



Shell Foundation | 

# Ugandan off-grid energy market accelerator

Mapping the market



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# Open Capital has partnered with the Shell Foundation to increase off-grid energy access & reduce market barriers

## Substantial progress to-date

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- Uganda has seen considerable growth in off-grid energy access through innovative products, strong investor and donor interest, & growing political will
- Many stakeholders have invested time & resources to advance access across tiers
- Substantial research has been conducted to identify barriers to continued growth

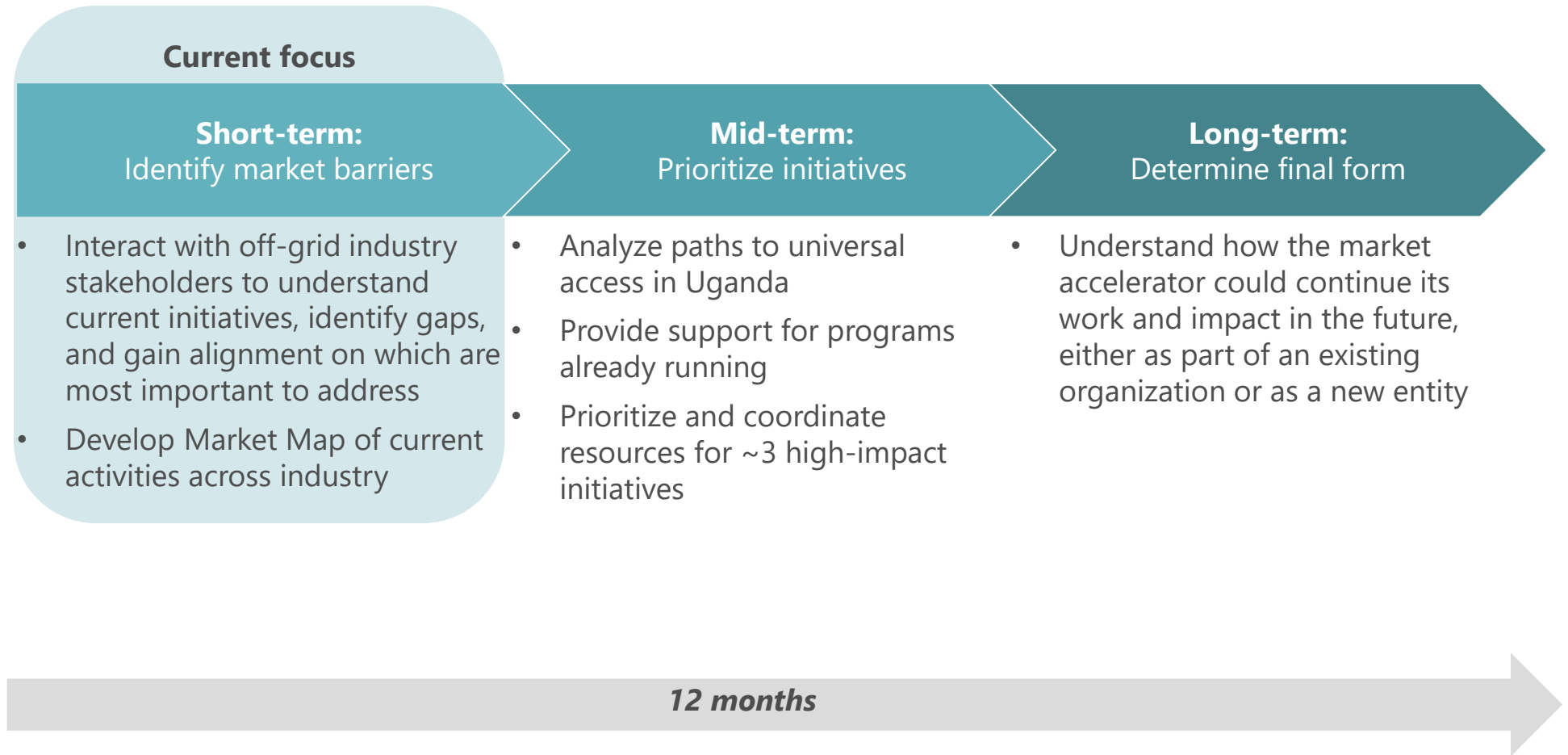
## Our goal is to facilitate further growth

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- Partnership has been formed between Shell Foundation & Open Capital Advisors (OCA), in close collaboration with DFID/Energy Africa & USAID / Power Africa
- Goal is to support stakeholders to reduce market barriers through direct initiatives & improve energy access across tiers
- Accelerator will build credibility as a neutral party to coordinate resources and provide support to current & future initiatives

**We believe there is an opportunity to accelerate energy access by reducing market barriers.**

# In 2017, the market accelerator seeks to identify key market barriers, prioritize high-impact initiatives, & determine viability



# In assessing the state of the market, the OCA team drew from consultations with 50 stakeholders across sectors

<b>Private Sector</b>	<ul style="list-style-type: none"> <li>• MKOPA</li> <li>• Fenix</li> <li>• Solar Today</li> <li>• Village Power</li> </ul>	<ul style="list-style-type: none"> <li>• Village Energy</li> <li>• Solar Now</li> <li>• Brightlife</li> <li>• Biolite</li> </ul>	<ul style="list-style-type: none"> <li>• Konserve</li> <li>• Bakulu Power</li> <li>• Absolute Energy</li> <li>• Azuri technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Off-Grid Electric</li> <li>• Mesh Power</li> <li>• Aptech Africa</li> <li>• Energy Systems Uganda</li> </ul>
<b>Government</b>	<ul style="list-style-type: none"> <li>• Ministry of Energy and Minerals Development (MEMD)</li> <li>• Rural Electrification Agency (REA)</li> <li>• Uganda Energy Credit Capitalization Company (UECCCC)</li> <li>• National Environment Management Authority (NEMA)</li> </ul>			
<b>Development orgs</b>	<ul style="list-style-type: none"> <li>• DFID / Energy Africa</li> <li>• USAID / Power Africa</li> <li>• UNCDF</li> <li>• GIZ</li> </ul>	<ul style="list-style-type: none"> <li>• WWF</li> <li>• KfW</li> <li>• PATRP</li> <li>• IFC</li> </ul>	<ul style="list-style-type: none"> <li>• Shell Foundation</li> <li>• World Bank</li> <li>• ADF</li> <li>• RECP / EUEI PDF</li> </ul>	<ul style="list-style-type: none"> <li>• Embassy of Sweden</li> <li>• Embassy of Netherlands</li> <li>• Embassy of Norway</li> <li>• USAID / Global Dev Lab</li> </ul>
<b>Other stakeholders</b>	<b>Local banks</b> <ul style="list-style-type: none"> <li>• Stanbic Bank</li> <li>• Equity Bank</li> <li>• Diamond Trust Bank (DTB)</li> </ul>	<b>Industry associations</b> <ul style="list-style-type: none"> <li>• UNREEEA</li> <li>• USEA</li> <li>• UNACC</li> <li>• GOGLA</li> </ul>	<b>Consultants</b> <ul style="list-style-type: none"> <li>• Energy for Impact</li> <li>• UDET</li> <li>• Geo Gecko</li> <li>• NARUC</li> </ul>	<ul style="list-style-type: none"> <li>• Rocky Mountain Institute (RMI)</li> <li>• MIT D-Lab</li> <li>• NRECA</li> </ul>

# Through consultations we were able to map relationships & off-grid market initiatives

Interviews & research were tailored to understand objectives & how they interact with each other

## Private sector

- Understand available products, current market share, growth plans, challenges to scale and strategic differences

## Government

- Understand different sub-industry focus areas, major initiatives underway, plans / strategies, and sensitivities

## Development orgs

- Review current interventions, broader mandates, preferred models and existing collaborations

## Other stakeholders

- Build holistic view of facilitating market actors & their role in capital provisioning, industry research, & coordination

# Industry overview

# Industry overview presents actors & activities across off-grid space


## Structure

- The industry overview section is divided by the four categories of industry actor: Private sector; Industry associations; Development partners; & Government
- In each sub-section, actors are presented along with relevant industry activities

## Purpose

- In this section, we seek to provide a holistic & objective description of the off-grid industry in Uganda across key stakeholder categories

## SHS distribution is driven by the private sector, with majority of sales coming from top int'l firms

Operator	Geos	Units sold	Branches	Price of lowest cost system	PAYG enabled	Capital raised
 fenix intl	UG, ZM	105,000	70	\$164	Yes	>10M
 M-KOPA SOLAR	UG, KE	80,000	32	\$278	Yes	>20M
 solar now	UG, KE	15,500	45	\$280	Yes	<10M
 Village Power	UG, ZM, MZ, KE, TZ	10,000	12	\$100	Yes	NA
 Solar today	UG	6,000	6	\$300	Yes	NA
 BrightLife by FINCA International	UG	800 <sup>1</sup>	25	\$81	Yes	NA
Other small local players	<i>Data not readily available</i>					

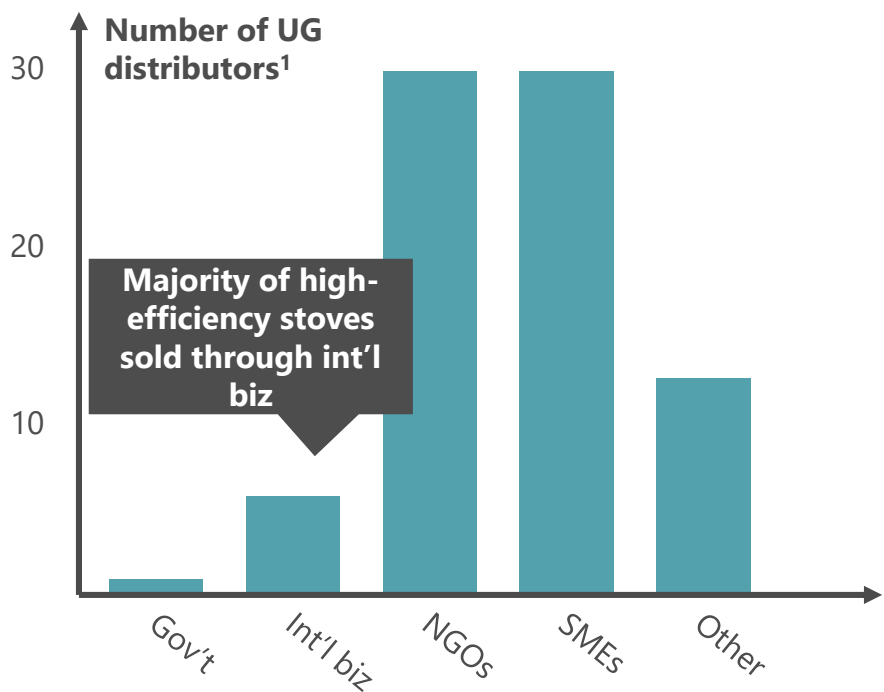
Sources: OCA interviews & consultations, supplemented by: <http://www.fenixintl.com/uganda>, <http://www.m-kopa.com/products/>, <https://www.solarnow.eu/solar-solutions/>

1. BrightLife is a subsidiary of FINCA Intl. who has been selling small pico for a number of years, with sales over 24,000 units. These are not SHS and are not included in this summary.



# Cookstove market is fragmented with over 77 manufactures / distributors operating in Uganda; large variability in quality & cost

>75% of UG cookstove distributors NGO & SME



Stoves range in quality, cost, & efficiency

The majority of sales have come from low cost distributors, typically "charcoal improved" stoves

- Entry level clean cookstoves are made of ceramic clay with few barriers to production
- Many small cookstove businesses produce & sell in rural areas, making exact sales tallies difficult

Select number of firms command majority of investment attention, importing highly engineered, efficient stoves

**ENVIROFIT** SMARTER LIVING • Envirofit manufactures & distributes energy-efficient charcoal & wood stoves throughout East Africa

**BioLite** • BioLite produces & sells high-efficiency biomass cookstoves

- Stoves are able to accommodate mobile phone charging & LED lights

**ecozoom** • Ecozoom is a Kenya-based firm which manufactures simple & efficient Jiko stoves

- A recent partnership with SolarNow has brought these products to UG

Unlike SHS, cookstove market is very fragmented

- Uganda's cookstove market is dominated by smaller players, with no core contingent of companies dominant in the market
- Many smaller, SME distributors are located in rural areas, producing stoves domestically







Sources: 1. <http://catalog.cleancookstoves.org/stoves>  
 Firms: <http://envirofit.org/product/cookstoves>, <http://www.bioliteenergy.com>, <http://www.ecozoom.co.ke/product-category/ecozoom-products/jikos/>

# Renewable energy associations represent private sector interests, advocate policy to government






## Uganda National Renewable Energy and Energy Efficiency Alliance

	Mandate & description	Membership & capacity
<b>USEA</b> <i>Uganda Solar Energy Association</i>	<ul style="list-style-type: none"> <li>Seeks countrywide mobilization of solar providers, coordinating stakeholders, playing an advocacy role and capacity building</li> </ul>	<ul style="list-style-type: none"> <li>60-70 members consisting of engineers running local businesses and solar product distributors; receives support from dev partners like RECP</li> </ul>
<b>BEETA</b> <i>Bio-mass Energy Efficient Technologies Association</i>	<ul style="list-style-type: none"> <li>Promotes biomass energy efficient technologies through networking, sharing information, and developing knowledge among member organizations / individuals</li> </ul>	<ul style="list-style-type: none"> <li>50 member companies involved in production of biomass efficient technologies, such as briquettes &amp; stoves, &amp; institutions involved in research and development of biomass energy</li> </ul>
<b>HPAU</b> <i>Hydropower Association of Uganda</i>	<ul style="list-style-type: none"> <li>Champions hydropower development in the hydropower sub-sector through advocacy, capacity devt &amp; resource mobilization</li> </ul>	<ul style="list-style-type: none"> <li>Membership open to private sector companies, organizations &amp; associations, consumers, &amp; policy makers; receives support from GIZ, CREEC, &amp; WWF</li> </ul>
<b>EEAU</b> <i>Energy Efficiency Association of Uganda</i>	<ul style="list-style-type: none"> <li>Aims to foster provision for quality energy efficiency services, enhancing research, innovation &amp; knowledge transfer</li> </ul>	<ul style="list-style-type: none"> <li>Large capacity of technical members working to get association accreditation to certify Energy Efficiency Professionals in the country</li> </ul>
<b>UNBA</b> <i>Uganda National Bio-gas Alliance</i>	<ul style="list-style-type: none"> <li>Seeks to unite and support stakeholders as well as existing regional associations in the biogas sector</li> </ul>	<ul style="list-style-type: none"> <li>National umbrella organization of the UG biogas sector; four associations organized according to regions, supported by partnership with GIZ</li> </ul>

# The European Union is supporting a number of programs to influence the private sector & advance off-grid access (1/2)

European Union (EU)	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Scaling-up rural electrification using innovative solar photovoltaic (PV) distribution models<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 SHS  Mini-grids  Cook stoves	<ul style="list-style-type: none"> <li>Scale up the use of solar PV systems at schools, health clinics, and business levels in the district of Kasese by building local capacity to install &amp; maintain solar PV systems</li> </ul>	<ul style="list-style-type: none"> <li>Provide business training &amp; specific solar PV energy training to CBOs</li> <li>Implemented under Champion District initiative</li> </ul>	<ul style="list-style-type: none"> <li>Set up pilot in Kasese with CSOs like SACCOS</li> <li>Scaling pilots to Arua and Masindi</li> <li>Planning to develop 20 mini-grids (5kw) in Kasese after successful SHS pilot</li> </ul>	<p><b>Implementers:</b> WWF (under Champion Districts Initiative)</p> <p><b>Funders:</b> ACP-EU</p>
<p><b>Access to energy services in rural and peri-urban areas in Northern Uganda (Teko Wa Project)<sup>2</sup></b></p> <p><b>Ongoing</b></p>	 SHS  Cook stoves  Bio fuels	<ul style="list-style-type: none"> <li>Increase the energy security of rural households in Northern Uganda through increased availability of biomass, energy-efficient stoves, and PV solar units</li> </ul>	<ul style="list-style-type: none"> <li>Locals groups are trained to create and use sustainable and more environmental friendly energy sources, like energy-saving stoves and affordable solar system</li> </ul>	<ul style="list-style-type: none"> <li>Training in local communities on constructing and selling clay stoves</li> <li>Partnership with Barefoot power providing solar lighting and accessories in Pader, Kitgum, Lamwo and Agago districts</li> </ul>	<p><b>Implementers:</b> Church of Sweden</p> <p><b>Funders:</b> ACP-EU</p>

# The European Union is supporting a number of programs to influence the private sector and advance off-grid access (2/2)






European Union (EU)	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Providing access to modern energy for northern Uganda (PAMENU)<sup>1</sup></b></p> <p><b>Completed</b></p>	 SHS  On-grid  Cook stoves	<ul style="list-style-type: none"> <li>Project focused on increasing the use of solar PV, improving household cookstoves and mini-hydro power for small grids</li> </ul>	<ul style="list-style-type: none"> <li>Disseminate solar PV and improved stoves</li> <li>Build capacity for intermediaries &amp; training of local stove builders</li> <li>Create awareness campaigns</li> <li>Coordinate installation of MHP and mini-grids</li> </ul>	<ul style="list-style-type: none"> <li>Distribution of clean cookstoves to hhs</li> <li>Street lighting project in Yumbe Town Council</li> <li>Construction of the pico-hydro power sites</li> <li>Provision of health centers with solar PV &amp; drug storage</li> </ul>	<p><b>Implementers:</b> GIZ</p> <p><b>Funders:</b> ACP-EU</p>
<p><b>Scaling up access to modern electricity services on a regional scale in rural Sub-Saharan Africa by means of a fee for service business model<sup>2</sup></b></p> <p><b>Ongoing</b></p>	 SHS  Mini-grids	<ul style="list-style-type: none"> <li>Working to scale up access, in the predominantly rural, poor communities of the targeted countries in Cameroon, Mali, Uganda &amp; Guinea-Bissau</li> </ul>	<ul style="list-style-type: none"> <li>Provide a number of households and SMEs with access to energy services via SHS and solar mini-grids</li> <li>Facilitate bi-annual workshops for areas in the four countries concerned</li> </ul>	<ul style="list-style-type: none"> <li>On track to provide 8,200 households and SMEs in Cameroon, Mali, Uganda and Guinea-Bissau with access to electricity through SHS</li> </ul>	<p><b>Implementers:</b> Foundation Rural Energy Services</p> <p><b>Funders:</b> ACP-EU</p>

Sources: OCA interviews & consultations, supplemented by

1. [http://energyfacilitymonitoring.eu/page/2/?option=com\\_docman&task=cat\\_view&gid=12&limit=15&limitstart=0&order=name&dir=ASC&Itemid=12](http://energyfacilitymonitoring.eu/page/2/?option=com_docman&task=cat_view&gid=12&limit=15&limitstart=0&order=name&dir=ASC&Itemid=12);

2. <http://database.energyfacilitymonitoring.eu/acpeu/project/4341/>; <http://database.energyfacilitymonitoring.eu/acpeu/project/4625/>

# World Bank has partnered with the government to implement the 15 year ERT initiative to improve lives of rural households

World Bank	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<b>Energy for Rural Transformation Phase II (ERT-2)<sup>1</sup></b>  <b>Completed</b>	 SHS   On-grid	<ul style="list-style-type: none"> <li>Increase access to energy and ICTs in rural Uganda, concentrating on three components:             <ol style="list-style-type: none"> <li>Rural energy infrastructure</li> <li>Broadband extension</li> <li>Energy development</li> </ol> </li> </ul>	<b>Rural energy infrastructure:</b> <ul style="list-style-type: none"> <li>Off-grid investments, technical assistance &amp; training</li> <li>Credit support facility through UECCC</li> <li>Business subsidy through PSFU</li> </ul> <b>Energy development:</b> <ul style="list-style-type: none"> <li>Cross sectoral links &amp; impact monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Financed extension of the existing distribution network, installation of household and institutional solar PV</li> <li>Financed solar installations for rural schools, health clinics, water facilities &amp; related costs for TA and training</li> </ul>	<b>Implementers:</b> REA, MOWE, MOH, MOESD, UECCC, PSFU, MEMD  <b>Funders:</b> World Bank/GEF
<b>Energy for Rural Transformation Phase III (ERT-3)<sup>2</sup></b>  <b>Ongoing</b>	 SHS   On-grid   Mini-grids	<ul style="list-style-type: none"> <li>Increase access to electricity in rural areas of Uganda, concentrating on 3 components:             <ol style="list-style-type: none"> <li>On grid access</li> <li>Off-grid access</li> <li>Institutional strengthening through impact monitoring</li> </ol> </li> </ul>	<b>Off-grid component:</b> <ul style="list-style-type: none"> <li>Installation of solar PV systems for public institutions in rural areas</li> <li>Business development support</li> <li>Provision of credit facilities</li> <li>Quality standards enforcement support</li> </ul>	<ul style="list-style-type: none"> <li>USD 8.5 million fund to be disbursed to local banks to provide working capital financing to SHS PAYG operators</li> </ul>	<b>Implementers:</b> REA, MOWE, MOH, MOESD, UECCC, PSFU, MEMD  <b>Funders:</b> World Bank/GEF

Sources: OCA interviews & consultations, supplemented by

1. <http://www.oag.go.ug/wp-content/uploads/2015/12/ENERGY-FOR-RURAL-TRANSFORMATION-ERT-PCU-II-REPORT-OF-THE-AUDITOR-GENERAL-2014.pdf>

2. <http://www.energyandminerals.go.ug/downloads/ERDreportERTIII1.pdf>; <http://projects.worldbank.org/P133312?lang=en>




# Add'lly, World Bank runs independent programs to advance access & create a conducive environment for private sector growth

World Bank	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<b>Lighting Africa Campaign<sup>1</sup></b> <b>Ongoing</b>	 SHS	<ul style="list-style-type: none"> <li>Enable access to off-grid lighting and energy products for 250 million people across sub-Saharan Africa by 2030</li> </ul>	Catalyze the market through: <ul style="list-style-type: none"> <li>Market intelligence</li> <li>Quality assurance</li> <li>Access to finance</li> <li>Consumer education</li> <li>Business development support</li> <li>Policy &amp; regulation</li> </ul>	<ul style="list-style-type: none"> <li>Market assessment study to determine demand for solar products, market bottlenecks, &amp; assess options for supporting the growth</li> <li>Consumer awareness campaigns</li> <li>Supporting UNBS in adopting and enforcing internationally recognized standards</li> </ul>	<b>Implementers:</b> Broad global alliance – imps. varying by country  <b>Funders:</b> World Bank / IFC

Source: OCA interviews & consultations, supplemented by

1. <https://www.lightingafrica.org/country/uganda/>

# USAID's Power Africa is playing a crucial role in leading and coordinating initiatives in Uganda (1/2)

USAID / Power Africa	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>The Scaling Off-Grid Energy Enterprise Awards<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 SHS	<ul style="list-style-type: none"> <li>Provide seed funding to solar start-ups to support geographic expansion throughout Africa, test new business models and tap into private and public financing</li> </ul>	<ul style="list-style-type: none"> <li>USD 4 million to enable recipients to expand home solar power solutions to existing and new African markets, improve payment and distribution processes, and bring down costs for customers</li> </ul>	<ul style="list-style-type: none"> <li>Awards given to Greenlight Planet, Village Energy, d.light, Fenix, Orb Energy, Vitalite, PEG Africa and Shinbone Labs</li> </ul>	<p><b>Implementers:</b> US Global Devt Lab through Development Innovation Ventures (DIV)</p> <p><b>Funders:</b> Power Africa, SOGE</p>
<p><b>The Off-grid Energy Challenge<sup>2</sup></b></p> <p><b>Ongoing</b></p>	 SHS   Mini-grids	<ul style="list-style-type: none"> <li>Promote innovative solutions that develop, scale-up or extend the use of proven technologies for off-grid energy – reaching communities not served by existing power grids</li> </ul>	<ul style="list-style-type: none"> <li>Awards grants of up to USD 100,000 each to African companies and organizations providing off-grid solutions that deploy renewable resources and power local economic activities</li> </ul>	<ul style="list-style-type: none"> <li>Awarded a number of Ugandan enterprises including Green Heat, One Lamp, GRS Commodities</li> </ul>	<p><b>Implementers:</b> USADF</p> <p><b>Funders:</b> Power Africa, GE Africa</p>




Sources: OCA interviews & consultations, supplemented by

1. <https://www.usaid.gov/news-information/press-releases/oct-14-2016-usaid-announces-4-million-solar-start-ups-african-grid-energy>;

<http://www.usadf.gov/power-africa/>

2. <http://www.usadf.gov/pressreleases/2016/9/21/us-african-development-foundation-and-ge-africa-announce-new-partnership-for-women-energy-challenge>

# USAID's Power Africa is playing a crucial role in leading and coordinating initiatives in Uganda (2/2)

USAID / Power Africa	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Quality Assurance Framework for Mini-Grids<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 Mini-grids	<ul style="list-style-type: none"> <li>Address some of the root challenges of providing safe, quality, and financially viable mini-grid power systems to remote customers</li> </ul>	<ul style="list-style-type: none"> <li>Provide a flexible alternative to rigid top-down standards by defining:             <ul style="list-style-type: none"> <li>Levels of service framework</li> <li>Accountability and performance reporting framework</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Provided a formalized, common standard for classifying energy consumers</li> <li>Facilitated aggregation of mini-grid projects &amp; unlock private investment from data generated</li> <li>Supporting implementation of consumer protections, thus a better consumer service</li> </ul>	<p><b>Implementers:</b> NREL, DOE</p> <p><b>Funders:</b> Power Africa, Global LEAP</p>
<p><b>REA Master plans project</b></p> <p><b>Ongoing</b></p>	 Mini-grids   On-grid	<ul style="list-style-type: none"> <li>Rapidly increase electricity access in its rural areas</li> </ul>	<ul style="list-style-type: none"> <li>Develop five new master plans for more additional rural service territories in Uganda</li> </ul>	<ul style="list-style-type: none"> <li>Developing the plan for 12 of the 13 service territories, all concessions to the private sector</li> <li>Identified 90 mini-grid sites and distributed 600,000 SHS systems in the last 16 months</li> </ul>	<p><b>Implementers:</b> NRECA, REA</p> <p><b>Funders:</b> Power Africa</p>

Source: OCA interviews & consultations, supplemented by

1. <http://www.nrecainternational.coop/where-we-work/uganda>, [www.nrel.gov/publications](http://www.nrel.gov/publications)








## USAID's Power Africa is playing a crucial role in leading and coordinating initiatives in Uganda (2/2)

USAID / Power Africa	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Uganda Electricity Regulatory Partnership<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 Mini-grids	<ul style="list-style-type: none"> <li>Support the development of a regulatory and policy framework for electricity access with focus on the role of mini-grids to address the electricity needs of rural customers</li> </ul>	<ul style="list-style-type: none"> <li>Develop a practical guide to the regulatory treatment of mini-grids to outline the practical issues and potential decision-making tracks for regulators</li> <li>Implement a technical workshop on mini-grid technical, performance and interconnection guidelines to assist ERA in developing tailored technical and performance guidelines for mini-grid providers of electricity in rural service territories</li> </ul>	<p><b>Held technical workshop to:</b></p> <ul style="list-style-type: none"> <li>Examine international best practices on mini-grid technical requirements (e.g. interoperability, compatibility)</li> <li>Develop an outline on mini-grid technical requirements, interconnection to the national grid and business models for interconnection, power quality, and service quality</li> </ul>	<p><b>Implementers:</b> NARUC, ERA</p> <p><b>Funders:</b> USAID / Power Africa</p>

Source: OCA interviews & consultations, supplemented by

1. <https://www.naruc.org/international/where-we-work/africa-middle-east/uganda>

# DFID initiatives work to increase investment in off-grid energy firms, overcome regulatory barriers & foster innovation



DFID	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<b>Energy Africa Campaign<sup>1</sup></b>  <b>Ongoing</b>	 SHS   Mini-grids	<ul style="list-style-type: none"> <li>Accelerate expansion of household solar market to help bring universal electricity access in Africa forward from 2080 on current trends to 2030</li> </ul>	<ul style="list-style-type: none"> <li>Campaign to improve policy and support conditions to accelerate market-based SHS delivery</li> <li>Core tool is Energy Africa Country Compacts matched with a coordinated multi-donor support offer</li> </ul>	<ul style="list-style-type: none"> <li>Coordinated and signed Energy Africa Compact with Uganda government and other stakeholders making commitment to address several challenges facing the SHS market</li> </ul>	<b>Implementers:</b> MEMD, DFID, REA, SE4ALL, USEA, USAID / Power Africa, UNCDF, et al.  <b>Funders:</b> DFID
<b>Transforming Energy Access (TEA)<sup>2</sup></b>  <b>Ongoing</b>	 SHS   Cook stoves   Bio fuels	<ul style="list-style-type: none"> <li>Address critical evidence gaps, test innovative technology applications, business models, financing, &amp; skills development to accelerate the provision of affordable, clean energy based services to poor households &amp; enterprises</li> </ul>	<ul style="list-style-type: none"> <li>Partnership with Shell Foundation to support private sector innovations</li> <li>Support Innovate UK's Energy Catalyst to stimulate technology innovation</li> <li>Build other strategic innovation partnerships</li> </ul>	<ul style="list-style-type: none"> <li>Shell foundation created market accelerator in Uganda to advance off-grid access</li> <li>Testing P2P Solar crowding platform</li> <li>Scoping potential partnership with Gates Foundation on Mission Innovation</li> </ul>	<b>Implementers:</b> Shell foundation, Innovate UK  <b>Funders:</b> DFID

Sources: OCA interviews & consultations, supplemented by

1. <https://www.gov.uk/government/news/energy-africa-campaign>; <https://www.contractsfinder.service.gov.uk/Notice/1a44f944-fe22-4e77-b300-2da4fbb6068e>

2. <http://energyaccess.org/news/recent-news/applied-research-program-transforming-energy-access/>



# Embassy of the Netherlands runs programs to support the private sector & advance energy access

Netherlands	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Milking the Sun &amp; Harvesting the Sun<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 SHS   Solar agric. app	<ul style="list-style-type: none"> <li>Provide dairy and crop farmers and their households with high quality, affordable and sustainable solar lighting systems and solar powered agricultural appliances</li> </ul>	<ul style="list-style-type: none"> <li>Subsidy to provide farmers with access to 37,000 solar products with reliable after sales service</li> </ul>	<ul style="list-style-type: none"> <li>6,500 systems sold as of October 2016 (NB: Harvesting the Sun started in July 2016)</li> </ul>	<p><b>Implementers:</b> Solar Now, Barefoot Power, Uganda Crane Creameries Cooperative Union &amp; other value chain managers</p> <p><b>Funders:</b> Government of Netherlands</p>

Sources: OCA interviews & consultations, supplemented by

1. <https://www.linkedin.com/pulse/milking-sun-barefoot-power>


# UNCDF's global CleanStart program has partnered with other dev partners to provide financing to local businesses & advance access

UNCDF	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>UNCDF CleanStart<sup>1</sup></b></p> <p><b>Ongoing</b></p>	<p> SHS</p> <p> Mini-grids</p> <p> Cook stoves</p> <p> Bio fuels</p>	<ul style="list-style-type: none"> <li>Supports low-income hhs transition to renewable energy</li> <li>Co-invests in early stage business ideas of private companies that can bring affordable clean energy to under-served markets</li> <li>Emphasis on the inclusion of women and youth in value chain</li> </ul>	<ul style="list-style-type: none"> <li>Risk capital (performance-based grant) to bring early stage business ideas to market</li> <li>Advisory services to address implementation bottlenecks, facilitate linkages to partnership &amp; funding opportunities</li> <li>Knowledge and learning in the form of research initiatives, M&amp;E, &amp; networking events</li> <li>Nationwide campaigns to improve consumer awareness &amp; protection</li> <li>Partnerships with government, dev partners, &amp; other stakeholders to leverage resources &amp; strengthen sustainability &amp; impact</li> </ul>	<ul style="list-style-type: none"> <li>2015 Energy Access Challenge funding five businesses in PAYG solar and clean cook stoves through two-year partnership (2016-2017), cost share 30% (cash &amp; in-kind)</li> <li>New round to fund 15 more SMEs - in clean cooking and solar (pico, larger SHS and micro-grids) through 2 to 3-year partnership, cost share TBC; Clean Cooking Challenge Window Call for EOI launched in March (cost-share 40%)</li> </ul>	<p><b>Implementers:</b></p> <p>UNCDF</p> <p><b>Funders:</b></p> <ul style="list-style-type: none"> <li>RECF Uganda: Embassy of Sweden in Uganda (RECF), UNCDF</li> <li>CleanStart Global: Austrian Development Agency, Liechtenstein, Norad, Sida, UNCDF</li> </ul>

Sources: OCA interviews & consultations, supplemented by

1. <http://www.uncdf.org/en/cleanstart>


# GIZ has provided support to both the government and private sector to further advance access & support clean energy (1/2)

GIZ	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Promotion of Renewable Energy &amp; Energy Efficiency program (PREEEP)<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 SHS	<ul style="list-style-type: none"> <li>Promote sustainable use of energy for social economic empowerment, increased access to renewable energy, and efficient utilization of existing energy resources</li> </ul> <p><b>Focuses on three areas:</b></p> <ul style="list-style-type: none"> <li>Supporting clean energy strategies</li> <li>Mitigating climate change</li> <li>Promoting access to energy</li> </ul>	<ul style="list-style-type: none"> <li>Support the Ministry of Energy in areas of energy policy, improvement of market structures and energy efficiency.</li> <li>Support activities in implementation of energy programs at district level, monitoring and evaluation and mainstreaming of cross cutting issues such as gender and HIV / AIDS</li> <li>Work through EnDev to achieve advance access</li> </ul>	<p><b>Policy support:</b></p> <ul style="list-style-type: none"> <li>Energy programs structured in West Nile &amp; Lango</li> <li>Quality management system for the planning, steering and evaluation processes of MEMD</li> <li>Fully operational GIS lab</li> </ul> <p><b>Market development:</b></p> <ul style="list-style-type: none"> <li>Capacity building through associations</li> <li>Awareness campaigns</li> </ul> <p><b>Licensing:</b></p> <ul style="list-style-type: none"> <li>Standardized licensing procedures for small-scale off-grid energy projects with REA &amp; ERA</li> </ul>	<p><b>Implementers:</b> GIZ, MEMD, REA, ERA</p> <p><b>Funders:</b> BMZ / GIZ</p>

Source: OCA interviews & consultations, supplemented by

1. <http://energyprogramme.or.ug/supporting-clean-energy-strategies>





# GIZ has provided support to both the government and private sector to further advance access & support clean energy (2/2)

GIZ	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Promotion of Mini-grids for Rural Electrification (Pro Mini-Grids)<sup>1</sup></b> Ongoing</p>	 Mini-grids	<ul style="list-style-type: none"> <li>Promote decentralized electrification strategies such as mini-grids to support employment and economic development</li> <li>Develop mechanisms to support private sector capacity for installation and operation of off-grid systems</li> </ul>	<p><b>Four components:</b></p> <ol style="list-style-type: none"> <li>Develop off-grid strategy for the National Electrification Policy &amp; develop methodology to identify mini-grid project locations</li> <li>Develop mechanisms for license concessions, efficient tenders</li> <li>Implement and award tenders to private mini-grid concessionaires in villages</li> <li>Promote productive use in villages to raise household incomes &amp; improve the economic feasibility of service providers' business model &amp; tariff revenue structure</li> </ol>	<ul style="list-style-type: none"> <li>Created task force with REA &amp; the Ministry to develop directive and support development of mini-grid tender mechanism</li> <li>Ongoing support to REA to promote development of site identification expertise</li> </ul>	<p><b>Implementers:</b> GIZ, MEMD, REA, ERA</p> <p><b>Funders:</b> BMZ/GIZ</p>



Source: OCA interviews & consultations, supplemented by

1. BMZ brief on "Promotion of Mini-Grids for Rural Electrification"

# The Shell Foundation has launched a number of Uganda-specific initiatives to advance off-grid, support mini-grid development







Shell Foundation	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Off-grid market accelerator</b></p> <p><b>Ongoing</b></p>	 SHS  Mini-grids  Cook stoves	<ul style="list-style-type: none"> <li>Support off-grid stakeholders - including the public sector, private sector, and development community - to reduce market barriers</li> </ul>	<ul style="list-style-type: none"> <li>Create neutral body to coordinate stakeholders and execute high impact initiatives that will advance off-grid access</li> </ul>	<ul style="list-style-type: none"> <li>Developed market map report on Uganda off-grid</li> <li>Developing three high impact initiatives to reduce market barriers</li> </ul>	<p><b>Implementers:</b> Open Capital Advisors</p> <p><b>Funders:</b> Shell Foundation, DFID</p>
<p><b>Catalyzing larger-scale solutions specifically designed to spur economic growth in rural areas</b></p> <p><b>Ongoing</b></p>	 Mini-grids	<ul style="list-style-type: none"> <li>Provide support for development of disruptive solutions to increase the availability of energy</li> </ul>	<ul style="list-style-type: none"> <li>Providing project finance to pilot projects</li> <li>Supporting key stakeholders in lobby to articulate &amp; pass key legislation governing concessions, guarantees, duties, &amp; feed-in tariffs</li> </ul>	<ul style="list-style-type: none"> <li>Providing milestone based funding to Absolute Energy for mini-grid at Kitobo</li> </ul>	<p><b>Implementers:</b> Absolute Energy, others</p> <p><b>Funders:</b> Shell Foundation</p>

# In addition to UG focused programs, GOGLA plays an important role in working towards PAYG metric standardization globally

GOGLA	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Standardizing reporting metrics for PAYG</b></p> <p><b>Ongoing</b></p>	 SHS	<ul style="list-style-type: none"> <li>Work with private sector operators &amp; development partners to define &amp; implement standardized reporting on financial &amp; impact metrics</li> </ul>	<ul style="list-style-type: none"> <li>Work with stakeholders to first harmonize around what metrics businesses need for investors</li> <li>Draw from business &amp; investor consultations, will arrive at standard metrics for key financial &amp; impact definitions</li> </ul>	<ul style="list-style-type: none"> <li>Held conference in Dubai in 2015 brought stakeholders together to discuss</li> <li>Received support from SEAGAP &amp; UNCDF</li> </ul>	<p><b>Implementers:</b> GOGLA</p> <p><b>Funders:</b> GOGLA</p>
<p><b>Advocating for clear solar tax policy in Uganda</b></p> <p><b>Ongoing</b></p>	 SHS	<ul style="list-style-type: none"> <li>Reduce and / or establishing a clear solar product tax policy in Uganda following the governments decision to rescind tax exempt status</li> </ul>	<ul style="list-style-type: none"> <li>GOGLA is assuming an industry association role, coordinating with private companies &amp; dev partners to speak as one voice to the government</li> </ul>	<ul style="list-style-type: none"> <li>Held call with private sector &amp; USEA to determine path forward &amp; gain alignment</li> <li>Drafted a letter to the government making argument for reinstating tax exemption in Feb, 2017</li> </ul>	<p><b>Implementers:</b> GOGLA</p> <p><b>Funders:</b> GOGLA</p>







# Shell Foundation operates a number of global initiatives which touch Ugandan market, enable private sector development

Shell Foundation	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Accelerating the growth of early-stage partners<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 SHS  Mini-grids  Cook stoves	<ul style="list-style-type: none"> <li>Support entrepreneurs in the off-grid sector by working with partners to provide investment, business skills and market linkages in order to scale their businesses and deepen impact on BoP</li> </ul>	<ul style="list-style-type: none"> <li>Provide grants, innovative financing products &amp; technology</li> <li>Support development of business skills training &amp; market linkages</li> </ul>	<ul style="list-style-type: none"> <li>Creating blended working capital facility</li> <li>Built Odyssey - tech platform to help standardize how projects are valued</li> <li>Helping to broaden range of products beyond household energy solutions to include productive use</li> </ul>	<p><b>Implementers:</b> DFID, OPEC / OFID, et al.</p> <p><b>Funders:</b> Shell Foundation</p>
<p><b>Working with other actors in the social investment ecosystem<sup>1</sup></b></p> <p><b>Ongoing</b></p>	 SHS  Mini-grids  Cook stoves	<ul style="list-style-type: none"> <li>Create greater 'syndication' with impact investors to reducing the risk and transaction cost of securing growth capital</li> </ul>	<ul style="list-style-type: none"> <li>Improve ability to measure impact</li> <li>Develop robust performance evaluation methodologies to track the cost-efficiency of the impact</li> </ul>	<ul style="list-style-type: none"> <li>Investigating various ways to measure, price and sell impact to various organizations interested in results-based financing</li> </ul>	<p><b>Implementers:</b> DFID, OPEC / OFID, et al.</p> <p><b>Funders:</b> Shell Foundation</p>

Source: OCA interviews & consultations, supplemented by

1. [https://www.shellfoundation.org/ShellFoundation.org/new/media/Shell-Foundation-Reports/Access\\_to\\_Energy\\_Report\\_2014.pdf](https://www.shellfoundation.org/ShellFoundation.org/new/media/Shell-Foundation-Reports/Access_to_Energy_Report_2014.pdf)



# Many development partners have partnered on initiatives to further accelerate progress towards shared goals for access (1/6)

Multi-lateral	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<b>Energizing Development (ENDEV)<sup>1</sup></b>  <b>Ongoing</b>	 SHS	<ul style="list-style-type: none"> <li>Achieve sustainable access to modern energy services for 19 million people by 2019</li> </ul>	<ul style="list-style-type: none"> <li>Rural partner synergy &amp; private sector development approaches for cook-stoves &amp; solar market development</li> <li>Implement innovative financing &amp; distribution schemes</li> <li>Grid densification projects targeting no-pole connections &amp; implement micro-hydro power projects</li> </ul>	<ul style="list-style-type: none"> <li>Increased access of BoP to improved cook stoves – with more than 500 rural stove artisans, trained and able to sell higher number of stoves – and to increase their income</li> <li>Supported solar co.'s to implement end user financing such as PAYG and consumer financing with local institutions</li> <li>Implemented micro-hydro power projects in Bwindi and Saum and handed over to REA connecting more than 200SMEs, tourist lodges and a local hospital</li> </ul>	<b>Implementers:</b> GIZ – PREEP  <b>Funders:</b> GIZ, SDC, DGIS, DFID, MFA, SDC, SIDA
	 Mini-grids	<p><b>EnDev Uganda:</b></p> <ul style="list-style-type: none"> <li>Improve cook stoves for 550,000 people</li> </ul>			
	 Cook stoves	<ul style="list-style-type: none"> <li>Provide energy for lighting/electrical applications for 157,000 people</li> <li>Provide cooking energy for 500,000 people</li> </ul>			
	 On-grid	<ul style="list-style-type: none"> <li>Provide modern energy services for 1100 social institutions and 1600 SMEs</li> </ul>			

Source: OCA interviews & consultations, supplemented by

1. <https://www.giz.de/en/worldwide/24209.html>, <http://endev.info/content/Uganda>




# Many development partners have partnered on initiatives to further accelerate progress towards shared access goals (2/6)

Multi-lateral	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<b>Africa-EU Renewable Energy Cooperation Programme (RECP)<sup>1</sup></b>  <b>Ongoing</b>	 SHS	<b>Catalyze development of markets to:</b> <ul style="list-style-type: none"> <li>Promote access to energy, supporting sustainable economic growth</li> <li>Develop value chains, providing employment opportunities</li> <li>Enhance energy security and mitigate the impacts of volatile fossil fuel prices</li> <li>Mitigate climate change by substituting clean energy sources for fossil fuels</li> </ul>	<ul style="list-style-type: none"> <li>Policy advisory to support the development of regulatory frameworks</li> <li>Private sector cooperation by facilitating co-investment and sharing of expertise</li> <li>Access to finance by supporting development of bankable projects</li> <li>Innovation and skills development through African-European network, including research and private sector institutions</li> </ul>	<ul style="list-style-type: none"> <li>Provided critical information on energy markets through in-depth studies</li> <li>Helped identify concrete project opportunities through on the ground scouting and matchmaking btw project developers, tech suppliers &amp; service providers</li> <li>Organized networking and information events</li> <li>Supported access to finance through targeted advisory services and an online database of funding instruments</li> </ul>	<b>Implementers:</b> EUEI PDF  <b>Funders:</b> Africa-EU Energy Partnership (African Union, European Union)
	 Mini-grids				
	 Cook stoves				
	 On-grid				

Source: OCA interviews & consultations, supplemented by

1. <https://www.africa-eu-renewables.org/about-recp>




# Many development partners have partnered on initiatives to further accelerate progress towards shared goals for access (3/6)

Multi-lateral	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<p><b>Scaling OffGrid Energy (SOGE): Grand Challenge for Development<sup>1</sup></b></p> <p><b>Ongoing</b></p>	<p> SHS</p> <p> Mini-grids</p> <p> Cook stoves</p>	<ul style="list-style-type: none"> <li>Accelerate growth in the off-grid energy market to provide 20 million households in sub-Saharan Africa with access to clean and affordable modern energy services</li> </ul>	<ul style="list-style-type: none"> <li>Platform for leading donors and investors to incentivize technological innovation, fund early stage companies, and support critical elements of the off-grid ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>Support companies by helping geographic expansion, test new business models and tap into private and public sources of finance</li> <li>Encourage innovation in products and services customers want and need, including energy efficient household appliances, energy storage, and digital financial services.</li> <li>Promote policy and regulatory reforms, spurring the growth of mobile payment systems, and building capacity in local markets</li> </ul>	<p><b>Implementers:</b> KPMG Finland</p> <p><b>Funders:</b> USAID / Power Africa, DFID / Energy Africa, Shell Foundation</p>




Source: OCA interviews & consultations, supplemented by

1. <http://www.cleanenergyministerial.org/Events/scaling-off-grid-energy-grand-challenge-for-development-new-funding-opportunity-80276>; <https://www.scalingoffgrid.org/>

# Many development partners have partnered on initiatives to further accelerate progress towards shared goals for access (6/6)

Multi-lateral	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<b>Energy and Environment Partnership/Southern and East Africa<sup>1</sup></b>  <b>Ongoing</b>	 SHS	<ul style="list-style-type: none"> <li>Contribute to reduction poverty by promoting inclusive and job-creating green economies, and by improving energy security in the Southern and East Africa regions while mitigating global climate change</li> </ul>	<ul style="list-style-type: none"> <li>Funding projects in all fields of renewable energy and energy efficiency, bridging the gap between a good idea and a bankable project</li> <li>Projects are selected through two funding windows from early stage to market ready projects, including last mile feasibility studies, pilots, demonstrations, commercial scale-ups, replication and rejuvenating projects</li> </ul>	<ul style="list-style-type: none"> <li>Providing sustainable energy and agro hubs in Kamwenge district</li> <li>Providing clean energy for the Ugandan dairy industry, biogas for milk cooling</li> <li>Providing sustainable energy services for Kitobo island</li> </ul>	<b>Implementers:</b> KPMG Finland  <b>Funders:</b> Ministry of Foreign Affairs of Finland, DFID and The Austrian Development Agency
	 Mini-grids				
	 Cook stoves				

# Many development partners have partnered on initiatives to further accelerate progress towards shared goals for access (4/6)

Multi-lateral	Target Industry	Target action	Approach	Results to date	Affiliated organizations
<b>Off-Grid Refrigeration Challenge<sup>1</sup></b>  <b>Ongoing</b>	 SHS	<ul style="list-style-type: none"> <li>Seek to catalyze new technological advancements and identify best-in-class commercially available off-grid refrigerators</li> </ul>	<ul style="list-style-type: none"> <li>USD 600,000 competition to increase the availability of off-grid energy refrigeration solutions</li> </ul>	<ul style="list-style-type: none"> <li>Have closed application window , finalists going through lab and field testing of products</li> <li>Will announce winners in August 2017</li> </ul>	<b>Implementers:</b> Global LEAP  <b>Funders:</b> USAID / Power Africa, US Global Dev't Labs, DFID / Ideas to Impact, Global LEAP
	 Mini-grids				
	 Cook stoves	<ul style="list-style-type: none"> <li>Increase the availability of these high-demand products, and in turn increase demand for appropriate solar home systems.</li> </ul>			

Source: OCA interviews & consultations, supplemented by

1. <https://www.scalingoffgrid.org/refrigeration-competition>; <http://globalleap.org/refrigerators/>

# The Government has dedicated capacity and resources to initiatives to advance access to energy and participation of private sector

## Ministry of Energy and Minerals Development (MEMD)

### Mandate in industry

- Has the overarching mandate to promote development of sustainable-use of energy and mineral resources
- Renewable energy department serves under this directorate and runs a number of the programs for access both on and off the grid

### Off-grid initiatives & partnerships

- Implementing several initiatives through ERT, in partnership with the World Bank
- Coordinating cross lateral projects with other ministries such as MoE, MoH

## Rural Electrification Agency (REA)

- Promotes equitable rural electrification access with special regard to marginalized communities
- Provides oversight on how projects are designed and sequenced to provide appropriate energy services based on their value to advance access & economic development

- Implementing UG's Rural Electrification Strategy and Plan (RESP) on behalf of MEMD
- Developing UG's Rural Electrification Master Plan with NARUC and USAID

## Uganda Energy Credit Capitalization Company (UECCC)

- Facilitates investments in renewable energy sector by providing innovative financing products and technical assistance
- Channels investment to projects as the administrator of Uganda Energy Capitalization Trust, the framework for pooling resources from gov't and development partners

- Provides various products in partnership with dev partners and local financing institutions such as:
  - Solar refinancing facility
  - Guarantee fund
  - PAYG solar working capital facility

# The Government has dedicated capacity and resources to initiatives to advance access to energy and participation of private sector

## Mandate in industry

## Off-grid initiatives & partnerships

### Electricity Regulatory Authority (ERA)

- Issues licenses for generation, transmission, distribution or sales of electricity, as well as ownership or operation of transmission systems
- Establishes tariff structures and investigates tariff charges, approves rates, terms, and conditions of electricity services provided by transmission and distribution companies

- Provides licensing for Absolute Energy's island mini-grid
- Involved in licensing negotiations for additional mini-grids & mini-grid pilots, including those by GiZ & WWF

### National Environment Management Authority (NEMA)

- Responsible for coordinating, monitoring, regulating and supervising environmental management in UG
- Focuses activities on providing support to sustainable development through the National Development Plan (NDP)

- Responsible for producing regulations on Environmental Impact Assessments (EIA) & reviewing submitted reports; EIA are required for mini-grid construction

### Uganda National Bureau of Standards (UNBS)

- Formulates and promotes the use of standards
- Enforces standards to protect public health and safety
- Ensures fairness in trade and precision in industry through reliable measurement systems
- Assures the quality of locally manufactured products to enhance the competitiveness of exports in regional and international markets.

- Working with Lighting Africa on adopting and enforcing internationally recognized standards



# Market insights

# Market insights section aggregates research & consultations to assess state of off-grid in Uganda

## Structure

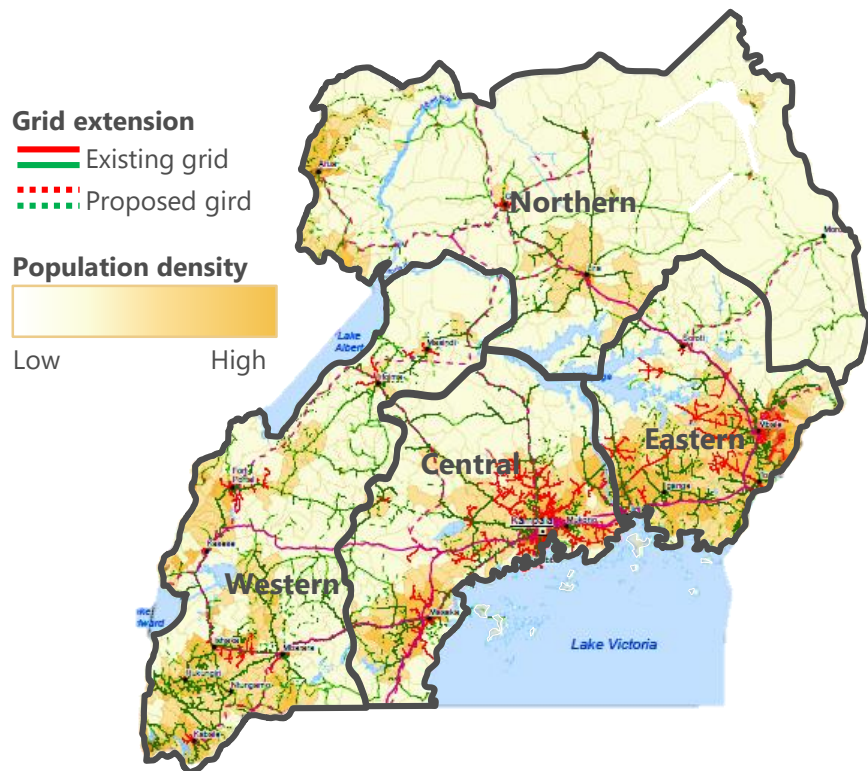
- The Market insights section takes a data-driven approach to industry analysis, seeking to present the state of off-grid development by looking at the two leading solutions – SHS & mini-grids – & the financing landscape that enables their growth

## Purpose

- In this section, we seek to provide dimension & context to the off-grid industry's key players

# SHS operator branches typically located in higher-density regions; SHS sales total ~260k units, with 93% of market unserved

Majority of SHS branches built in higher-density regions



SHS operator distribution branches are located predominately in higher-density areas, with few distribution or service centers in Northern & Eastern provinces

Only ~7% of addressable off-grid market is served

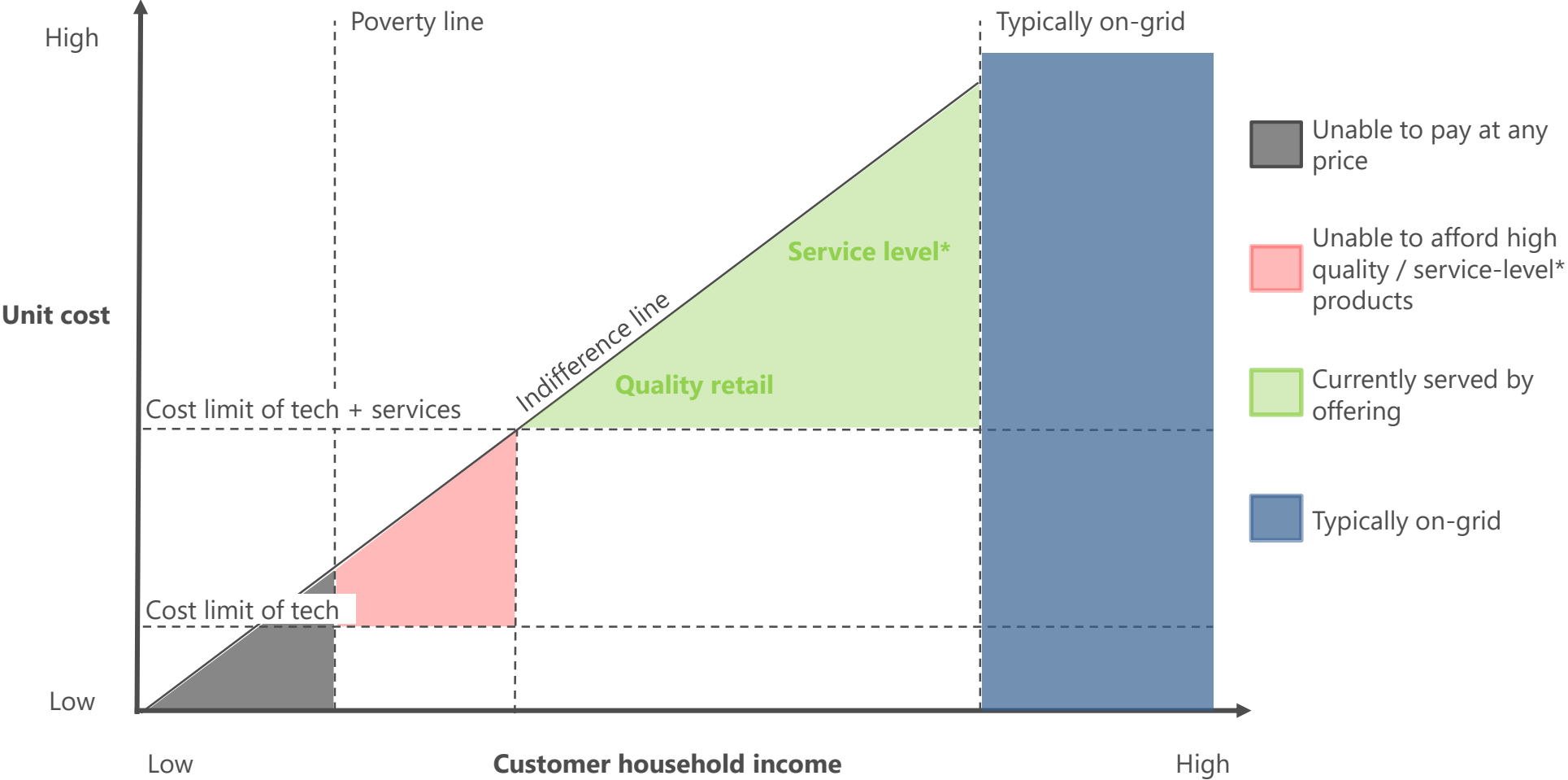
Total population	39 M
% of population off-grid	85 %
Total population off-grid	33 M
% of population above poverty line	62 %
Addressable market	21 M
Equivalent households	4 M
Units sold:	
Fenix	105k
M-Kopa	77k
SolarNow	15.5k
Village Power	10k
Other market	50k
Total units sold	257.5k
Addressed market	7%
Unaddressed market need	93%

**Figure does not include Chinese generics; low-cost units are popular but low-quality – quickly requiring replacement**

UG electricity grid & population density map: <http://data-energy-gis.opendata.arcgis.com/>

Population estimates from UN ESA 2015 estimates; Population off-grid estimates from IEA, World Energy Outlook 2014; Poverty line defined as <\$1.25 per day from UN HDR 2014; Off-grid populations assumed to have same poverty rate as general population; Households assumed to be comprised of 5 people, UNFPA Kenya Estimate, July 2013; All SHS PAYG unit sales are estimates based on OCA consultations

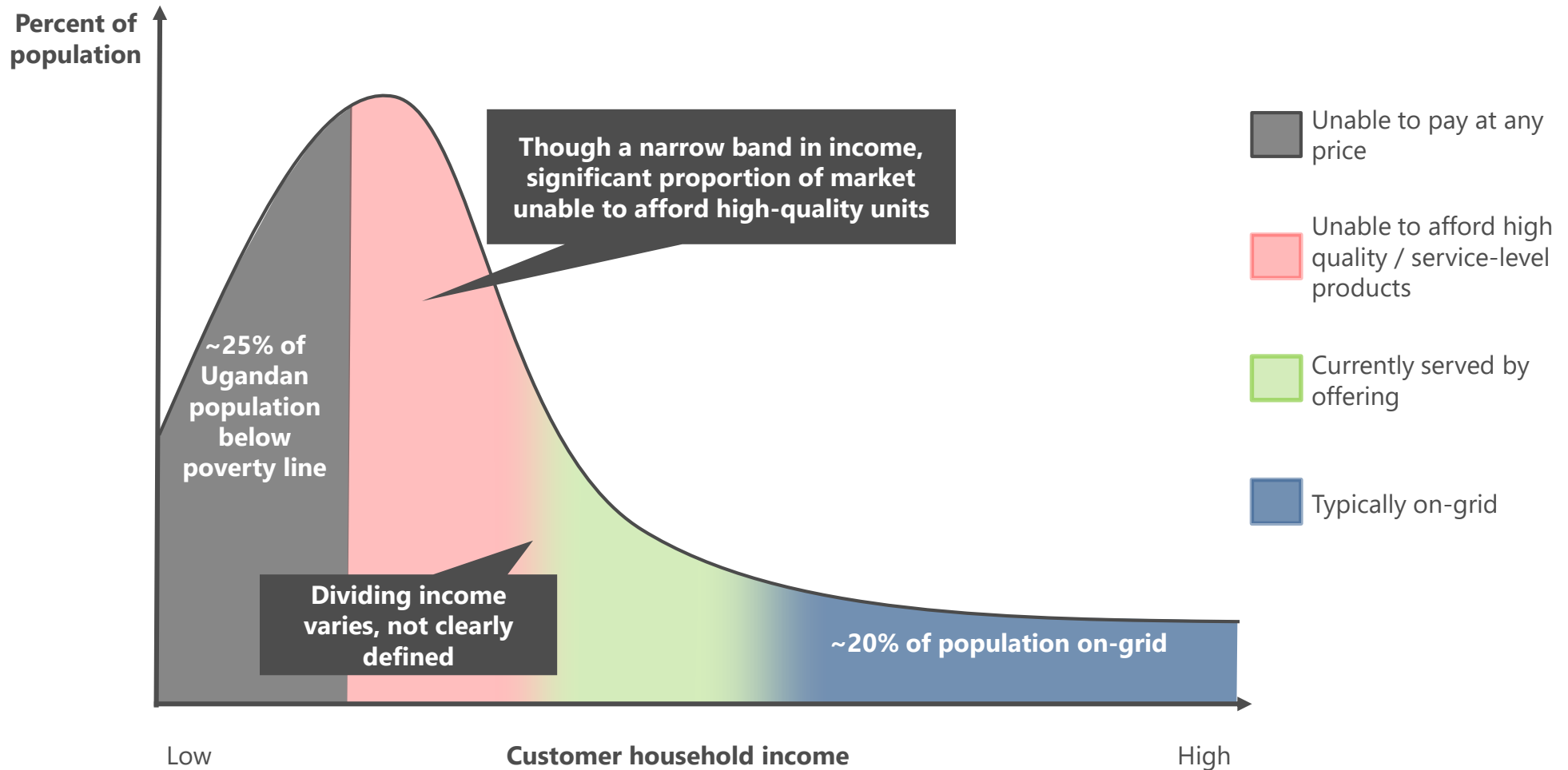
# Leading operators sell to upper market, with lower income populations unable to afford, left to buy low-quality units



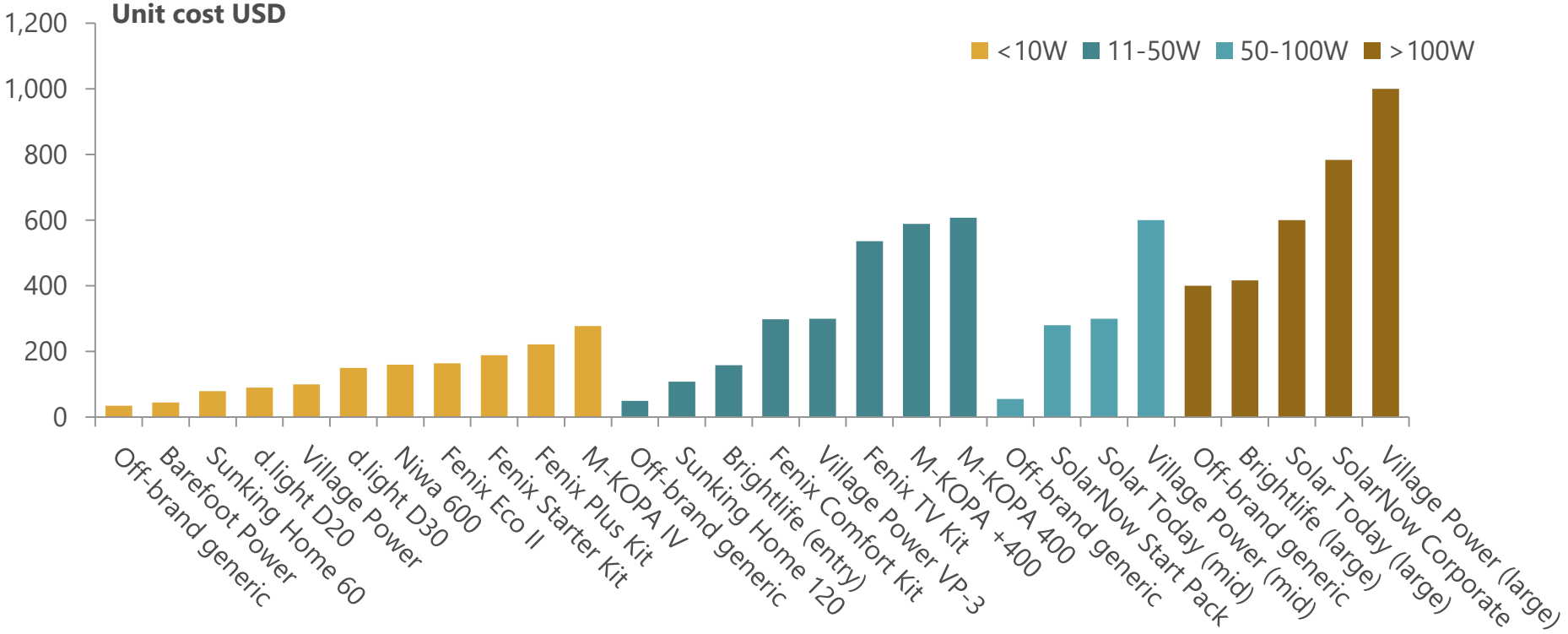
**High cost to provide service means many households unable to afford, left to buy cheap units or continue with traditional fuels**

\* Service-level defined as products offered by businesses able to provide servicing & warranties. These products are of higher quality and are more expensive than Chinese generics. Source: OCA analysis

# Although a small band of income, these unserved populations represent large portion of the Ugandan population



# The SHS ecosystem is the most developed, offers range of products & price points

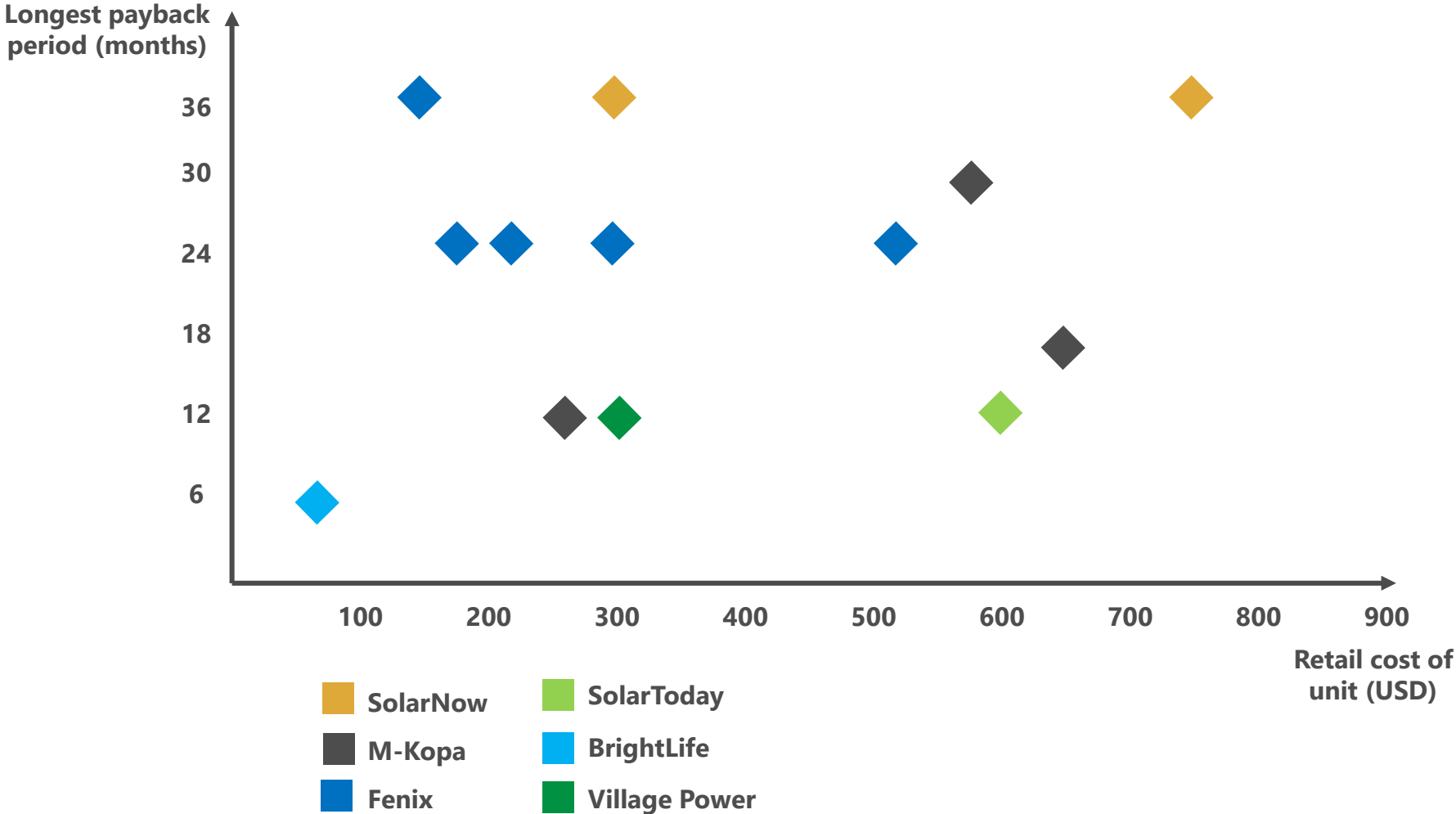


Source: OCA research and interviews, <http://www.fenixintl.com/uganda>, <http://www.m-kopa.com/products>, <https://www.solarnow.eu/solar-solutions>, <http://www.greenlightplanet.com/shop>, <http://power4all.org/products>, <https://www.lightingglobe.org/products>

# Ugandan SHS supplier landscape divided, with price driven by unit quality, warranty provisions, & after sales services

	Off-brand generics	High-quality retail	High-quality service-level
Description	<ul style="list-style-type: none"> <li>Ultra-low cost solar systems, generally sold piece-by-piece</li> <li>Offer similar specs to brand-name products, but often mislabeled, w/short life-span</li> </ul>	<ul style="list-style-type: none"> <li>Brand-name, reputable systems sold retail or resold through distributors</li> <li>Specs and quality equal to brand-name PAYG operators</li> </ul>	<ul style="list-style-type: none"> <li>Brand-name, reputable systems sold directly through PAYG operators</li> <li>Highest cost due to PAYG &amp; after-sales support systems</li> </ul>
Distribution channels	<ul style="list-style-type: none"> <li>Typically sold through hardware shops, general stores in both urban &amp; rural areas</li> </ul>	<ul style="list-style-type: none"> <li>Sold through kiosks &amp; shops, as well as NGOs &amp; donors, often times with heavy subsidy for to final customers</li> </ul>	<ul style="list-style-type: none"> <li>Typically sold through operator-ran network of shops &amp; service centers</li> </ul>
After sales services	<ul style="list-style-type: none"> <li>No aftersales service or warranties provided</li> </ul>	<ul style="list-style-type: none"> <li>After sales service limited to implementing org. / NGO</li> <li>Warranties supplied through manufacturer</li> </ul>	<ul style="list-style-type: none"> <li>After sales services (hardware &amp; PAYG support), as well as warranties provided directly from distributor / operator</li> </ul>
Ex. operators in UG	<ul style="list-style-type: none"> <li>Labeling varies, often intentionally misleading</li> </ul>	<ul style="list-style-type: none"> <li>Manufacturers: Barefoot Power, Greenlight Planet, d.light, and others</li> <li>Distributors: Village Energy, Solar Energy Distributors and other local businesses</li> </ul>	<ul style="list-style-type: none"> <li>Fenix, M-Kopa, SolarNow, Village Power, Solar Today, and others</li> </ul>

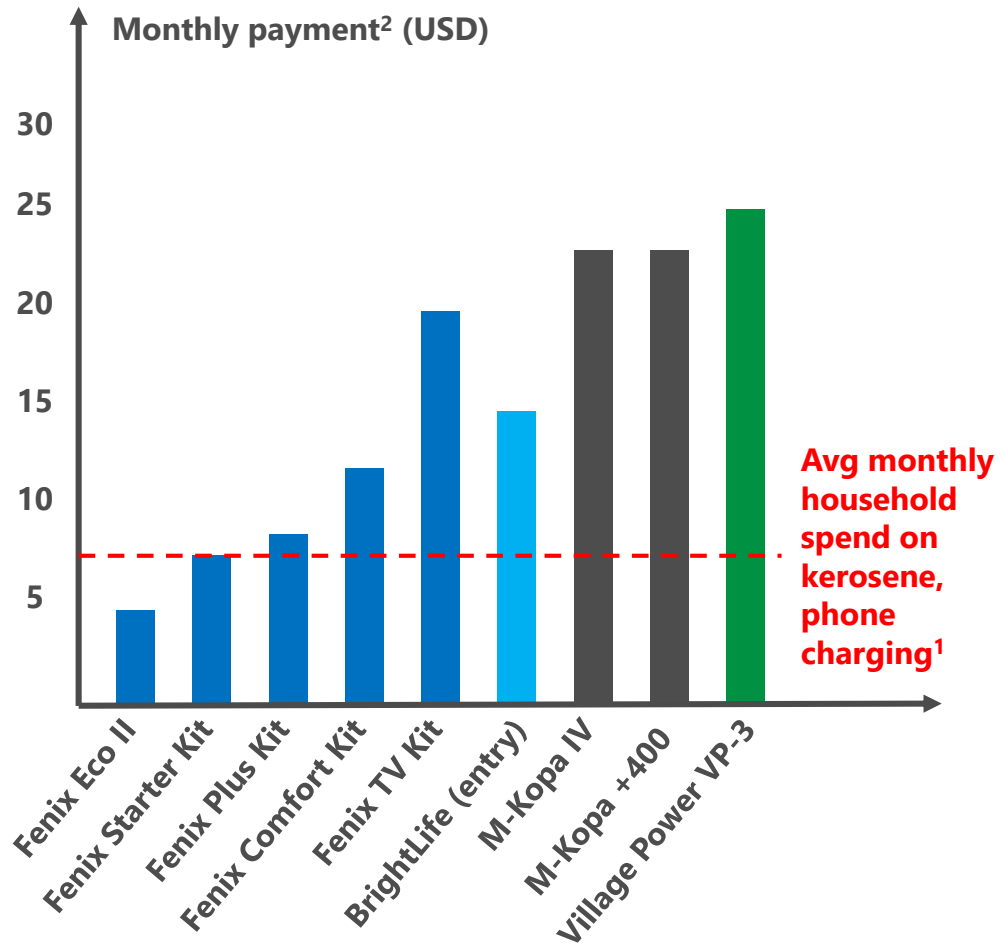
# PAYG companies offer financing periods of between 6 & 36 months, with large variance across price ranges



Note: Longest payback periods are listed for each unit. For example, if a company's USD 300 unit can be financed at 3, 6, & 12 months, only 12 is presented.  
 Source: OCA analysis & interviews



# PAYG monthly payments on cheapest units are typically above the avg monthly displaced spend, with two Fenix units falling below



Affordability of SHS is key market constraint; those who lack ability to pay have two main options:

**1. Purchase lower-functionality 'pico' units:**

- Pico units provide basic light & phone charging at lower prices than SHS
- Some see pico as an important entry to the 'energy ladder' where displaced spending on kerosene / phone charging will allow savings & eventual purchase of larger systems

**2. Purchase low-cost off-brand generic SHS:**


- Low-cost, off-brand generics can cost up to 8x less than higher-quality & service-level products
- These units are often mislabeled (e.g., a 5w panel labeled as a 7w), break easily, & have short lifespans relative to higher-quality products
- Their prevalence in the market harms consumer confidence & is thought to slow uptake of higher-quality, higher-priced units

1. Kerosene estimate; p.8, fn 7 at USD 71 per year; phone charging estimate p.14, at USD 0.26 per week: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/10229.pdf>


2. Some operators (e.g., M-Kopa) offer financing that is paid per-day or per-week; in these instances payments were scaled to compare total monthly spend.

# There is opportunity for cookstoves to leverage synergies with SHS providers to reach more rural & unserved populations

## Clean cookstoves face a number of sales challenges that SHS are well placed to address...

- Though popular in urban & peri-urban areas, cookstove operators struggle to sell to rural customers, where traditional cooking methods are preferred & incomes are lower
  - To reach lower-income customers, some operators offer financing, but have difficulty accommodating customers without existing credit histories (e.g., outside of SACCOs)
- 
- SHS operators are among the most successful service providers in East Africa, with well established channels to rural customers
  - Many SHS are PAYG enabled, allowing operators to remotely control the function of the unit; this functionality enables SHS to be used at "collateral" for other assets that are not well-suited to PAYG technology

## ...while providing potential solutions to some of the key challenges faced by SHS operators

- Unlike SHS, cookstoves are often purchased by women directly, enabling a sales channel that SHS operators have struggled to secure
  - Further, many low-income urban & peri-urban areas are off-grid, providing possible route to a difficult-to-serve demographic
- 
- SHS operators have expressed desire to increase sales volumes to women, but struggle to develop reliable sales paths to reach women
  - Additionally, SHS operators see opportunity in high density urban & peri-urban communities, but have struggled to properly serve these populations

## Together, cookstoves & SHS offer strong synergies, with a number of orgs & operators joining the products:

- UNDP is working with MEMD on the NAMA-Green schools project, which seems to provide clean energy technologies in schools to provide a more holistic solution economic, health, & environmental challenges
- In the private sector, cookstove & SHS operators are begin to leverage the respective advantages of the two technologies to reach a wider range of customers & extend commercial relationship by offering products in series, leveraging the PAYG ability to SHS to allow broader financing of cookstoves

# Energy efficient appliances increase value-prop to customers, can enable income generating activities

## Appliances greatly increase SHS value-prop to consumers...

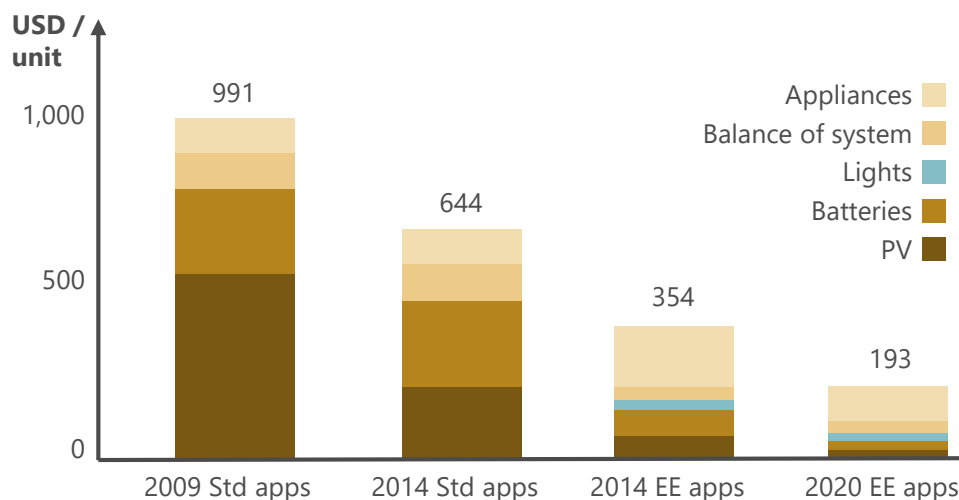
### Operators report TVs & other entertainment drive value

- SHS operators & other stakeholders report that consumer-value is driven by luxury items, primarily televisions

### Energy efficient apps reduce cost barrier to SHS purchase

- Specially designed energy efficient televisions are able to operate off lower-wattage systems
- Because the unit size – and associated payments – are reduced, the “barrier to own” is lower than it would be through a less-efficient appliance

## Energy eff. apps. + falling PV cost greatly incr. affordability<sup>1</sup>



Source: Africa Progress Panel Paper: *Lights Power, Action: Electrifying Africa* (<http://www.africaprogresspanel.org/policy-papers/lights-power-action-electrifying-africa/>)

1. Retail cost trends of SHS with 19" TV, radio, and two lights.

## ...and can create opportunities for income generation

### Certain appliances enable micro-business, income growth

- Hair clippers, sewing machines, & refrigerators, among others, have the potential to be used to create micro-businesses
- The ability to increase income distinguishes this classification of appliances for other uses of SHS, which are designed to increase lifestyle & provide long-term savings

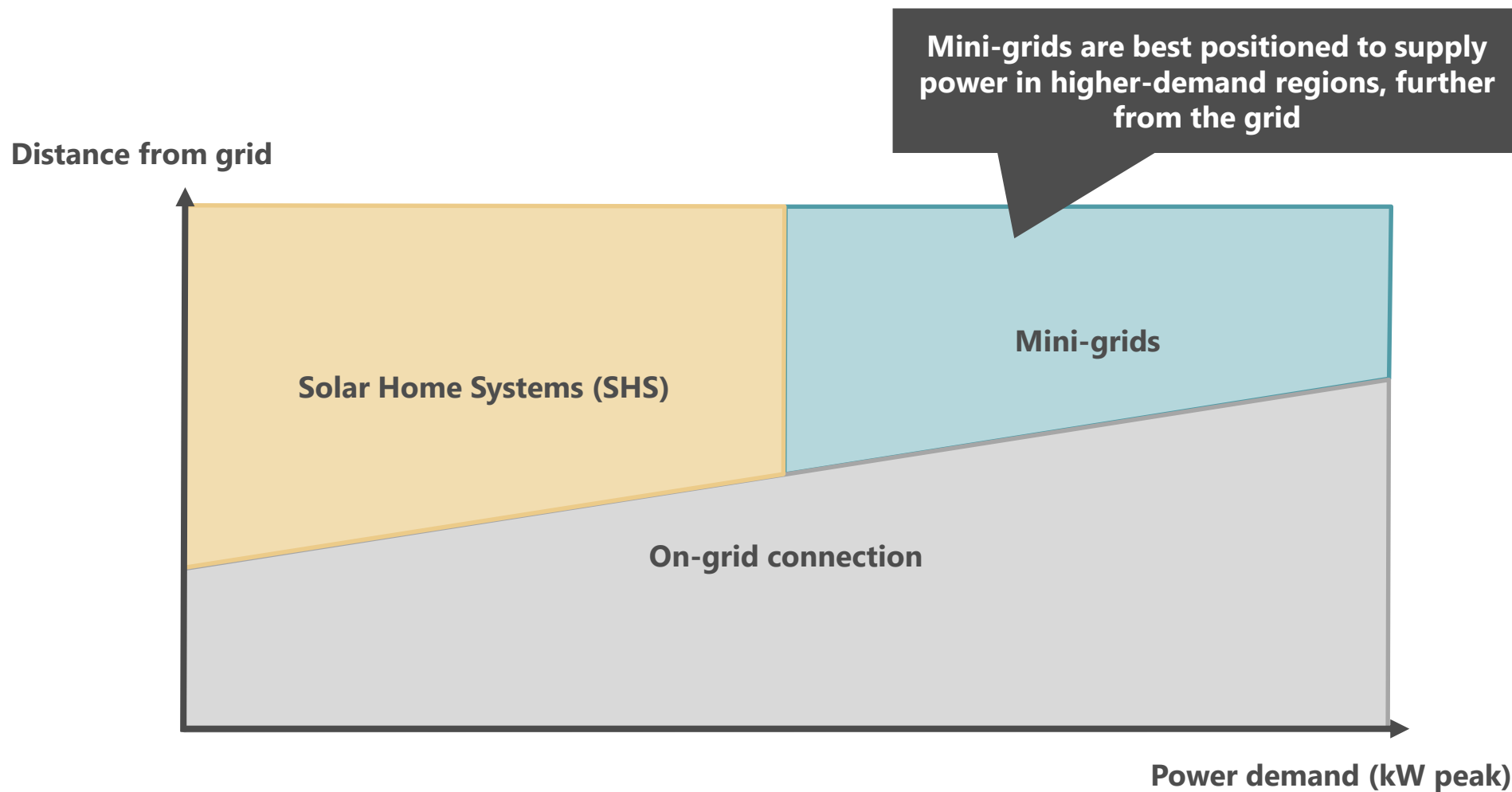
### Income-generating apps help hhs climb energy ladder

- Of central concern to operators across the industry is the ability of customers to climb the “energy ladder”, increasing their energy demand over time
- UNCDF is conducting research to understand if savings from displaced fuels leads to increasing demand for energy in UG; currently, both SHS & mini-grid operators struggle to increase energy demand off displaced fuels alone

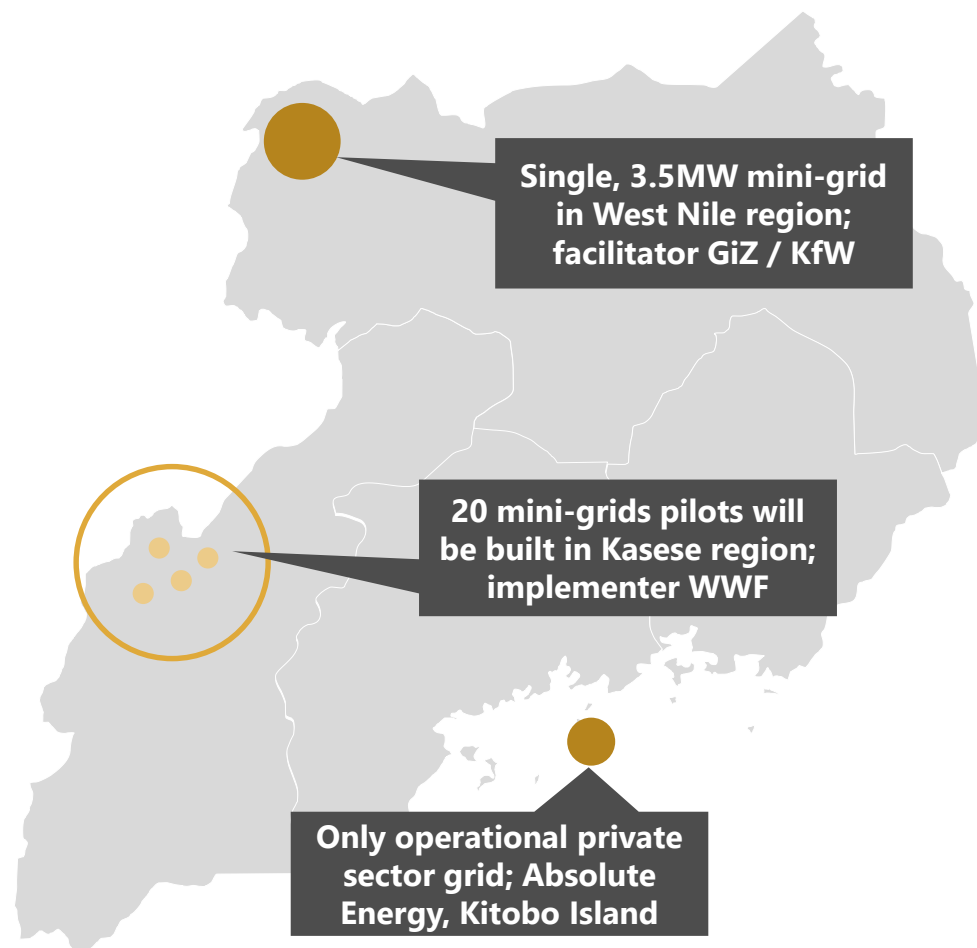
### Operators agree primary barrier is awareness of potential

- Though appliances can increase incomes, operators report that hhs often don't fully understand opportunity
- However, targeted training has been said to increase demand & uptake of these appliances, raise incomes

# Mini-grids are positioned to complement SHS, provide productive-use & appliance grade power



# To date, only a small number of mini-grids have been installed, with majority using solar / battery hybrid systems



## Today, only a single private sector mini-grid is operational in Uganda

- Of private operators, only Absolute Energy has secured the licensing & investment required to build a mini-grid
- Absolute Energy builds on islands in Lake Victoria, thus enabling a more straightforward concession from the government for generation rights

## However, efforts are underway by the Ministries & donor agencies to support growth

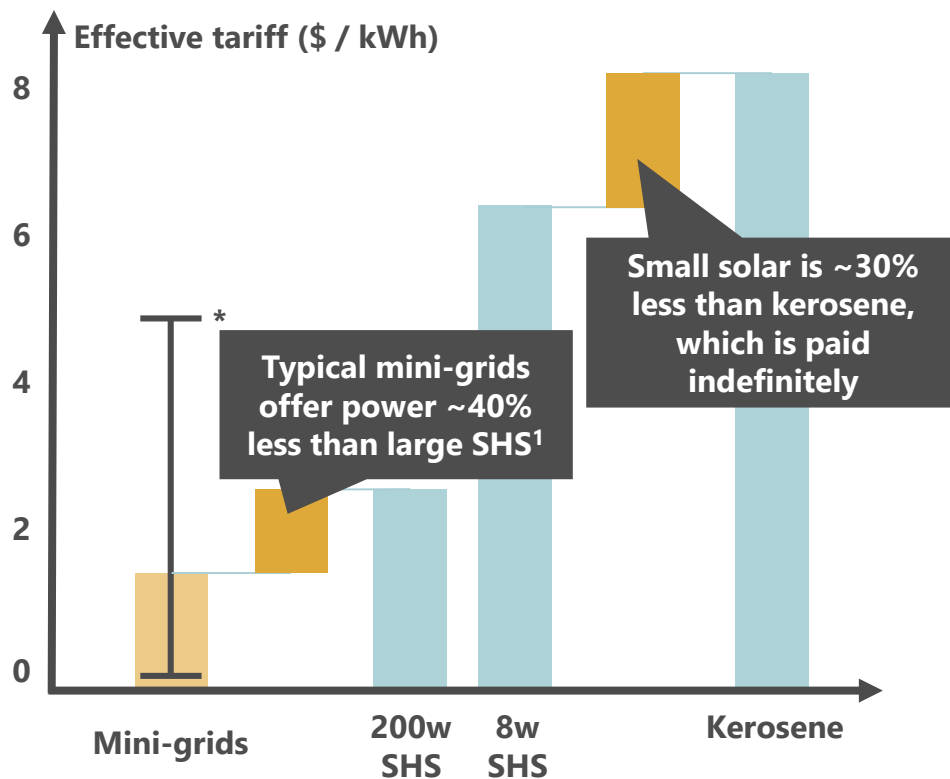
- USAID & GiZ are working closely with REA to design master plans for all 13 of UG's service territories
- WWF is conducting a pilot of 20 mini-grids in effort to prove market
- GiZ is releasing tenders for 15 mini-grids under a pilot program, to be developed by the private sector

## Solar / battery hybrid grids preferred technology

- Mini-grids can be powered on a number of technologies, incl. solar, wind, mini-hydro, biomass, & biogas
- Due primarily to climate & tech cost, the vast majority of UG projects are solar / battery hybrid grids, with a few donors considering mini-hydro pilots

# Mini-grids have the potential to offer power cheaper than SHS, but face a number of operational & political hurdles

Typically, mini-grids offer power at lower rates than SHS



However, mini-grids face variety of operational challenges

## Mini-grid operators must navigate extensive licensing

- Building & operating a mini-grid requires lengthy regulatory approval, often taking >1yr & involving a number of resource-intensive filings (e.g., Environmental Impact Assessments)

## Site identification is intensive, key for success

- Mini-grid operators invest heavily in the locations in which they build & are unable to easily move assets
- Finding locations with sufficient long-term demand is central to reaching profitability
- Site selection relies on a number of inputs, including expected arrival date of the central grid, anchor buyers, & residential & commercial demand within the area

## When uncertainty is high, investors hesitate

- In cases where mini-grid operators are able to navigate the licensing procedures & identify a strong location, investment is generally required to finance Capex
- When the regulatory landscape is not established, & policies surrounded concessions, feed-in tariffs, & duties are uncertain, operators often struggle to secure necessary investment

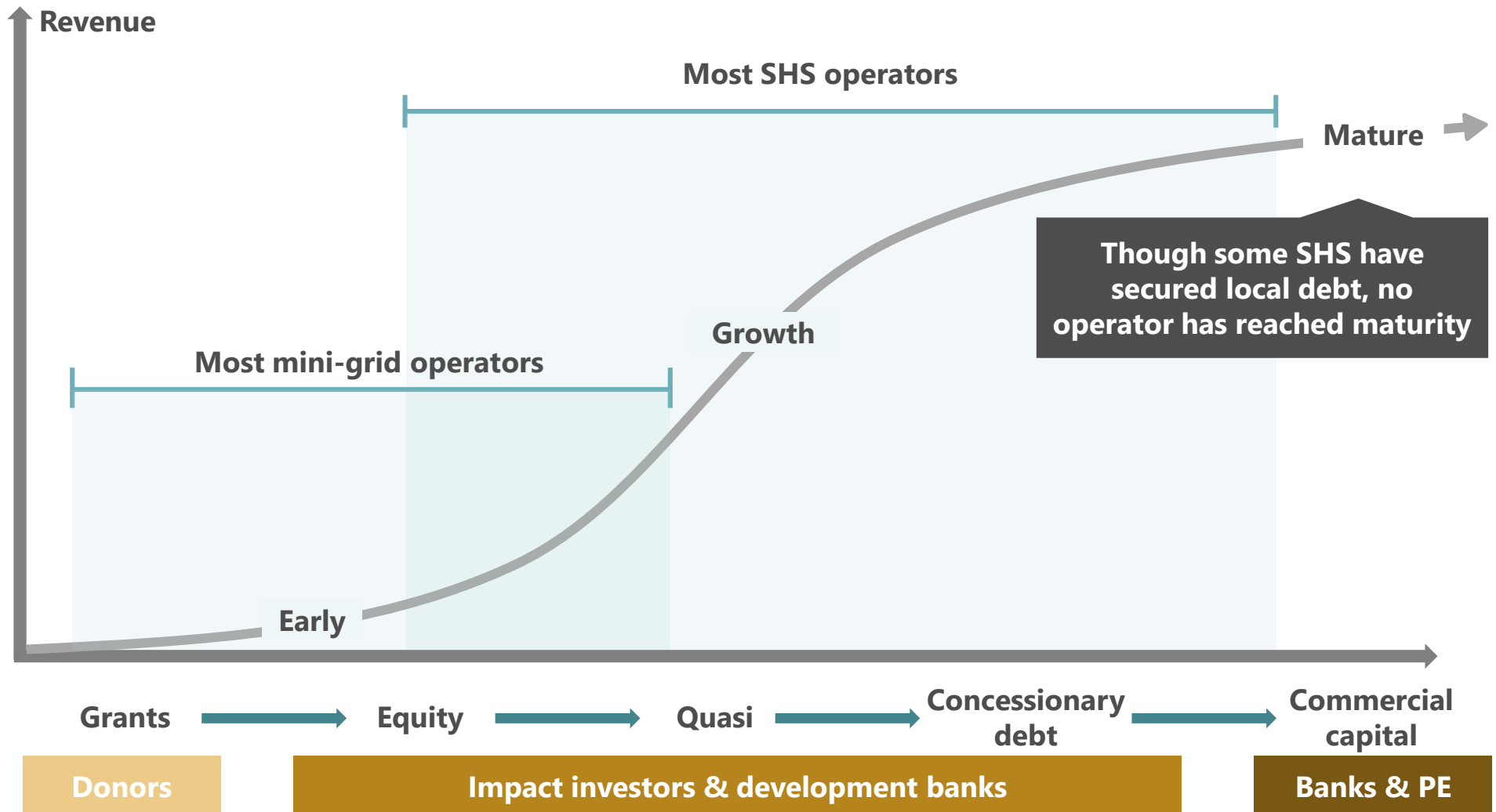
- In addition to supplying power at lower per kilowatt-hour rates than SHS, mini-grids are capable of powering high-demand anchor buyers and productive-use facilities, including industrial refrigerators & mills

\* Bars boundary the least & most expensive tariffs seen for mini-grids. Generally, tariffs move with capacity, with larger capacity grids able to offer cheaper power, and vice versa.

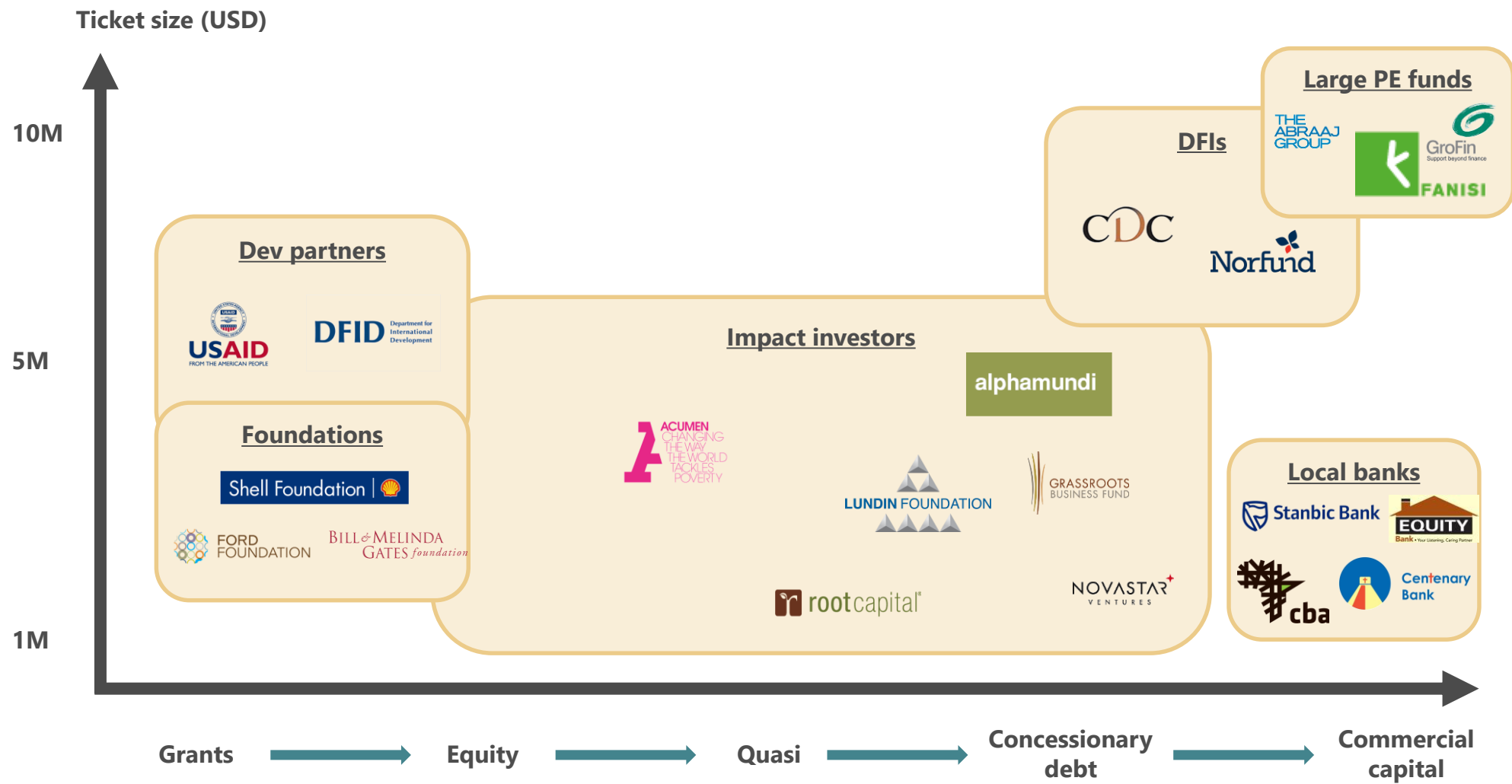
Kerosene \$/kwh equivalent from Azuri Power: [http://www.huffingtonpost.com/pierce-nahigyan/solar-power-is-freeing-ru\\_b\\_10564586.html](http://www.huffingtonpost.com/pierce-nahigyan/solar-power-is-freeing-ru_b_10564586.html)

1. It's important to note that though mini-grids generally offer lower \$/kwh price than SHS, then normally operate a utility model, meaning customers pay this rate as long as they want access, with SHS, units are paid off over time & the \$/kwh becomes 0 once the unit is owned

# While mini-grid operators remain nascent, many SHS operators are experiencing strong growth, with some securing local debt



# Financial institutions & donors provide capital to enable scale; especially for PAYG businesses, where working capital is limiting





# Though banks still require guarantees and / or high collateral, a number of deals have been made, with increasing frequency

## Banks require track-record, guarantees

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### PAYG is a nascent & sophisticated technology

- The consumer financing enabled by PAYG technology has been in the market for less than ten years, & has seen meaningful growth only in the last five
- Many banks remain unfamiliar with the SHS PAYG industry & the sophistication of the business model

### Historically risk averse, banks require assurances

- Ugandan banks are traditionally risk averse; requiring financial assurances that many companies are unable to access or provide, limiting deals:
  - **Guarantees:** Enabled chiefly through dev partners like USAID & SIDA, guarantees provide mechanisms to reduce risk to banks
  - **Collateral:** In the absence of sufficient guarantee, banks require collateral – typically cash or property – to secure a loan; many PAYG companies – particular early-stage – are unable to provide collateral outside of their stock, which banks are unwilling to accept

**Despite challenges, a select number of debt deals have been finalized in Uganda around the region, suggesting key obstacles are being overcome**

# Challenges facing off-grid development

# Consultations with industry stakeholders have revealed eight market challenges

- 1 Local SHS businesses struggle to access capital, management talent, & financial expertise required for scale
- 2 Despite growth, certain populations remain unserved, including the urban poor & rural regions
- 3 Unclear & inconsistent tax policy on SHS imports hurts business case, prevents operators from planning pricing & orders
- 4 Lack of standardized PAYG portfolio performance definitions & reporting methods limit investment
- 5 Businesses struggle to effectively manage currency risk, despite broad, cross-sector attention
- 6 A lack of defined & enforced product standards creates low consumer confidence by allowing low-quality products & servicing to persist
- 7 Development & investment in mini-grids is limited by lack of policy around concessions, feed-in tariffs, guarantees, & duties
- 8 Research for productive-use technologies is less developed than for SHS & mini-grids; potential benefits & capital requirements are not well understood

# Local SHS operators struggle to access the tools, training, & capital needed to reach scale



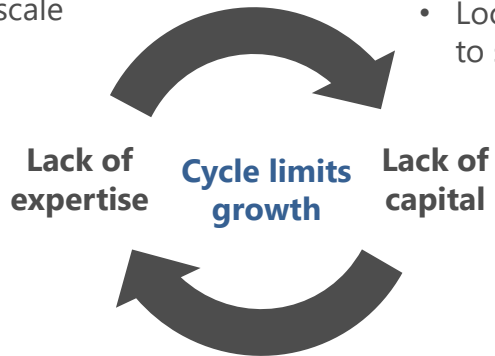
**Local businesses struggle to access expertise, retain talent**

## Key systems remain out of reach for local businesses

- SHS are a low cost, high volume market; to reach scale businesses must employ robust logistical systems; requiring expertise & capital
- For businesses using the PAYG model, the technical expertise required to develop requisite systems is considerable; most local operators do not have the capacity, technical expertise, or capital necessary to build these systems

## Businesses need training to build technical & mgmt. capacity

- Local SHS companies often lack skills to execute key technical & operational tasks
- Technical assistance programs & accelerators are unable to offer the long-term support needed to develop this expertise
- Broadly, some industries have begun developing embedded talent models to facilitate training & technical development, though these remain rare



**Entrepreneurs unable to access local, int'l capital**

## Local operators unable to access local debt...

- Local operators have not developed track record required to secure financing from local banks
  - Further, local players are typically unable to provide the type & quantity of collateral banks require
  - Donor guarantee programs that provide a substitute for collateral to SHS operators are rarely given to local players, in favor of the larger multi-nationals

## ...and struggle to access global capital markets

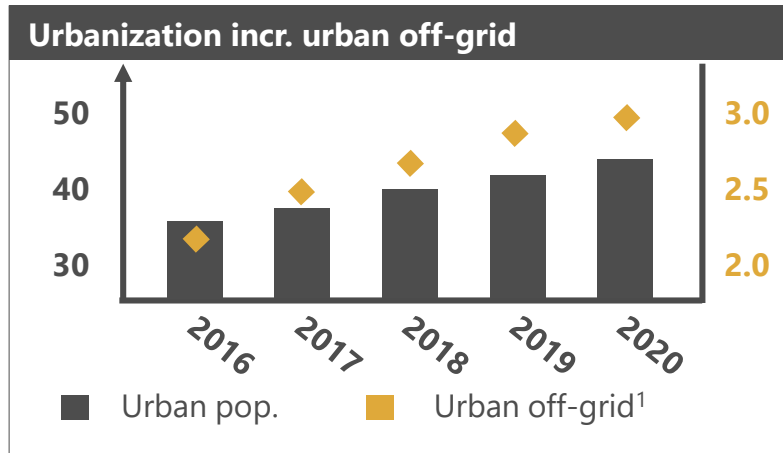
- Local operators struggle to access global capital markets typical leveraged by int'l firms for early growth
- Local entrepreneurs are typically not investment ready, lacking materials global financiers rely on when performing due diligence
- Finally, many entrepreneurs are unversed in the language of impact investing & struggle to communicate their narratives for impact & growth to investors

**A tailored technical assistance pool could provide the type of support local businesses require; focusing on building key business competencies, developing growth strategies & narratives, building capital usage plans, & supporting investor approach & pitching**

# Despite donor efforts to incentivize, providing energy to certain segments of the off-grid populations remains a key challenge



## Urban-poor



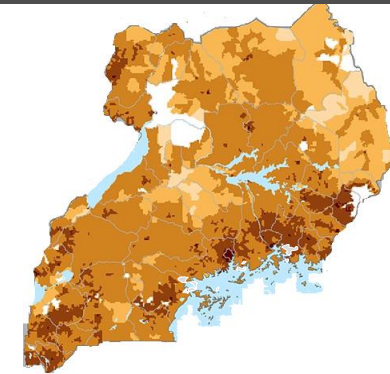
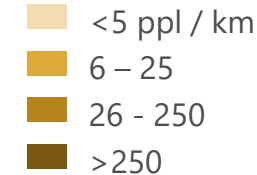
- Population growth & urbanization trends mean nearly 3M (~10%) of Ugandan's off-grid population will be urban by 2020
- Informal urban settlements are poorly suited to modern connectivity & SHS operators struggle to provide service
- Efforts have been made by REA, ERA, & donors to reach the urban poor but electrification rates remain low



## Very rural

### Of 31M unserved & off-grid<sup>4</sup>, majority are rural

#### Pop density



- SHS companies target rural areas surrounding secondary cities, allowing a hub for sales & servicing
- Hard to reach & sparsely populated regions, particularly in Northern Uganda, significantly change the value proposition for SHS operators
- A number of donor programs, including the World Bank's ERT II have sought to encourage business to expand their reach, but a concerted, long-term solution has not been found

1. World Bank report, 38% of urban population connected to grid, 2013: (<http://www.worldbank.org/en/news/press-release/2015/03/03/managing-rapid-urbanization-can-help-uganda-achieve-sustainable-and-inclusive-growth>)

2. Population growth rates from CIA Factbook: (<https://www.cia.gov/library/publications/the-world-factbook/fields/2212.html>)

3. On grid population from World Bank: (<http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS>)

4. Total off-grid pop. is 31M, with 7% penetration, 28M are unserved

# Unclear & inconsistent tax policy on SHS imports hurts business case, prevents operators from planning pricing & orders

**International operators claim taxes on SHS kits ruins business case; local players less affected**

## Recent revocation of SHS kit exemption eliminates business case for most established players

- In June of 2016, the Government of Uganda rescinded the tax exemption status of SHS kits, exposing the products to import duties & VAT
- The tax was retroactive, applying to all imports for the 12 months preceding the new law
- Many major operators claim that with their current margins, this tax would eliminate their unit economic profitability
- Operators continue to sell under assumption the tax will be lifted, and have not passed cost on to customers

## With the tax only applying to SHS kits, larger-unit operators & local players are less affected

- The change in tax-exempt status affected SHS kits only; individual solar products (e.g., panels, batteries) remain exempt
- This means that smaller system operators who import their products pre-packaged, like M-Kopa & Fenix, are affected, while operators that sell larger, installation systems, like SolarNow & some local players, are less affected

**Uncertain state of tax environment, & knowledge that tax can change without notice prevents planning**

## With tax uncertain, some companies have reduced imports

- The change in business case is sufficiently large to substantially affect how operators price their units; operators say the required price to accommodate tax burden would be untenable for their customers
- Reportedly as a direct result of the change in tax policy, affected operators have reduced imports to Uganda, with M-Kopa ceasing shipments all together

**To fight the tax, many operators have struck one-off deals with the government; leading to a chaotic & uncertain tax environment, where duties are enforced inconsistently & unequally among operators**

**A recent initiative lead by GOGLA is working to unite operators & present to government with one voice**

**Broad sentiment across industry is that a known tax is preferable to sustained uncertainty.**

# Lack of standardized PAYG portfolio performance definitions & reporting methods limit sector growth & development

In today's market, PAYG companies define own metrics & do not disclose portfolio health data

## PAYG space lacks uniformity in metric collection

- Though some third party companies offer PAYG-as-a-service solutions – like Angaza in Kenya & Village Energy's upcoming product – most PAYG companies develop systems in-house
- These platforms collect different sets of information about customer demographics, usage habits, & payback, making inter-company comparisons difficult

## Key metrics are defined differently for different companies

- PAYG companies often have very different definitions for key financial metrics, including 'default,' 'Portfolio at Risk (PAR),' 'grace period,' 'write-off ratio,' & 'Lifetime Revenue Ratio (LRR)'
- Because there is no standardization across businesses, it is difficult to compare the performance of operator portfolios

**A number of programs are underway focusing on metric standardization, including Village Energy / UNCDF's PAYG platform & KPI harmonization; & a global initiative from GOGLA**

Standardization offers opportunity to increase market visibility, allow outsourced financing, & grow investment

## Standardization would allow benchmarking, tailored financing

- If PAYG operators adopted standardize collection metrics & portfolio health definitions it would be possible to anonymously collect data across operators to assess the state of the industry
- This would enable businesses, investors, & donors visibility into the broader health of the industry
- Shared data would allow capital providers to better assess the true needs of the industry & design tailored, more effective financial products

## Portfolio standards would enable outsourcing of consumer financing; enfranchising small players & increasing investment

- Standardized reporting would allow PAYG operators to outsource consumer financing to specialty third party entities such as the World Bank, SunFunder, & Lendable
- This would allow operators to focus on their core business of selling units, passing risk management to an entity specifically designed to manage it
- Consumer financing expertise – a key barrier to entry – would be removed, enabling smaller businesses to enter the market
- Finally, aggregating consumer financing lines to a specialty firm would allow tranching & more accurate pricing; paving the way for much larger capital investments

# Managing currency risk continues to be major challenge, despite broad cross-sector attention

## All off-grid operators face same currency challenges

### Large & small operators alike buy units from China

- Regardless of size or technology, virtually all solar products are purchased from Chinese manufacturers

### Chinese product purchases are made in dollars

- Though terms of sale vary, manufacturers require payment in hard currency, almost always U.S. dollars

### Sales are made in Ugandan Shillings

- Off-grid product providers sell in Ugandan shillings
- For operators that sell units in cash, foreign exchange exposure is relatively limited, existing only between the time of payment to the manufacturing & sale in Uganda; generally this is between 4 & 6 months
- Operators who offer financing to consumers face much greater exposure since revenues from sales are realized over the financing period

**In the last 24 months, UGX has depreciated ~40% against the USD<sup>1</sup>**

## FX risk remains central challenge

### In-house hedging is expensive, requires substantial expertise & is out of reach for smaller businesses

- Larger, international businesses have developed in-house hedging systems; these systems remain expensive, often >12%
- Further, developing in-house hedging requires considerable technical expertise, creating a major barrier smaller operators

### Accessing local currency debt from local banks remains elusive, even for established players

- The most effective way to hedge currency risk is to not need to; however, the majority of local capital is unwilling to take on the risk profile of offered by today's off-grid businesses
- In recent months, some direct investments have been made by local banks to SHS companies, suggesting that local capital may be warming to the industry; however, substantial collateral (provided via guarantees by donors or with business owned property) was required to enable the deals
- Outside of direct investment, local banks are more willing to establish ancillary financial facilities (e.g., trade financing) that is perceived as lower risk than providing direct debt

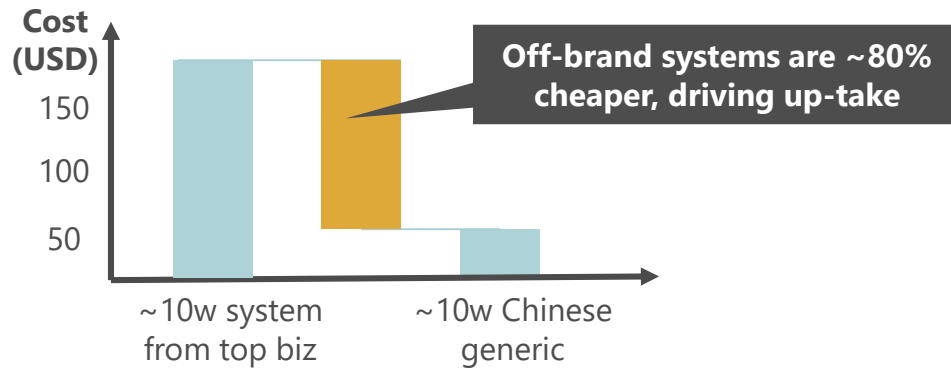


# SHS growth stunted by lack of product standards & awareness of standards, contributing to low consumer confidence

**Lack of product standards means consumers don't know what they are buying**

## Consumers are most sensitive to unit price

- Even with financing, SHS units are a major purchase for many off-grid consumers; leading to strong preference for low cost units
- Low-cost units are often miss-labeled (e.g., advertising a 5w unit as 7w) & low quality, breaking soon after purchase



## Unknowingly buying low-quality units erodes consumer trust

- Consumers struggle to distinguish high- from low-quality units, & when a unit does not perform or breaks, market confidence is damaged

**Creating a standardized certification for units would help keep customers informed of what they are buying, increasing trust in the market**

**Lack of technical certification for servicers means customers are unaware of where to go when units break**

## "One-size fits all" solar systems require minimal servicing...

- Solar mini-kits have few moving parts and do not require significant technical expertise for servicing

## ...while larger, tailored systems require significant expertise

- As units grow in functionality, the expertise needed to service the unit increases
- Expert servicers struggle to distinguish themselves for low-cost, untrained technicians
- Low-quality servicing damages consumer trust in the market, making them and other hesitant to purchase products in the future

**Creating a certification process for technicians would allow service providers to distinguish themselves & improve relationship with customers**

# Development & investment in mini-grids is limited by lack of policy around concessions, feed-in tariffs, guarantees, & duties

## Mini-grids require alignment across four key areas to scale

- 1 Clear & credible master plan for grid extension**
  - Developers need a long-term outlook on grid extension in order to know regions remaining off-grid
- 2 Strong evidence of demand, quality grid sites**
  - Chief concern of developers & investors is the ability to secure quality sites with adequate long-term demand in regions outside of grid extension
  - Donor-supported piloting often required
- 3 Clear path to profitability & risk management**
  - Before placing capital, investors want to see a path to financial return – requiring clear policy on concessions, tariff guarantees, & duties
  - Policy on feed-in tariffs needed to provide security to investors in event of grid arrival
- 4 Investor understanding of financial return profile**
  - Return timeline, financial structuring, & investor expertise for mini-grids differs from SHS
  - Investors generally have less experience with mini-grids, leading to hesitance in placing capital

## Though early, substantial progress is underway to create ecosystem conducive to growth

- USAID / GiZ working with REA to build master plans**
  - Across the 13 service territories, USAID & GiZ are working with REA to design off-/grid master plans
- GiZ, WWF executing pilots across UG to prove market**
  - WWF is currently building 20 grids to prove biz models, consumer demand
  - GiZ will launch 15 tenders to test up-take, demand
  - USAID has ID'ed 90+ high-potential sites for grids
- REA, Ministry working with donors to define key policies**
  - In collaboration with USAID & GiZ, REA & the Ministries are working to articulate & pass key legislation governing concessions, guarantees, duties, & feed-in tariffs
- Donors seek neutrality, leaving gap in investor outreach**
  - Only a single privately held grid operates in Uganda
  - While donors & government push to subsidize development & encourage investment, little outreach has been made to educate investors on opportunity in effort to maintain neutrality in tendering process

# Potential of productive-use solutions is not well understood in the Ugandan context, despite interest

## Productive-use can extend / increase agric. value chain

### *Large opportunity for improved efficiency & increased output across agricultural production chains*



#### Extending cold chain to reach 5 milk regions of UG

- Milk production in 2011 was at 1.6-1.8 billion liters from 38 central processing plants across 5 UG regions
- Estimated that 20-50% of all milk production is wasted due to lack of timely cooling
- Strategically placed off-grid collection centers can service these processing points, increasing effective production & farmer income by >20%



#### Enabling irrigation in off-grid, low water regions

- Ugandan produce is supplied largely by small-holder farmers, with great density in the Western & Eastern regions
- Solar irrigation systems are able to reduce labor costs by 30%, increase annual yields by 40% and further increase farmer incomes by 30% per month



#### Improving ag processes across industries, crops

- Many agricultural processes require or would benefit from access to electricity
- For example, the drying process for tea – representing \$100 million in UG annual export – is significantly expedited from low-capacity, electric driers

## Productive-use opp. less researched than residential

### *The opportunities of productive-use technologies are less researched, less mapped than SHS & mini-grids*

#### Map opportunities for productive-use in Uganda

- The business case for productive-use is less researched & mapped than for SHS or mini-grids
- Coordinated research on rural agriculture value chain would allow better sizing of the market & potential long-term benefit to farmers

#### Work with businesses to understand viable models

- Though a number of businesses in UG focus on productive-use, they have not succeeded in attracting capital to the same extent as SHS
- Further, the major UG SHS companies do not provide productive-use products

#### To grow, opp. needs to be linked w/biz, funding

- To reach scale, the UG opportunity must be accurately mapped & tied to operators
- From this, capital needs can be defined & financing can be secured

