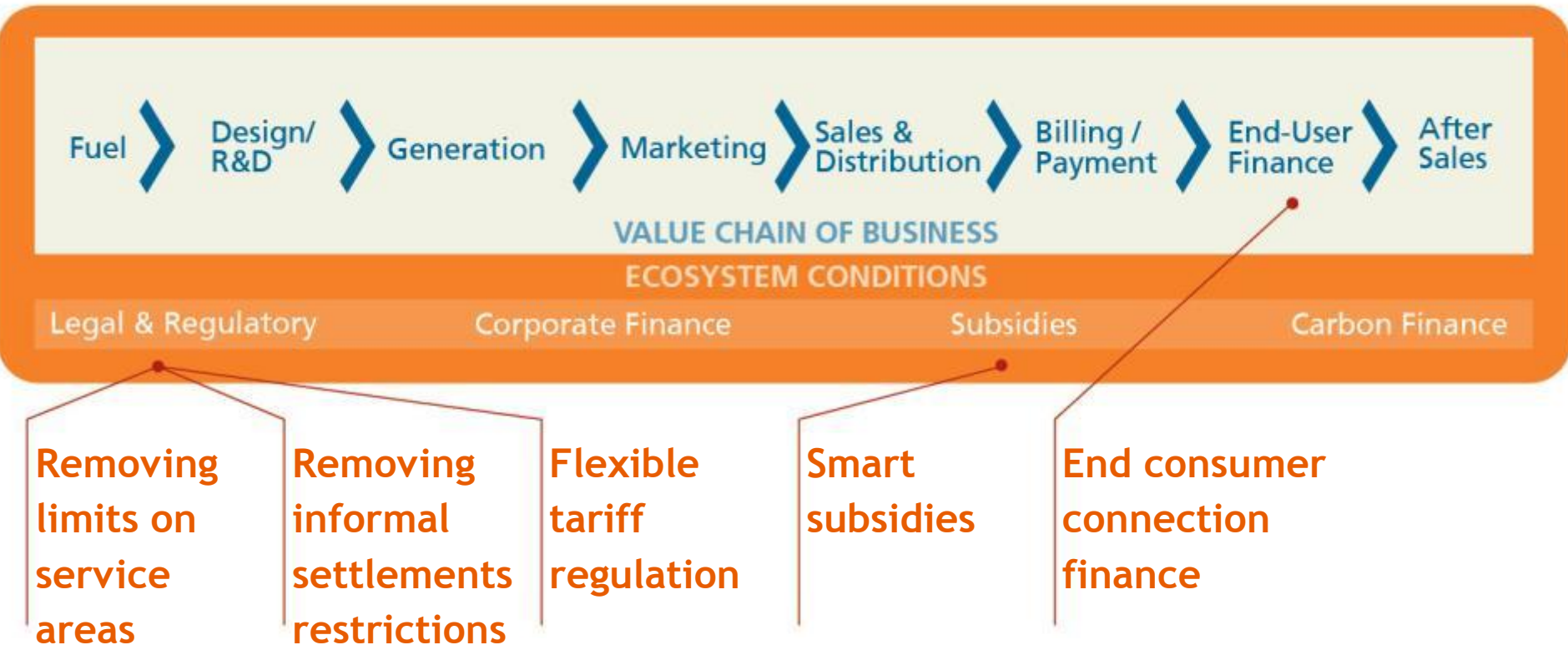


3 Central grid-based access

Limited commercial opportunity but drives the greatest developmental potential = \$2 bn market size

Beyond large-scale capital expansion, interesting examples of improved access through intensification

3 Ecosystem success factors for grid extension



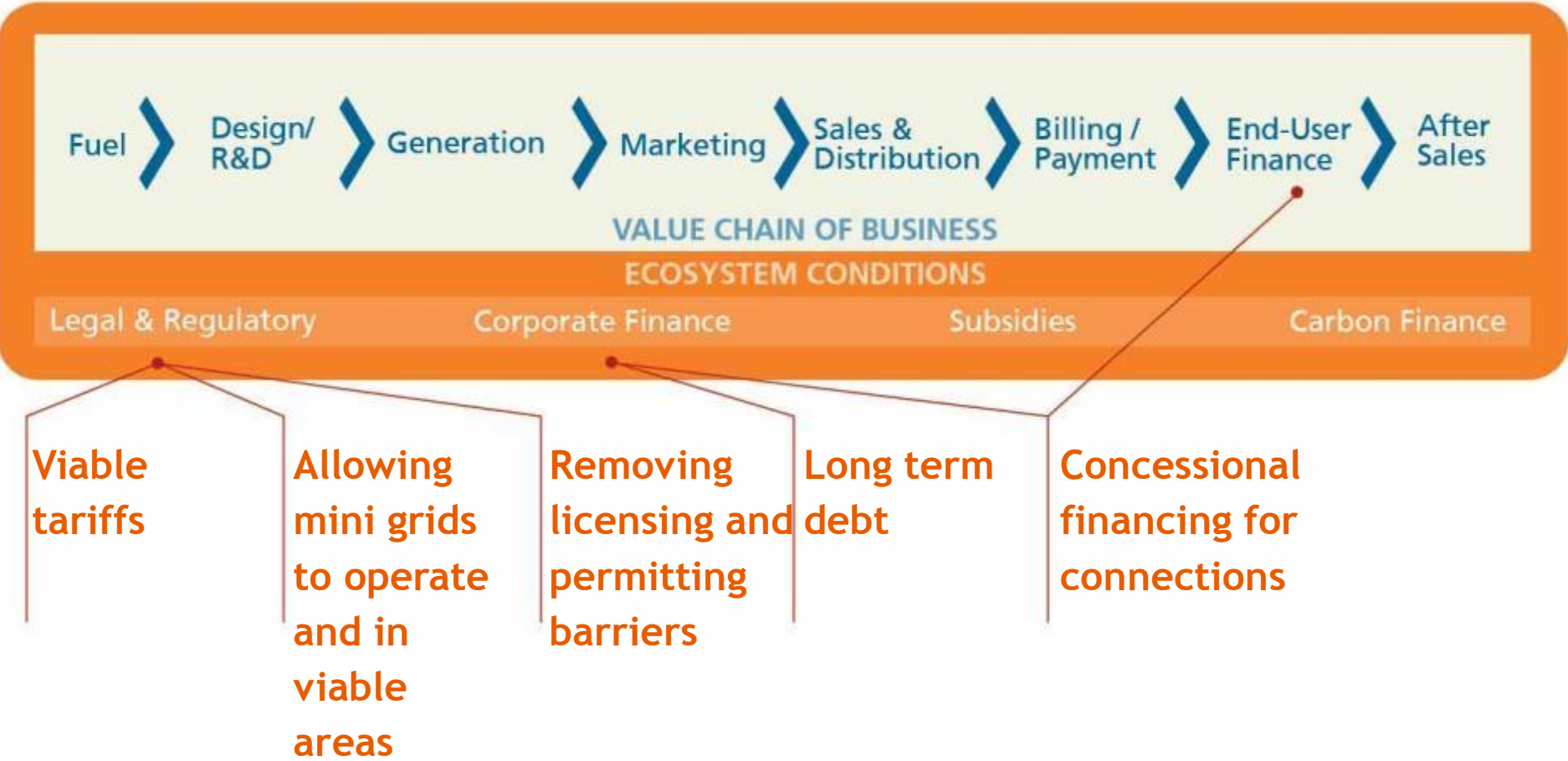
2 Community-scale mini-utilities

Basic household needs for < \$10 per month = \$4 bn market

Potential productive uses, e.g. small-scale manufacturing



2 Ecosystem success factors for mini-utilities



1 Household systems & devices

Decentralized retail solutions = \$31 bn market

\$5-40




\$10-40



\$100-500



The many faces of off-grid solar: *multiple needs/ multiple sectors/ multiple models*

Solar lanterns	Solar kits	Solar home systems
		
		
		
<p>Solar lanterns are single devices with an associated PV panel to charge them.</p>	<p>Solar kits comprise of more than one light - offering phone charging, radio or additional lights.</p>	<p>Solar Home Systems are a larger PV panel, permanently installed on a roof or pole, with various uses.</p>
<p>TOP: d.light MIDDLE: Barefoot Power BOTTOM: Greenlight Planet</p>	<p>TOP: Barefoot Power MIDDLE: Duron BOTTOM: Sundays</p>	<p>TOP: Technosol MIDDLE: Selco BOTTOM: Sunlabob</p>

Quality Simple Lighting Solutions



Quality Plug and Play Solar Systems for Home and Business



Disruptive technology+ innovative business models = *Opportunity to redefine energy paradigm*



Fuel-based Lighting	LED/other modern Technology
Avg kerosene expenses/month = \$5-\$15	High efficiency = low to zero operating cost
Low light output & quality	High light output & quality
Hazardous for health and safety	Safe
High emissions, polluting	Clean

Analogue

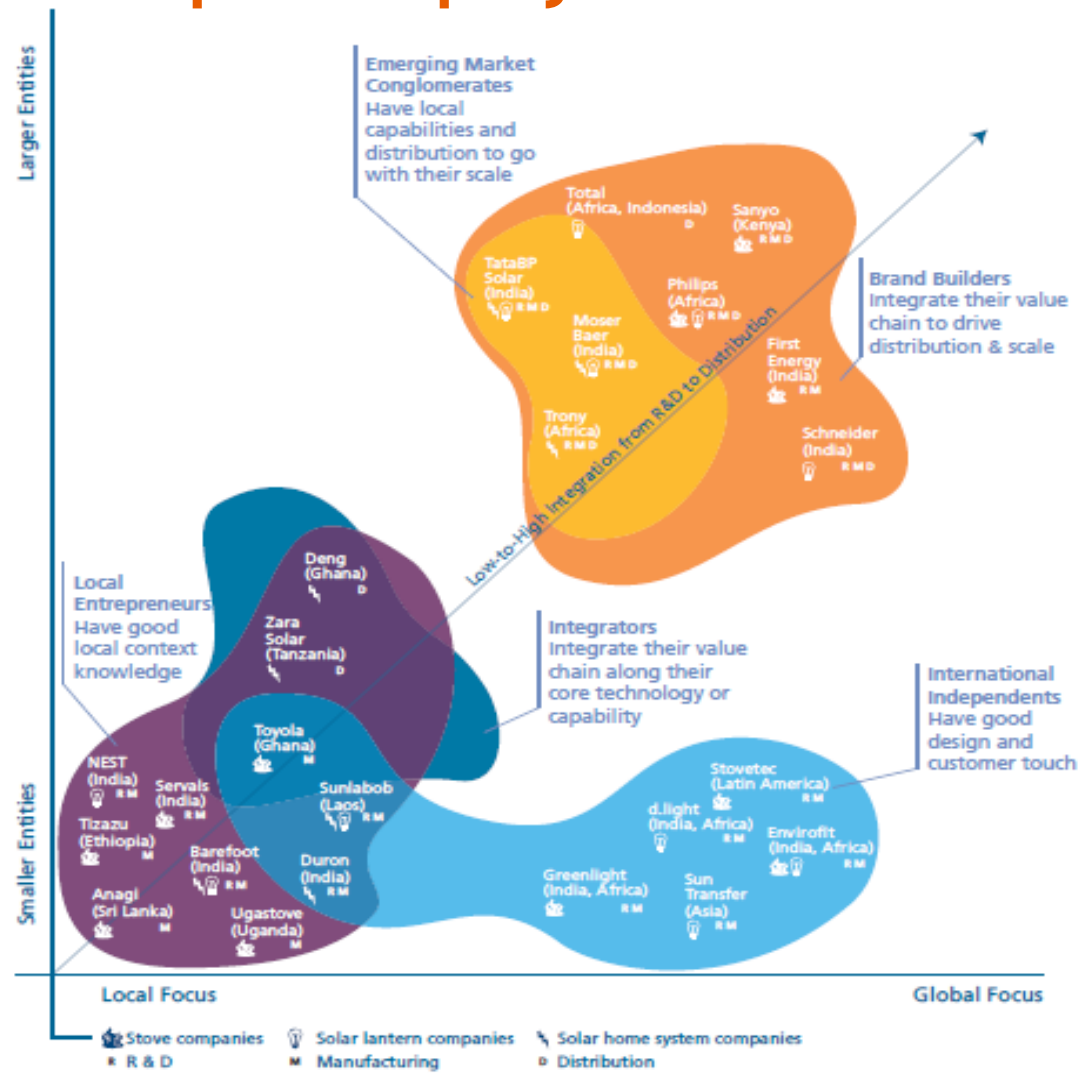


Traditional banking



Empesa / Mobile banking

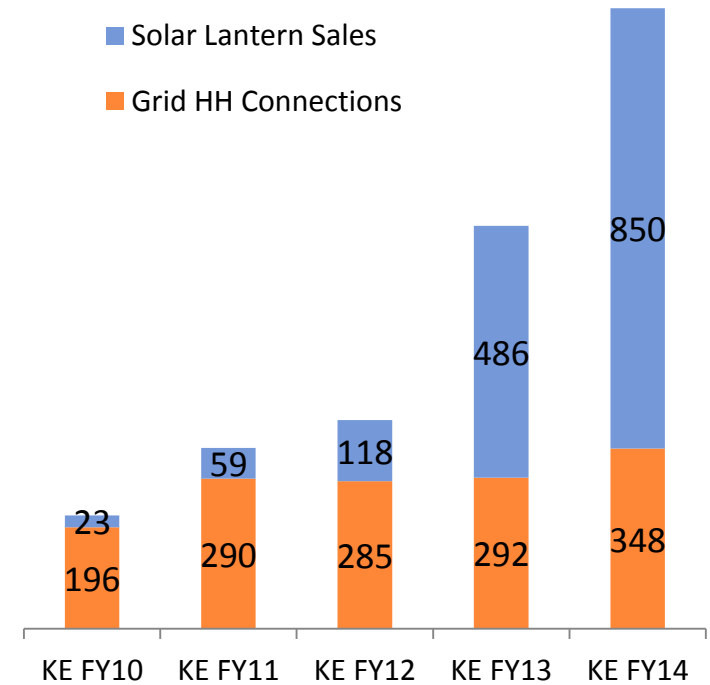
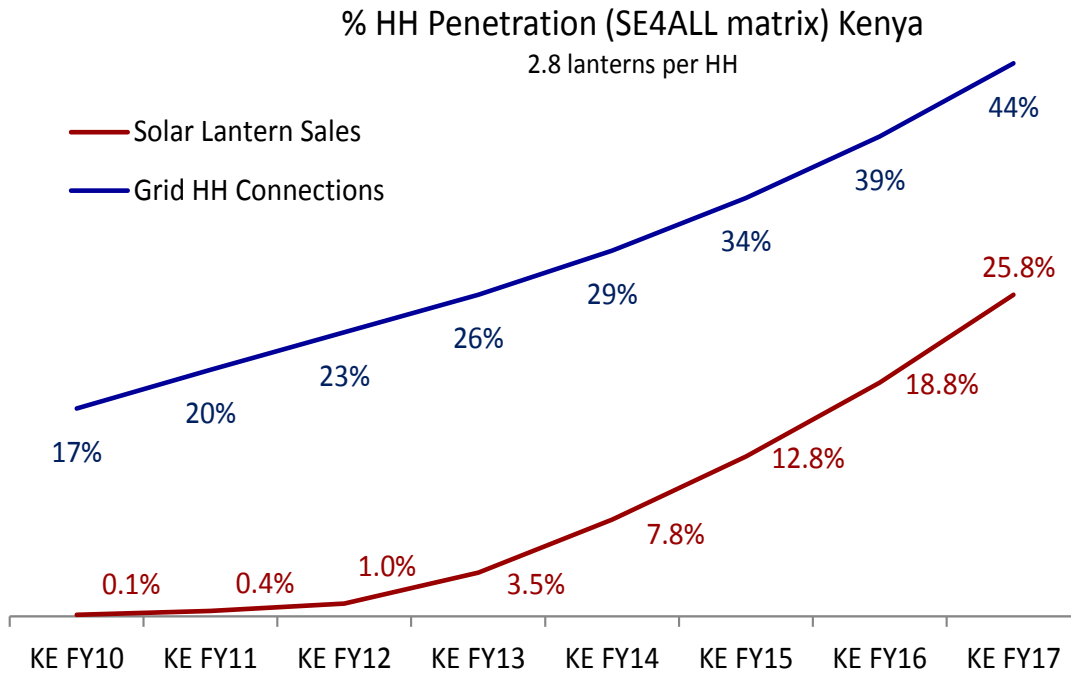
1 Where companies play in the devices space



Product: Paygo Variations

Paygo variant	Pro	Con
<p>Payment collection: Payment is collected at the door or is paid to a retailer. Device is repossessed after non-payment</p>	<ul style="list-style-type: none"> • Low device cost, no modem required • Simple process 	<ul style="list-style-type: none"> • High cost, low reliability for manual payment collection • Not scalable
<p>Retail tokens w/ keypad: User buys token code at retail outlet, enters into device with keypad. Device stops when no new token is entered</p>	<ul style="list-style-type: none"> • No manual payment collection required 	<ul style="list-style-type: none"> • Retail margin adds to cost • Depends on local presence of retail outlet • Not available 24/7
<p>Mobile money w/ tokens and keypad: User pays via mobile money on handset, receives SMS with token, enters token into device with keypad</p>	<ul style="list-style-type: none"> • Available 24/7 • Mobile money universally accepted • No retail margin, no collection cost 	<ul style="list-style-type: none"> • Still some manual action required (keypad entry) • Mobile money cost added
<p>Mobile money w/ direct link: User pays via mobile money in handset, device is activated via built-in mobile modem</p>	<ul style="list-style-type: none"> • Highest degree of automation • Very simple process 	<ul style="list-style-type: none"> • Prohibitive cost for built-in mobile modem • Requires cellular signal in situ

Scaling Energy Access: Solar Lanterns provide 1st step up the Energy Ladder



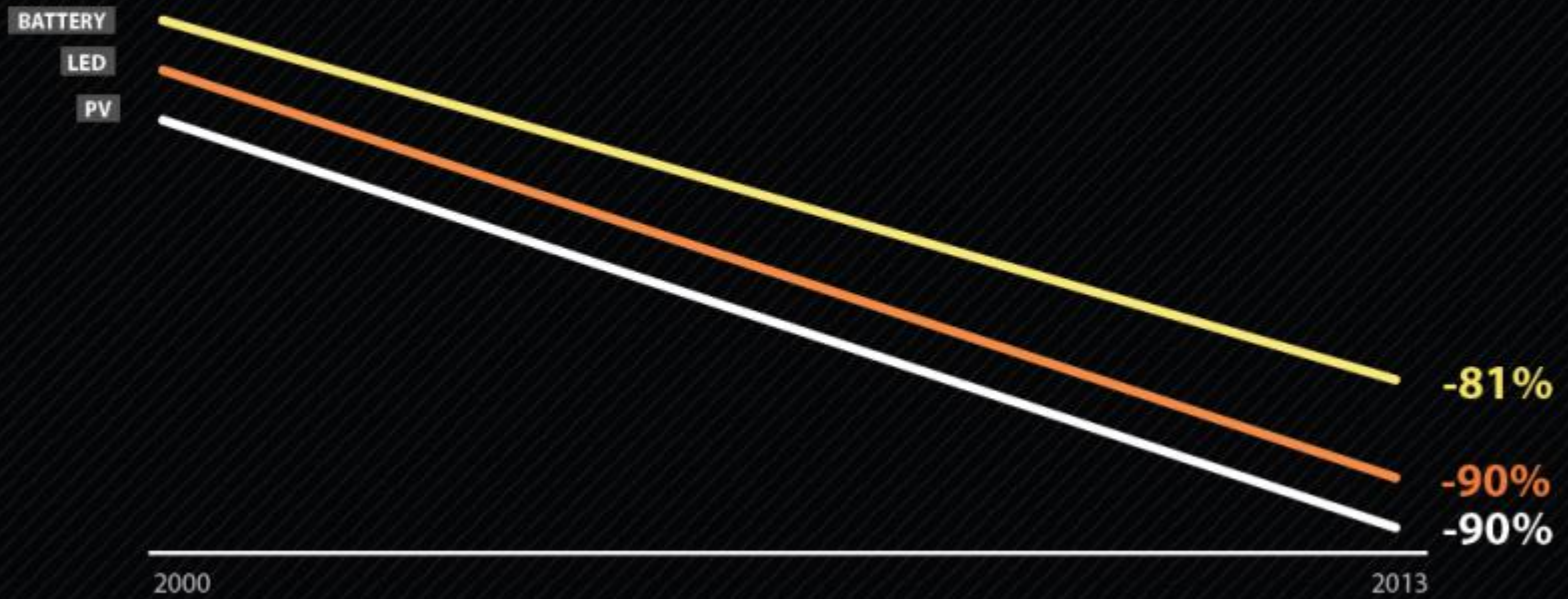
Source: IFC Lighting Global and World Bank/SE4ALL team analysis, 2014

A photograph of two women in a village setting, wearing traditional beaded jewelry and colorful clothing. The word "OPPORTUNITY" is overlaid in large white letters, flanked by two horizontal yellow bars. The background shows a dirt path with other people and traditional huts.

OPPORTUNITY

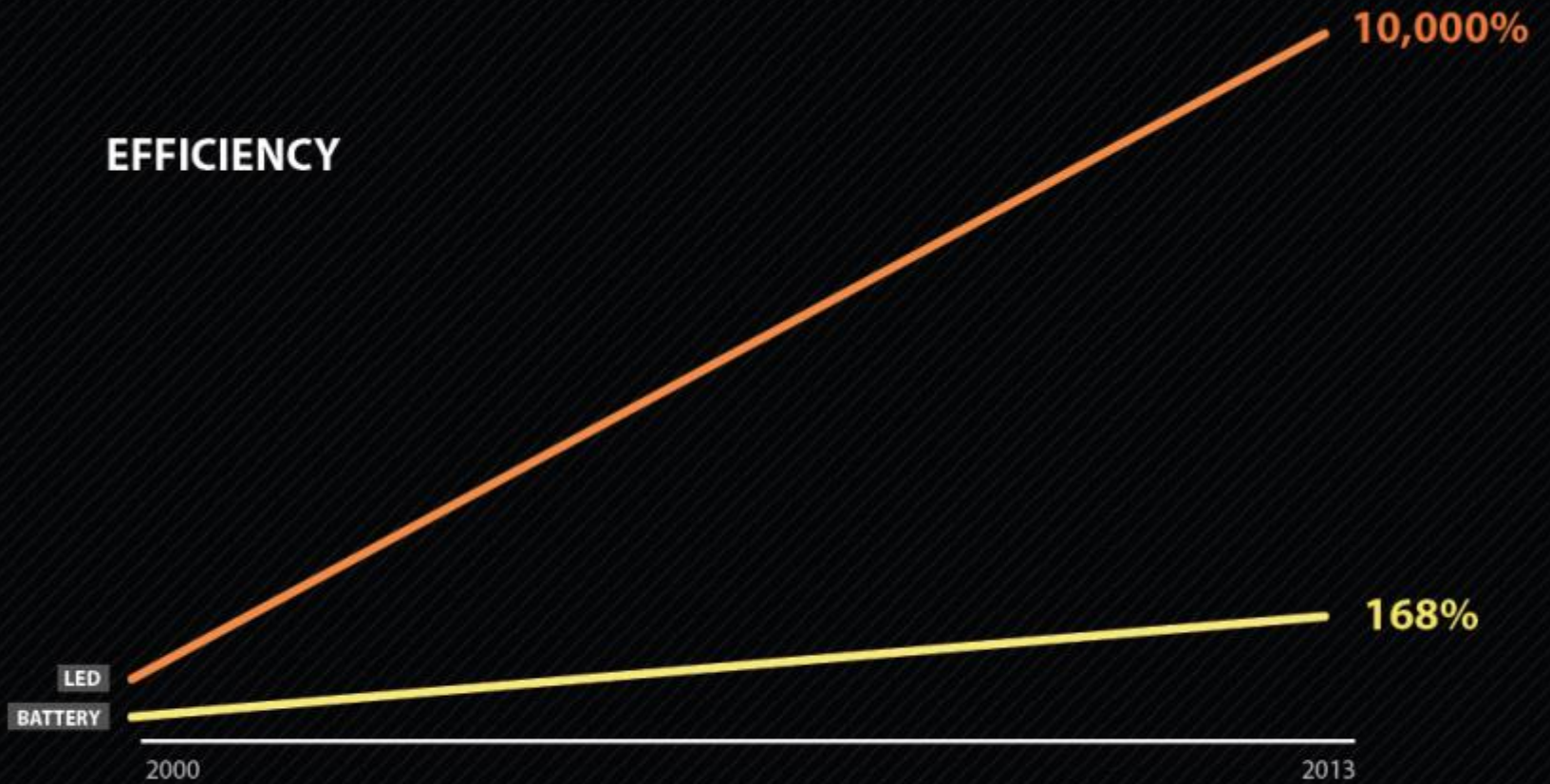
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COST REDUCTION



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EFFICIENCY



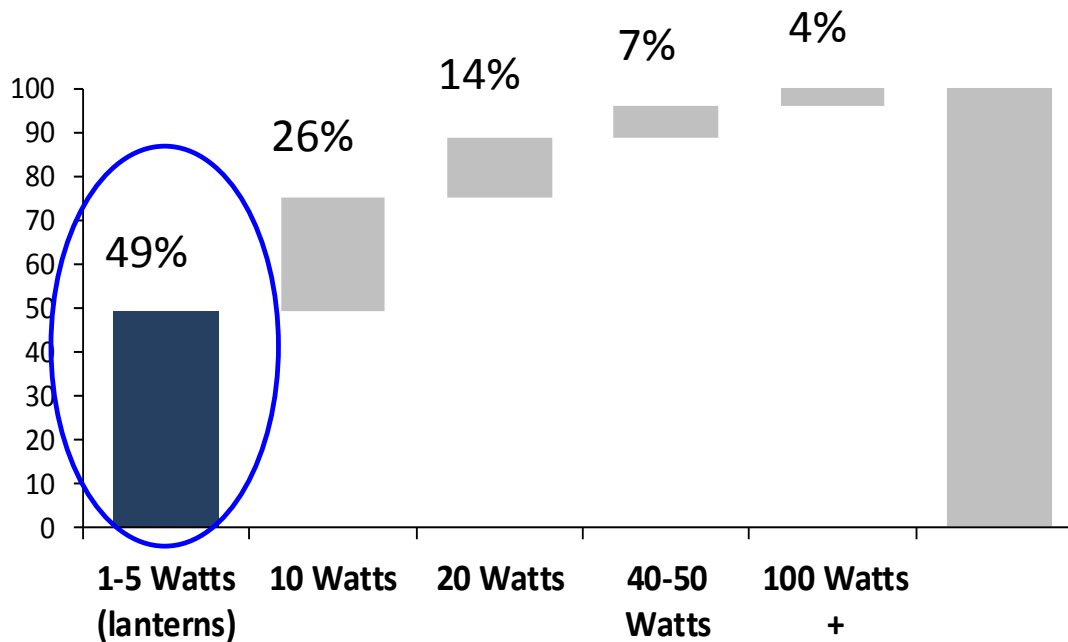


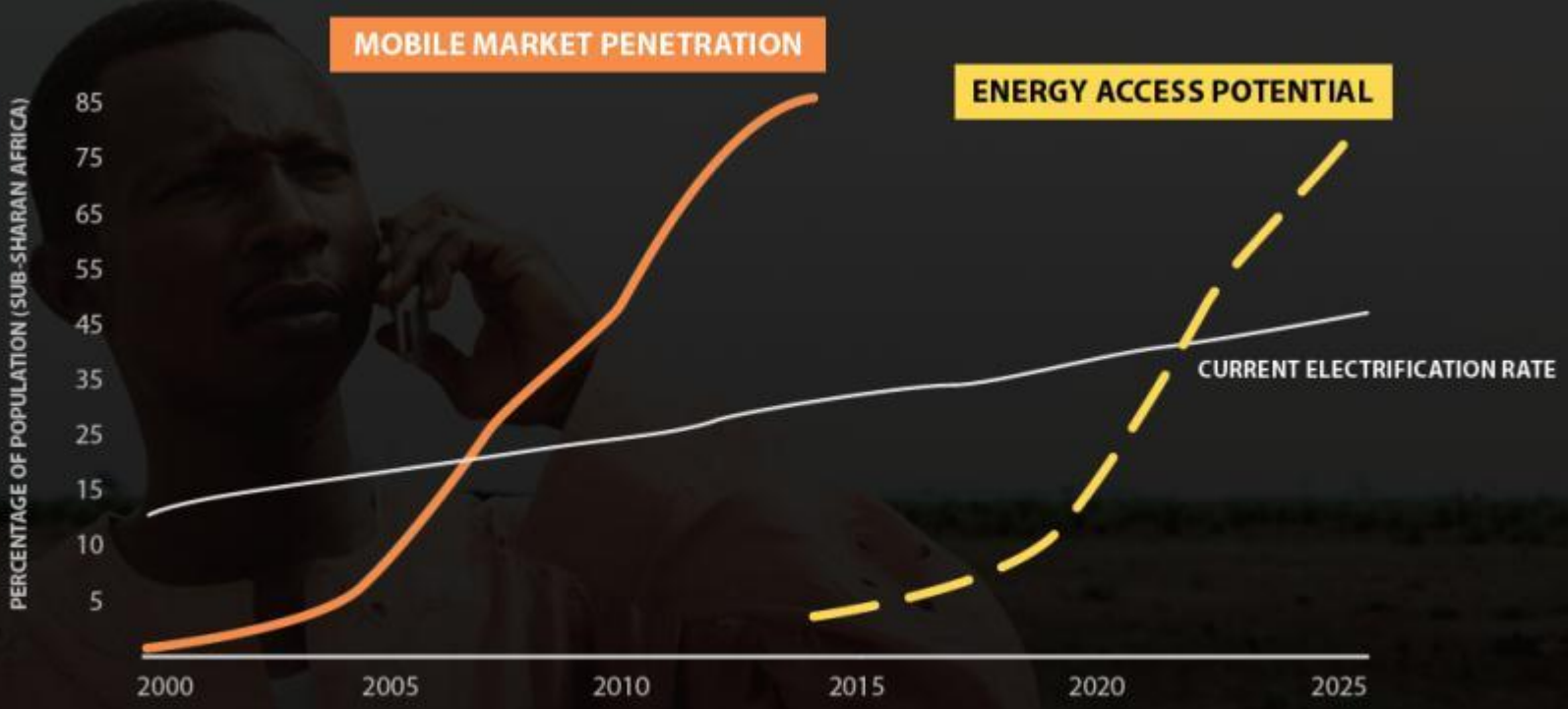
Transformative technology in a dynamic market



Consumer's aspiration is driving innovation and new opportunities: pico-powered lanterns are- the first step in the RE energy ladder

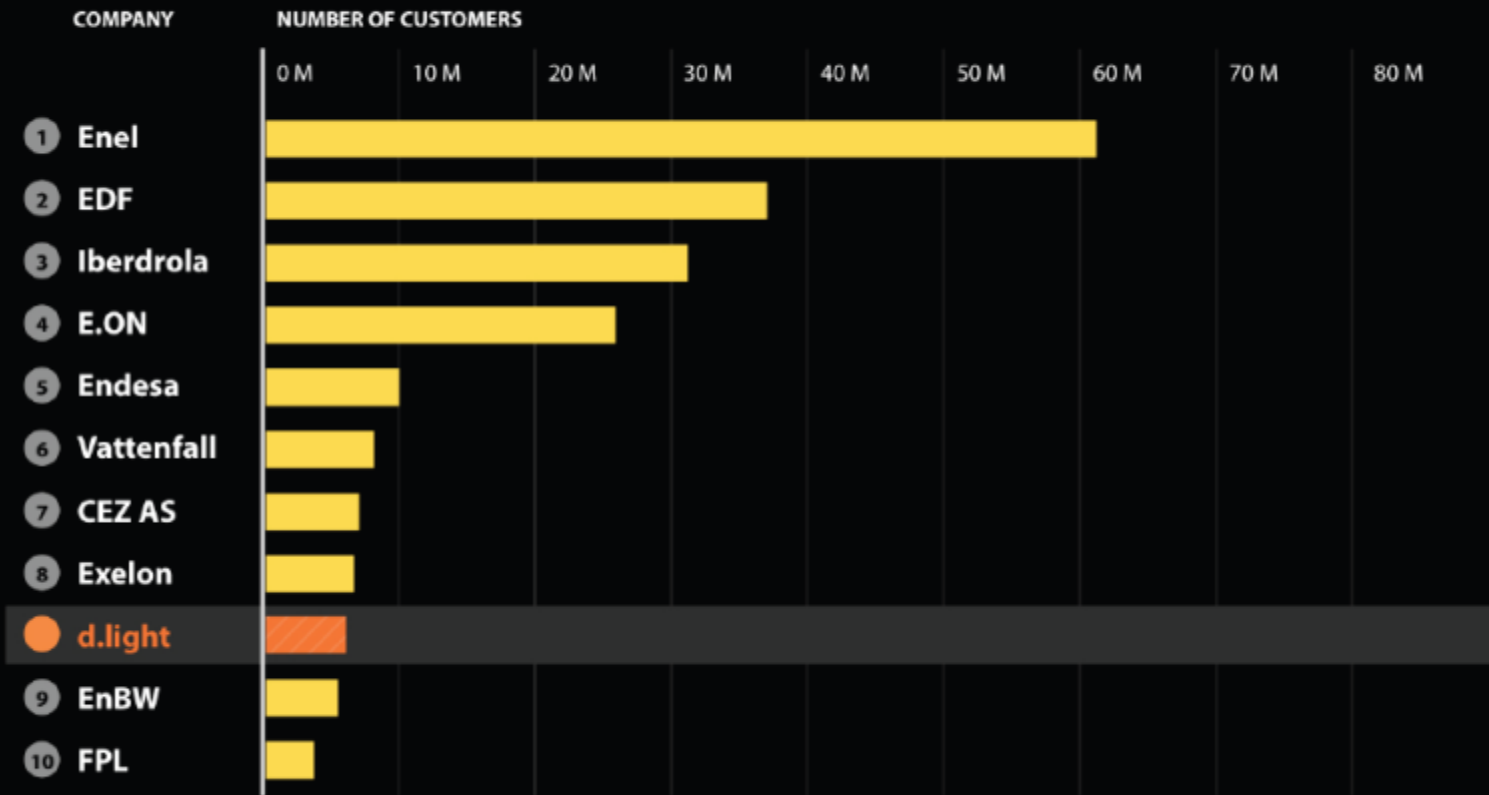
Segmentation of potential market for solar lighting devices





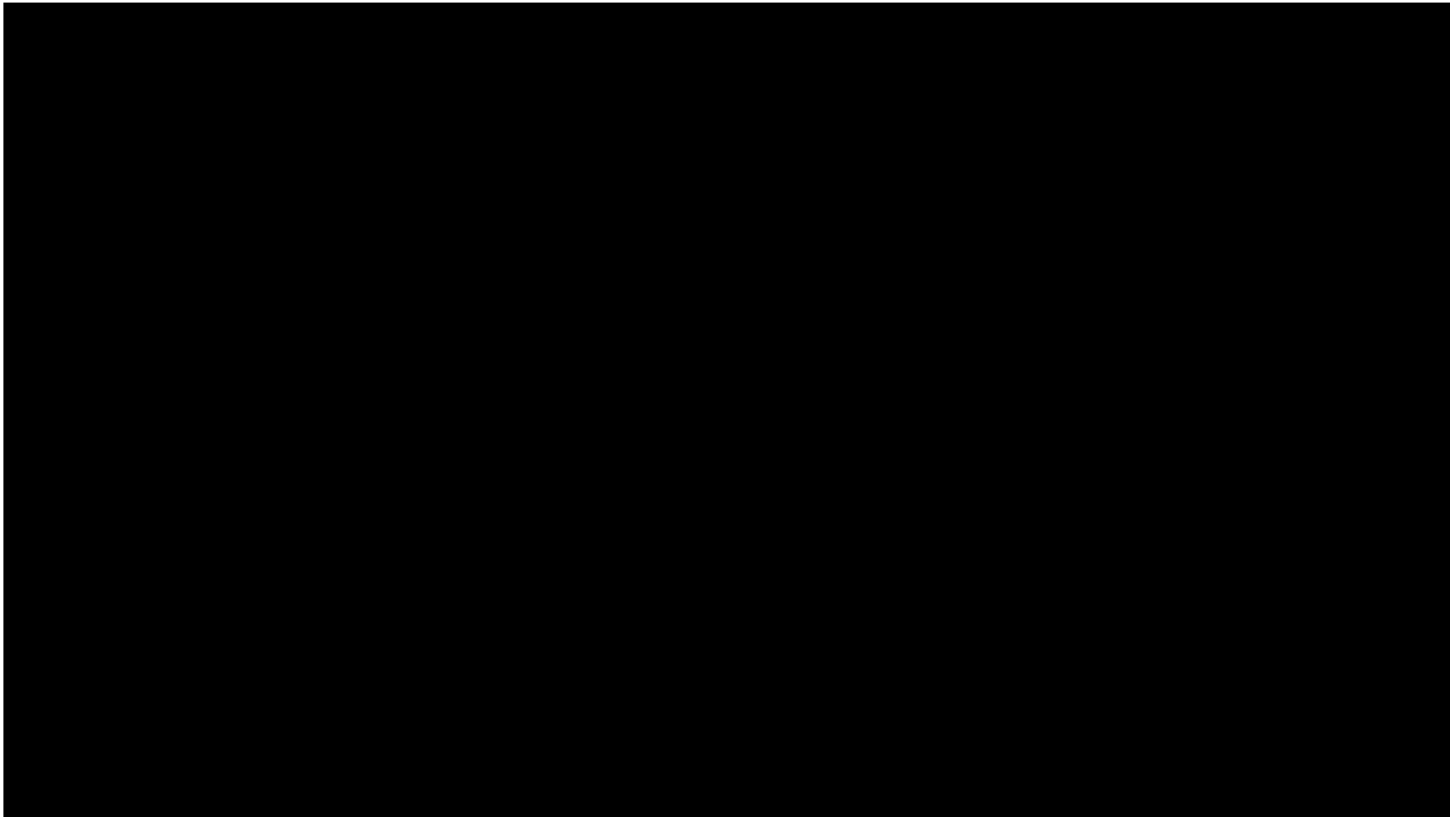
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LARGEST GLOBAL ELECTRICAL UTILITIES



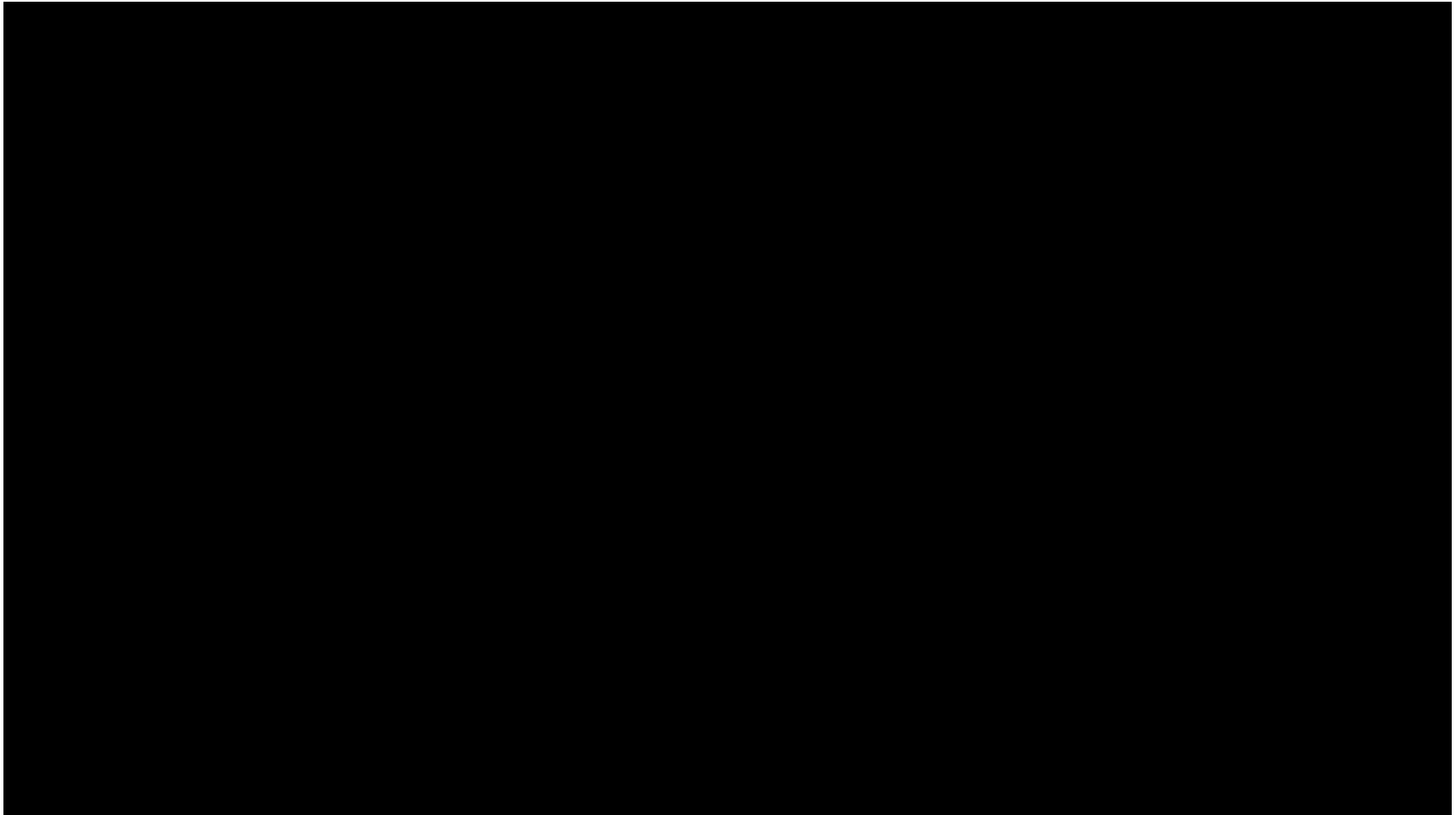
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Behind the Market... people



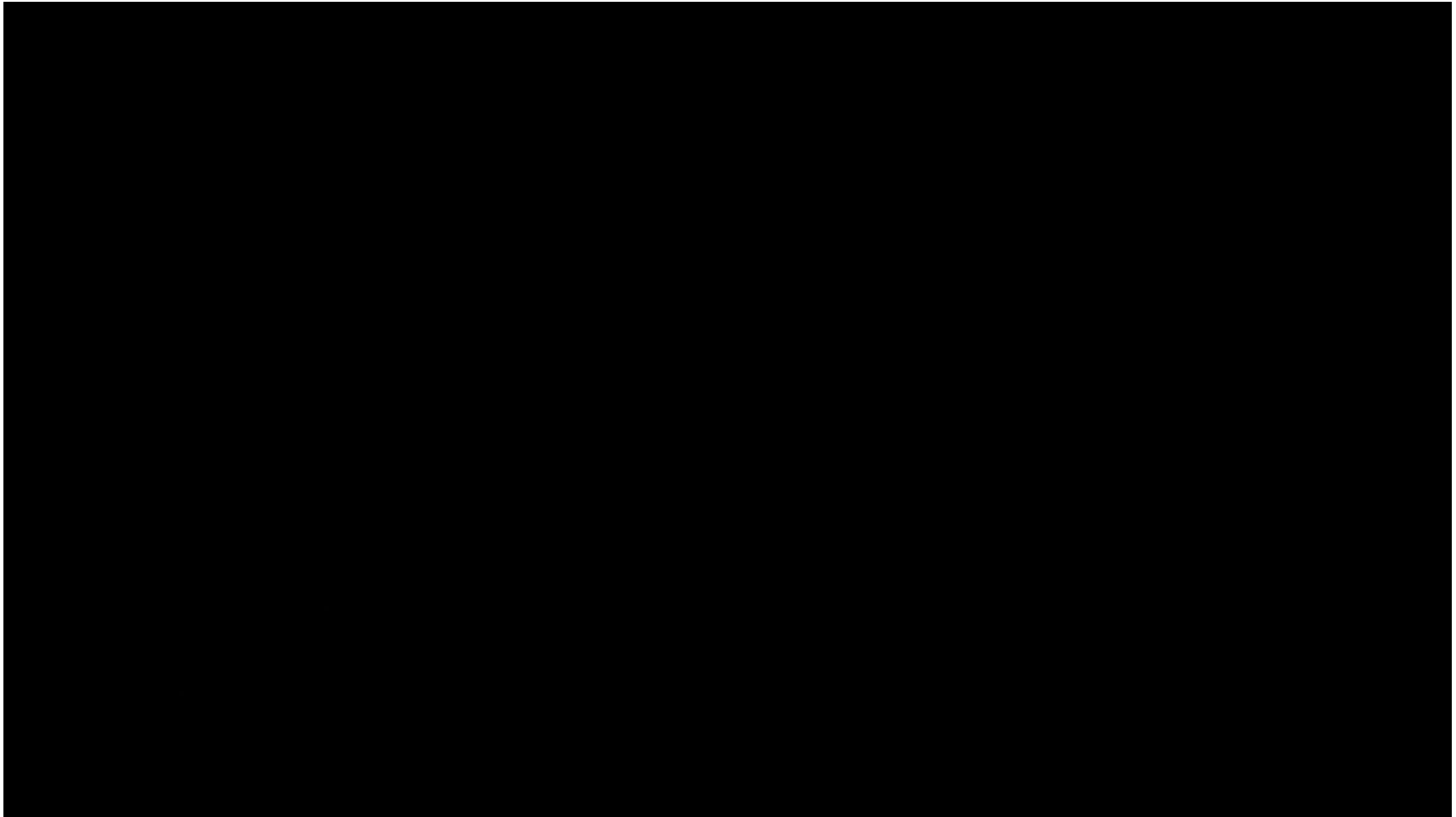
The Farmer

Behind the Market.... people



The Hotel Owner

Behind the Market... people



The Bike Shop