



# MAPPING THE OFF-GRID SOLAR MARKET IN SENEGAL

2019

Source: Signify Foundation

ignify foundation

 **intellicap**  
AAVISHKAAR GROUP

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## Abbreviations

<b>ACE</b>	Africa Clean Energy Programme
<b>AFD</b>	Agence française de développement (French Development Agency)
<b>AfDB</b>	African Development Bank
<b>ANER</b>	National Agency for Renewable Energy (Agence Nationale pour les Energies Renouvelables)
<b>ASER</b>	Senegalese Rural Electrification Agency (Agence Senegalaise D'electrification Rurale)
<b>ASN</b>	Standards Association of Senegal (Association Sénégalaise de Normalisation)
<b>BD</b>	Business Development
<b>CRSE</b>	Electricity Sector Regulatory Commission (Commission de Régulation du Secteur de l'Électricité)
<b>DFID</b>	Department for International Development

<b>ECREEE</b>	ECOWAS Renewable Energy and Energy Efficiency Centre
<b>EnDev</b>	Energizing Development
<b>ERIL</b>	Local Rural Electrification Initiative (Electrification Rurale d'Initiative Locale)
<b>GoS/Govt.</b>	Senegalese Government
<b>HH</b>	Household
<b>LPDSE</b>	Energy Sector Development Policy Letter (Lettre Politique de Développement du Secteur de l'Énergie)
<b>MNO</b>	Mobile Network Operator

## Abbreviations

<b>MEP</b>	Ministry of Energy and Petroleum
<b>MFI</b>	Microfinance Institution
<b>OGS</b>	Off-Grid Solar
<b>PANER</b>	National Action Plan for Renewable Energies (Plan d'Actions National des Energies Renouvelables)
<b>PASER</b>	Senegalese Rural Electrification Plan of Action (Plan d'Action Senegalais d'Electrification Rurale)
<b>PAYGO</b>	Pay-as-you-go
<b>PERACOD</b>	Promotion of Renewable Energy, Rural Electrification, and Sustainable Supply of Household Fuels
<b>PNER</b>	Rural Electrification Programme (Programme National d'Électrification Rurale)
<b>PPER</b>	Priority Rural Electrification Programme (Programme Prioritaire de l'Électrification Rurale)

<b>PREM</b>	Multi-sector Energy Programme (Programme Énergétique Multisectoriel)
<b>RE</b>	Renewable Energy
<b>ROGEP</b>	Regional Off-Grid Electrification Project
<b>SCEC</b>	Cooperative Society of Energy Citizens of Senegal (Cooperative la Société des Coopératives d'Energies Citoyennes du Sénégal)
<b>SE4ALL</b>	Sustainable Energy for All
<b>SHS</b>	Solar Home Systems
<b>SPL</b>	Solar Portable Light
<b>SREP</b>	Senegal Rural Electrification Programme
<b>SLS</b>	Solar Lighting System
<b>WTP</b>	Willingness to Pay



# MARKET OVERVIEW

- 1.1 Market potential
- 1.2 Market penetration
- 1.3 Product offerings

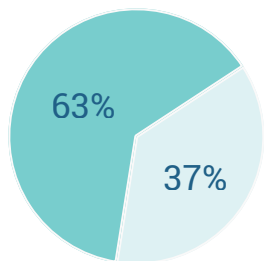
**Market potential: Senegal has an electricity access rate of ~62%. According to Senegal's SE4All agenda, an investment of \$56 Mn is required to install 15.4 MW of decentralized systems, by 2025, for universal access**

## ACCESS TO ELECTRICITY

GoS has proposed the following OGS solutions based on population and density, for electrification of HHs by 2025

No. of inhabitants	Density of Areas	Solar PV minigrid	SHS
>500		✓	✗
100-500	Dense	✓	✗
	Dispersed	✗	✓
<100	Dense	✓	✗
	Dispersed	✗	✓

Source: SE4All Agenda, Senegal



- Population with access
- Population without access

- ~8% of urban and 65% of rural areas do not have access to electricity in Senegal (2017)
- The additional plan for universal access by 2025 laid down in the SE4All Agenda, requires an investment of \$56 Mn in decentralized solutions, including \$44 Mn in minigrids (with \$24 Mn in solar minigrids) and \$12 Mn in stand alone solar systems
- Senegal has one of the most expensive electricity tariffs in Africa which is over \$0.26/kWh. High electricity tariffs create a favorable market for alternative off-grid solutions
- According to World Bank, **Senegal and Nigeria will develop over half of the planned minigrids in Africa by 2030**. ~1,217 minigrids (diesel, hydro and solar-hybrid systems) will be installed in Senegal by 2030, ~16% of planned minigrids globally

## KEY GOVERNMENT TARGETS THAT CONTRIBUTE TO THE OVERALL MARKET OPPORTUNITY

### National Action Plan for Renewable Energies (PANER), 2015

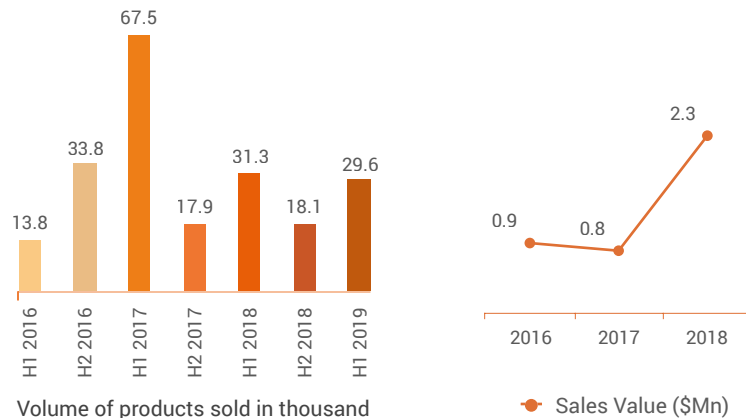
- 783 minigrids (renewable or hybrid) to be constructed by 2030
- 9% of the population to be electrified by RE or hybrid minigrids and 6% by RE based stand-alone systems, by 2030

### Senegal Sustainable Energy (SE4ALL) Rural Electrification, 2018

- 8.54% of villages or 4% of the rural population to be electrified through solar only or solar-diesel hybrid minigrids by 2025
- 3.26% of the villages or 1% of the rural population to be electrified with individual solar systems by 2025

## Market penetration (Solar lanterns, SHS, SLS): Senegalese OGS market is at an early stage and prone to fluctuations. SHS have reached only ~19% of Senegal's unelectrified population

### SALES VOLUME OF STAND-ALONE SOLAR SYSTEMS PEAKED IN 2017, BEFORE LEVELING OFF IN 2018

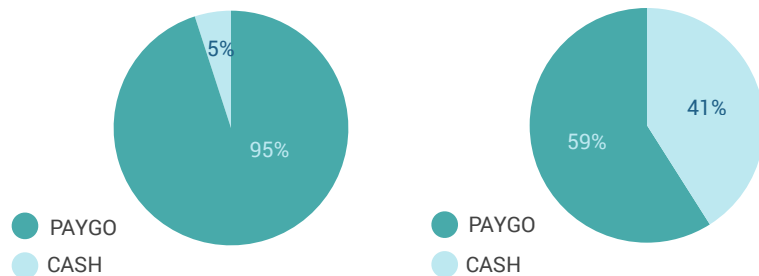


Volume of products sold in thousand

● Sales Value (\$Mn)

- **Senegal experienced a spike in sales in 2017, before levelling off in 2018.** Growing market saturation in terms of product affordability and geographic coverage may have contributed to this trend. Another reported factor is that customers may delay SHS purchase until they can afford a kit including a TV
- Higher volume of sales in the first half of the year in 2017 and 2018 could be due to an overlap with the harvest season in the first half
- **Coverage of OGS is lower in eastern departments** (Matam, Ferloos Regions, Casamance, and Kedougou) compared to the western departments (Mbour, Tambacounda, Ziguinchor-Sedihou, and Louga-St Louis-Dagana). This is due to the **higher operational costs** in the eastern departments

### 95% OF TOTAL VALUE AND 41% OF TOTAL VOLUME OF OFF-GRID SOLUTIONS SOLD WAS ATTRIBUTED TO PAYGO MODELS IN H1 2019



- **~95% of sales value** was derived from **PAYGO** in H1 2019, demonstrating high value creation through PAYGO models, even though PAYGO sales volume remained stable
- The first wave of PAYGO came in 2016 led by **Oolu Solar and Baobab+** selling simple, 3-lamp/charger SHS. Mid-2018, saw a second wave of larger Tier 2 SHS with companies like **Suntaeg, Vitalite, PEG and BBOXX**
- Companies **deploying PAYGO attracted 91%** of total investment in OGS market globally, between 2016 and 2018

## Market penetration (Minigrids): At the end of 2016, Senegal had a total of 142 clean energy minigrids, highest in Africa, with an installed capacity of 1.3 MW

IN DEC 2016, THE ECOWAS RE AND EE CENTRE (ECREE), MAPPED 142 CLEAN ENERGY MINIGRIDS IN SENEGAL (INCLUDING 46 SOLAR PV ONLY AND 96 HYBRID) WITH 1.3 MW OF INSTALLED CAPACITY

- Majority of the minigrid projects are **funded by donors** and **constituted under the Local Rural Electrification Initiative (ERIL)** with GoS (Senelec or ASER) responsible for ownership. **Private sector participation is limited to an operational role, taking engineering, procurement, and construction (EPC) and operations and maintenance (O&M) contracts**
- **Companies pursuing the development of their own minigrids include Engie, Ilemel, Valerium, Power Africa Trade, Eneki, Theloze, Coselec, and Prosolia.** This pipeline, however, has stalled due to licensing and tariff subsidy issues. While operators do not own the minigrid systems, they have to incur capital expense for maintenance and upgrades, the cost of which is not contemplated in the tariff-setting process

- According to USAID's recent off-grid solar market assessment report for Senegal, **only a few minigrids were operational under ERIL** in 2018. Among these were 10 minigrids constituted under Project Daye Ownes and financed by the Govt. of Netherlands in 2011. Most non-operational minigrids showed a pattern of poor O&M planning due to non cost-reflective tariffs, under-sizing of the grid, and lack of metering and monitoring
- Recent minigrid projects include a 2018 tender for **78 minigrids in Matam and Bakel** and an EPC with the **German GAUFF Engineering to build 300 minigrids**

### BARRIERS TO SCALING MINIGRIDS IN SENEGAL

- **Tariffs are not reflective of the cost of operating and maintaining a minigrid.** The cost of major upgrades—to increase generation capacity, extend the grid, or install meters—are not included in the tariff-setting process
- Inability to obtain a license due to a non-functioning private licensing process leads **difficulty in obtaining loans** for maintenance and upgradation of minigrids
- There is **uncertainty regarding public subsidy** for private minigrids
- The **grid extension process is opaque** and adversely affects the planning of minigrid operations
- **Feed-in tariff** for minigrid operators to sell electricity to Senelec has **not been defined**



## Market potential (Productive use): Senegal is an attractive market for off-grid productive use technologies with a potential market value of \$70-\$132 Mn, largely driven by Solar PV-based irrigation systems

Productive use of energy refers to use of energy for technologies in agricultural and commercial activities that result in the production of goods or provision of services

### SOLAR PV FOR IRRIGATION

- There is a high market potential for solar PV irrigation in Senegal given the dependency of the economy on agriculture. 50% (7.5 Mn) of the households are engaged in agriculture, which comprises of 90% smallholders. ~ 25,000 traditional pumps are operational in Senegal. The GoS is promoting solar pumping through its National Strategy on Renewable Energy Development (2016-2020)
- Assuming a market penetration rate ranging between 25%-50%, market potential of solar PV irrigation systems is ~\$61 - \$123 Mn

- National Agency for Renewable Energy (ANER) is instituting a program to replace diesel water pumps with solar pumps for irrigation and drinking water applications
- Current projects include a solar PV irrigation pilot with PAYGO financing by the Sustainable Energy Lab of Columbia University, whereby a 6.8 kW solar PV system was set up in the Niayes region to enable pumping of water from shallow wells, covering 7 horticulture farmers

### MARKET POTENTIAL OF SOLAR MILK CHILLING

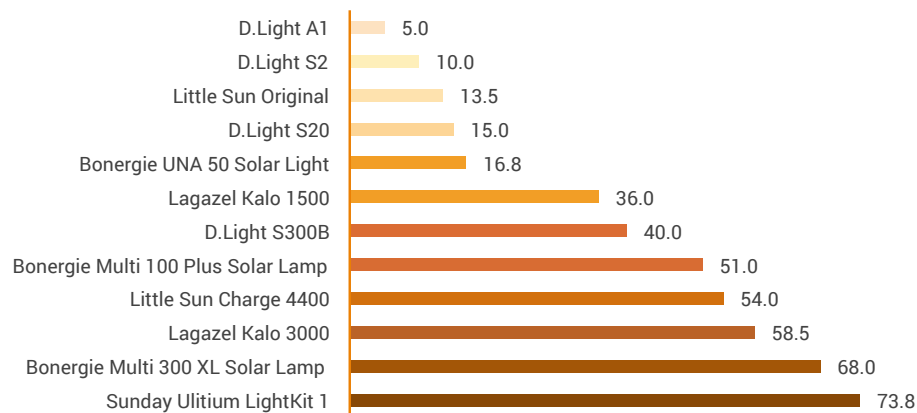
- Given that 450,000 households in Senegal are involved in livestock breeding, there is a significant potential in this market
- Based on a recent Get.Invest report, an installed capacity of close to 20 MW would be required to serve all livestock farmers in Senegal. Assuming Solar PV price of \$2.2 per W and a 20% market penetration, **market potential of solar PV for cooling is estimated at \$8.51 Mn** (not including the cooling equipment) market penetration, **market potential of solar PV for cooling is estimated at \$8.51 Mn** (not including the cooling equipment)

### DEMAND BARRIERS

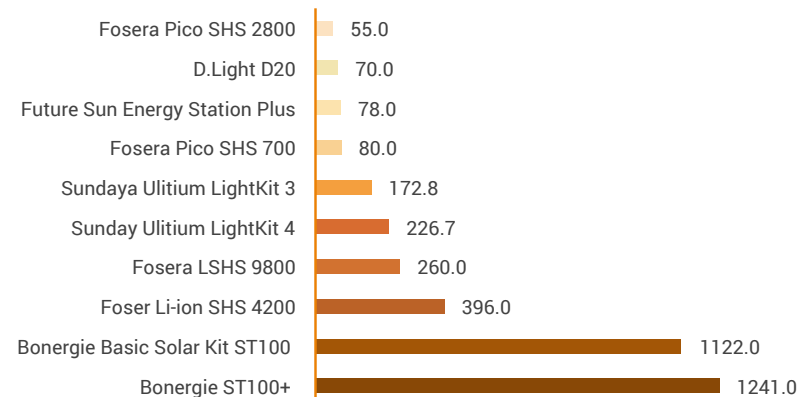
- **Affordability:** High cost of technology relative to farmer income levels
- **Awareness:** Poor knowledge about the availability and use of technologies, and
- **Accessibility:** No established market leading to limited options for obtaining the technology

## Products: Product landscape is wide-ranged & divided, with price driven by quality, warranty, PAYGO options and after sales service

### Solar Lights/Lanterns Product And Prices\* (USD)



### Solar Home Systems Products And Prices\* (USD)



#### Off-Brand Generics

#### Description

Low cost, may offer similar specifications to branded products but maybe of lower quality

#### Examples Of Operators In Senegal

Labelling varies



#### Branded Retail

Brand-name, reputable systems sold via retail or through distributors

#### Branded Service Level

Brand-name, reputable systems sold via retail or through distributors and sold through PAYGO  
Higher cost due to PAYGO technology

**Products (Productive use technologies):** A few companies are incorporating productive use solar products such as solar water heaters, water pumps, fridges etc., in their offerings

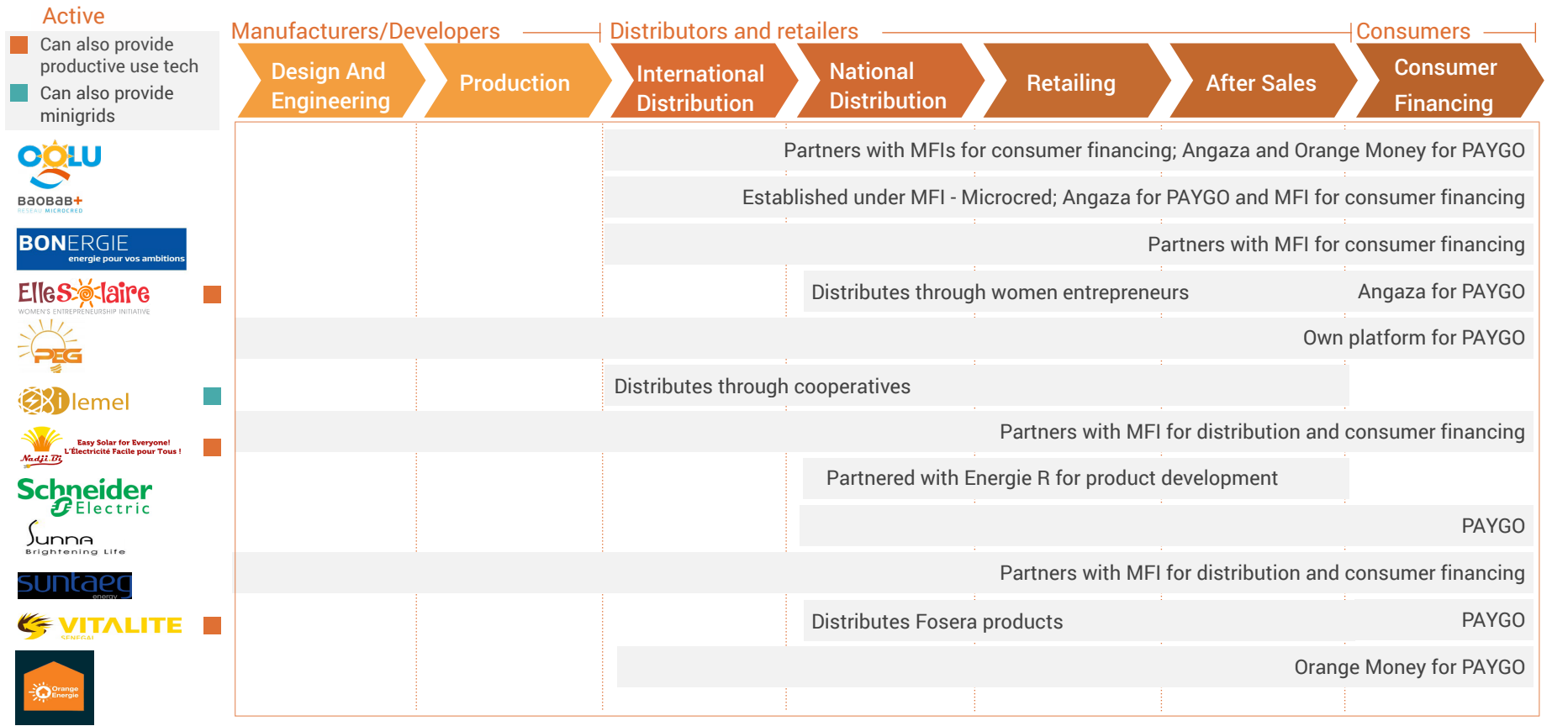
Category	Products	Private dealers in Senegal (illustrative)
<p>Household &amp; Institutional use</p> 	 <p>Solar water heater</p>	 <p><b>Süka</b> Greener Energy System</p>
<p>Small businesses</p> 	 <p>Solar refrigerator</p>	 <p><b>SOLARAKA</b></p>
<p>Agricultural Use</p> 	 <p>Solar water pump</p>	 <p><b>Bonergie</b></p>



# SUPPLIER MARKET TRENDS

- 2.1 Supplier landscape
- 2.2 Distribution models
- 2.3 Financing models
- 2.4 Value proposition by select suppliers
- 2.5 Barriers to Scale

# Supplier landscape: The OGS value chain comprises of developers (manufacturers); distributors (assemblers, wholesalers, retailers), last mile distribution agents and consumers



## Private operators: Select OGS providers in Senegal and their business models

Company Name	Products	Distribution models	Payment models	Contact Details
<b>Bonergie</b>	Solar pumps (Lorentz and Grundfos), solar fridge, solar dryers, backup systems, SHS (Niwa)	Kiosk outlets, direct sales through agents, MFI	Cash and carry	info@bonergie.com
<b>Baobab+ SHS</b>	SHS	Direct sales through agents, MFI	PAYGO	assistant@baobab.bz
<b>Ellesolaire</b>	SHS, lanterns, solar TV, solar fans (Omnivoltaic)	Women's groups	Cash and PAYGO	contact@womensentrepreneurshipinitiative.com
<b>Ilemel</b>	Lanterns, SHS (Greenlight Planet)	Distributors, cooperatives	Cash and carry	office@ilemel.com
<b>Nadji.Bi</b>	Solar pumps, solar fridge, SHS, lanterns		Cash and carry	group@nadjibi.com
<b>Oolu Solar</b>	SHS, solar TV (Amped Innovation)	Direct sales through agents, MFI	PAYGO	info@oolusolar.com
<b>Orange Energie</b>	SHS (BBOX)	Direct sales through agents	PAYGO	tom.wright@orange.com
<b>PEG</b>	Lanterns, SHS, solar TV	Direct sales through agents	PAYGO	info@pegafrica.com
<b>Schneider Electric</b>	SHS	Retail, direct sales through agents	Cash and carry	AFR-Info-seao@afr.schneider-electric.com
<b>Sunna Designs</b>	SHS (Greenlight Planet)	Retail, direct sales through agents	PAYGO	Thomas Samuel; thomas@sunna-design.fr
<b>Suntaeg</b>	SHS	Direct sales through agents, MFI	Cash and carry	
<b>Vitalite</b>	Solar pumps (SolarWorks!), SHS, solar TV (Fosera)	Direct sales through agents	Cash and PAYGO	info@vitalitesenegal.com

## Private operators: Select OGS providers in Senegal, their partner MFIs/cooperatives, and regional operations

Company Name	MFI and cooperatives	Regional operations
<b>Bonergie</b>	Caurie Microfinance (MFI)	Dakar, Tambacounda, Ziguinchor, Louga, Kedougou
<b>Baobab+ SHS</b>	Microcred (MFI)	All areas except Kedougou and Matam
<b>Ellesolaire</b>	–	Palmarin
<b>Ilemel</b>	Cooperative la Société des Coopératives d’Energies Citoyennes du Sénégal (SCEC) (Distribution Partner)	Fatik, Matam, Sine Saloum
<b>Nadji.Bi</b>	Caurie Microfinance (MFI), PAMECAS (MFI)	Mbour and surrounding area
<b>Oolu Solar</b>	PAMECAS (MFI)	Fatick, Kaolack
<b>Orange Energie</b>	–	Fatick, Mbour
<b>PEG</b>	–	Kaolack, Kafrine, Fatick, Ziguinchor, Bignona
<b>Schneider Electric</b>	–	Fatick, Kaolack, Sédhiou, Kolda, Ziguinchor et l’île de Carabane
<b>Sunna Designs</b>	–	Ziguinchor, Bignona
<b>Suntaeg</b>	Credit Mutuel du Senegal (MFI)	Kedougou
<b>Vitalite</b>	–	Thies

## Distribution models: Most common distribution models involve distribution through conventional dealer networks and institutional partnerships with MFIs

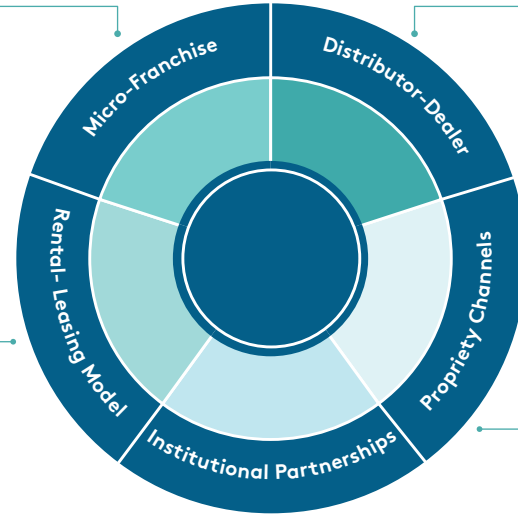


### Microfranchise Model

The company offers franchising packages (such as financing, training, marketing support etc.) to micro-entrepreneurs who wish to become formalized retailers of exclusive company products

### Rental-leasing Model

The solar company franchises to micro-entrepreneurs who set up solar charging kiosks. The micro-entrepreneurs either (1) rent products to consumers on an hourly/daily basis or (2) sell systems without a power source, offering a fixed fee for charging



### Distributor-Dealer

The company sells through established networks of generalist or specialist distributors, leveraging the traditional consumer durables supply chain. Products are retailed in a basket of consumer durables. A distribution hierarchy of at least two levels (distributor and dealer/retailer) is maintained



### Proprietary Channels

Products move through a proprietary distribution channel from manufacturer to in-house storage/ assembling facilities to a salaried/ contracted salesforce, which delivers them to customers directly

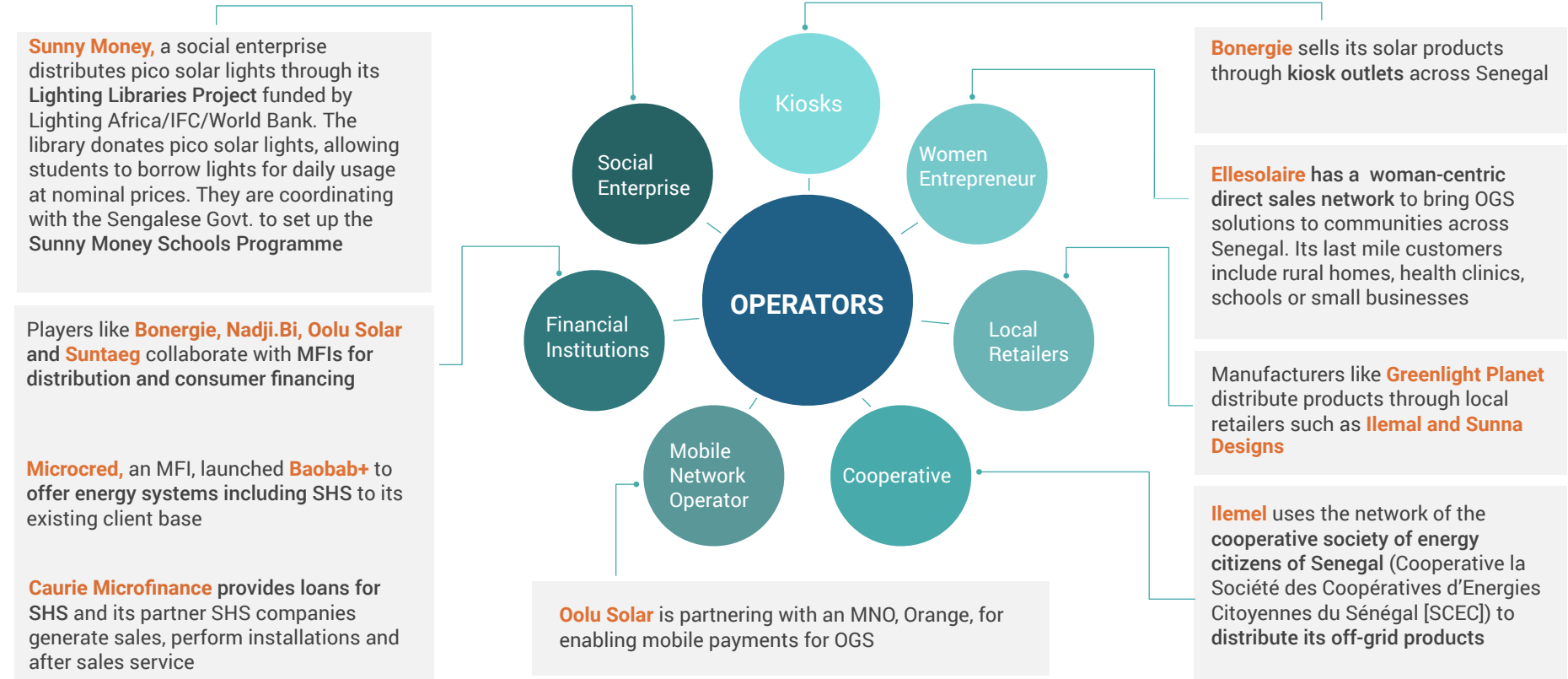


### Institutional Partnerships







The company partners with an institution (e.g., NGO, MFI, rural bank, assemblers, with links to a large potential customer base) to market its products to its customer base/members and/or to leverage its assembling & after-sales support services



## Distribution models: Businesses are exploring a variety of last mile distribution channels including local retailers, financial institutions, MNOs, social enterprises, kiosks and cooperatives



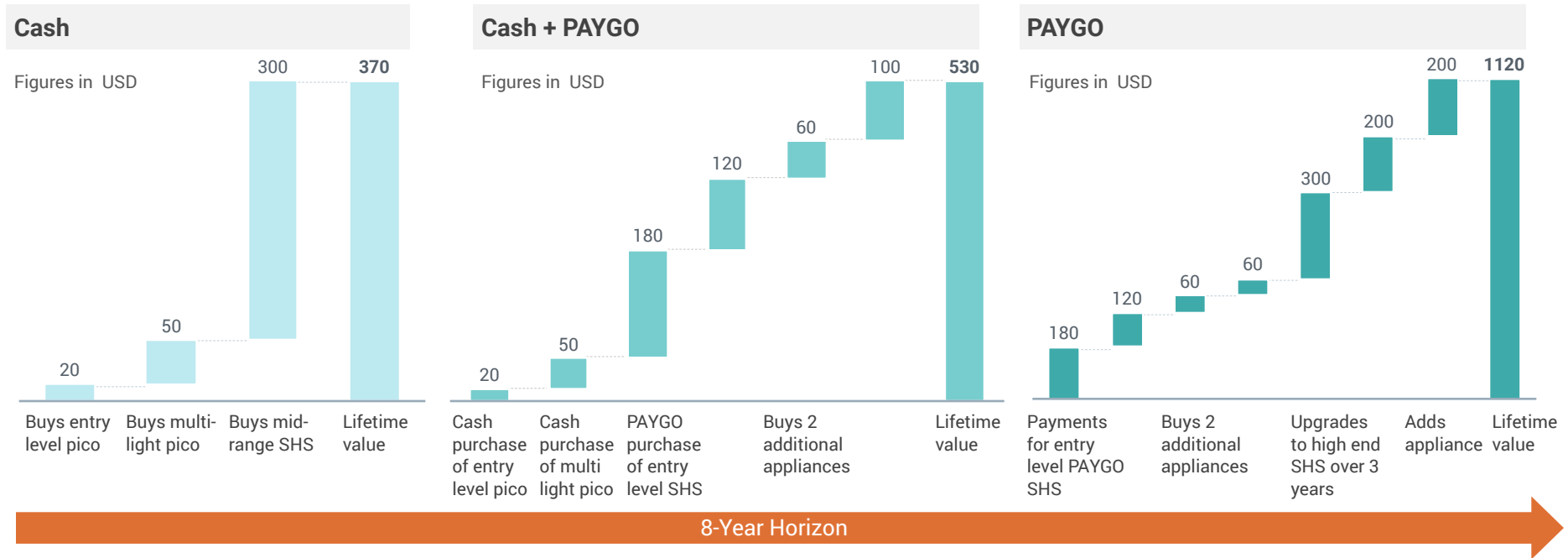
## Financing models: PAYGO is being widely used in Senegal for higher cost OGS devices like SHS and SLS with mobile charging

Business model	Benefits	Companies on PAYGO platforms
<p>PAYGO is a financing platform for off-grid energy systems with high up-front capital costs. An IT system underlies the platform, allowing automated payments and system monitoring/activation</p>	<ul style="list-style-type: none"> <li>● Ability to provide longer duration and big-ticket loans to users</li> <li>● High consumer confidence in product due to financing by the supplier</li> <li>● Improved operational efficiency of suppliers as no coordination needed between financial and technology providers</li> <li>● Reduced cost of payment collection (incase of mobile payments)</li> </ul>	     

### PAYGO BUSINESS MODEL ATTRIBUTES

Payment Platform	Customer Relationships	System Size	Connectivity	Partnership Strategy
<ul style="list-style-type: none"> <li>● <b>Full connectivity model</b>– M2M and mobile money</li> <li>● <b>Prepaid credit agent-based model</b> (off-network) – requires manual input of unique code (e.g. <b>Oolu, PEG, Baobab+, Sunna Designs, Ellesolaire</b>)</li> <li>● <b>Mobile airtime as prepaid credit</b></li> <li>● <b>USSD models</b></li> <li>● <b>Partial PAYGO models</b> - agents accept cash and activate products via cable, bluetooth or manual SMS code</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Lease to own:</b> Transfer of asset ownership to user after limited payment period. Payment via licensed platform (e.g. <b>PEG, Bonergie</b>)</li> <li>● <b>Energy service:</b> Co. provides electric service rather than financing. Service comes from a company-owned solar system</li> <li>● <b>B2B players:</b> Hardware/software support for energy service and payment logistics. (e.g. <b>Angaza</b>)</li> </ul>	<p>PAYGO solar products can be divided by system size, which dictates the service level that each provides</p> <ul style="list-style-type: none"> <li>● HH products: Solar lanterns, SLS, SHS</li> <li>● Community level shared minigrids</li> </ul>	<ul style="list-style-type: none"> <li>● Systems that are fully online, including <b>mobile money</b> and <b>remote, real time connections</b> with the energy system</li> <li>● Systems that are intermittently connected</li> </ul>	<ul style="list-style-type: none"> <li>● Partnerships could be made on distribution, payment portals, hardware/software service support, or other core business aspects</li> </ul>

## Financing models: The lifetime value of a customer through PAYGO models is much higher than it is with Cash based or Cash + PAYGO payment mechanisms



- Players are **increasingly focusing on the lifetime value** they can derive from a consumer as consumers migrate from basic products to products with higher functionality
- **PAYGO models offer the highest lifetime customer value**, as is reflected by the increasing adoption of PAYGO models by most suppliers in the market

## Financing models: Partnerships with MFIs is the most common way of advancing finance to consumers by energy enterprises

### DESCRIPTION

#### One Stop Shop Model

In this model, the same organization provides the products and finance. This happens when a finance provider decides to offer energy products, or when an energy enterprise decides to offer finance. (e.g. **PEG, Vitalite Senegal**)



#### FI Partners With Energy Enterprise

In this case, an energy enterprise enters into a partnership with a local financial institution to sell OGS products. This model typically involves a financial institution (FI) providing credit to an end-user and managing the monitoring and repayment processes, while the energy company provides the energy product, installation, service and maintenance (e.g. **Bonergie, Baobab+, Ilemel, Nadjibi, Oolu Solar, Suntaeg**)



#### Umbrella Partnership Model

The energy enterprise enters into a partnership arrangement with an “apex institution” that manages a network of local FIs (e.g. a union of credit cooperatives, credit unions, or other village-based FIs). The apex institution lends money to the local finance providers, who lend to an end-user and manage the monitoring and repayment processes. The energy enterprise provides the product, installation, service and maintenance (e.g. **Ilemel**)



#### Franchise/ Dealership Model

The energy enterprise provides credit to dealers and/or franchises to allow them to sell to clients on an installment basis. This particular model is common for relatively inexpensive products – usually those that cost under \$50 (e.g. **Greenlight Planet, Amped Innovation**)



#### Brokering Model

A third-party organization is paid by the finance provider and the energy enterprise to market energy products and assess customers’ suitability for financing. They bring viable customers forward to buy energy products. The broker may also be involved with loan payment collection, after-sales service, and technical upkeep

## Value proposition offered by select suppliers

### Salient Features



- **Microcred is an MFI that established Baobab+** to distribute and finance pico-solar products and SHS
- The MFI distributes products from two global manufacturers, **Greenlight Planet and Bright**
- Products are provided through two financing models:
  - Existing Microcred customers that take a loan for productive use, are offered OGS products that they can purchase through a top up of upto 7% on that loan
  - PAYGO model (lease to own): \$0.40 per day for a SunKing Home (3 lights and 1 USB) over 11 months
- Products are sold through **36 Microcred local branches** in Senegal and through a **direct salesforce for PAYGO models**
- Payment collection is implemented through various methods: direct collection by agents, payments made at Microcred's collection agents and mobile money transfers (through Wari and Orange Money).
- Baobab+ **reached 2,600 HHs** through its products in one year of operation (2015-16)

### Salient Features



- Oolu distributes SHS systems for **Greenlight Planet** and modular systems for **Amped Innovation**
- Product offering: **Entry-level SHS**, comes with a 5-10W PV panel, 20-40Wh LiFePO4 battery, 3-4 high efficiency LED lights and 1-2 USB charging ports; and **larger modular system** that includes a 40W (up to 120W) PV panel, 100Wh (up to 180Wh) LiFePO4 battery, 6 high efficiencies LED lights, 2 USB charging ports and a TV
- It provides SHS through **monthly installments over 18 to 24 months, or via. cash and carry sales**
- Oolu has partnered with the **MNO, Orange**, to use its **money mobile services - Orange Money**. The customers **pay installments** for their **PAYGO SHS** through this mobile money service
- It distributes through **commission-based distribution agents** and **PAMECAS** which is an **MFI**, that has a customer base of 80,000
- Since 2015, Oolu has **sold more than 35,000 PAYGO SHS** in Senegal, Mali and Burkina Faso

## Value proposition offered by select suppliers

### Salient Features



- Bonergie distributes **Pico PV, SHS, solar TVs, solar refrigerators and solar pumps** manufactured by Niwa
- Product offering: **UNO 50 solar lamp** (only lighting), **Multi 300 XL Solar Lamp** (LED, USB phone charging), **Bonergie Basic Solar Kit ST100** (100 Wp, 12 V solar panel, 55 Ah battery, 230 V solar inverter, 5 solar lamps)
- The company has **partnered with MFI, Caurie Microfinance**, for sale of solar refrigerators through **PAYGO** (enabling access of consumer credit for higher-end appliances)
- **80% of the OGS sales are on micro-credit over 12 or 24 months**, which is provided by **Caurie Microfinance**. The credit contracts are handed over to women of the HH after purchase of the product. They make monthly payments for the OGS solution
- Different payment models include **cash and carry** at a discounted price (50% advance payment, 50% after installation); **12-month credit** (50% advance payment, 50% after contract ends); and **24-month credit** (fixed monthly payment and 3 months deposit)
- Distribution channels include **commission-based agents, kiosks and MFIs**

### Salient Features



- Ellesolaire is a women-led solar **social enterprise** that supplies **solar lanterns and SHS with mobile phone charging capability, solar TVs and solar fans (manufactured by Omnivoltaic)**
- The off-grid solutions are distributed through **trained women entrepreneurs/ groups** and local agents
- Customers can make payments by **cash** or through **PAYGO** enabled by **Angaza** platform



- PEG distributes solar **lanterns, SHS and solar TVs** through **commission-based agents or local partners; via a lease to own model** involving monthly installments over 12-36 months (own **PAYGO platform**)
- The company provides **end-to-end solutions** including financing, installation, maintenance and lifecycle management
- It serves over 400,000 daily users in Senegal, Ghana, and Ivory Coast

## Barriers to Scale: Regulatory barriers and poor access to enterprise finance are among the main barriers for suppliers to scale operations in Senegal

### Barriers

#### Regulatory Barriers

- **High import duties (average 16% of SHS) and 18% Value-Added Tax (VAT) on OGS products** along with inconsistency in application of rates, **increases cost to consumers by 40%**
- Uncertain electricity tariff rates and no regulation for feed-in tariffs to Senelec, results in higher costs of provision of electricity for minigrid operators
- There is a lack of subsidies for off-grid electrification projects in Senegal

#### Poor Access To Enterprise Finance

- **Supply of equity for early stage SHS companies in West Africa has not met expectations of the private sector.** International investors have limited their presence in the region (many are overexposed in East African markets), leaving most companies to rely on angel investors for seed equity funding
- Financing has mostly been through international concessional debt, impact investment, grants, founder equity, and angel equity

### Initiatives/Opportunities

- GoS is undertaking a **tariff harmonization process** that will bring all electricity tariffs in the country in line with those charged by the national utility. This would enable **cost-reflective tariffs for minigrids** and make them a more attractive investment. This **applies to concessions under the rural electrification programme**
- **Import duties** are set at component level with **exemptions for PV panels** and a few direct connection (DC) appliances

- **Smaller companies rely on sectors specific debt providers**, such as Lendable, SIMA Funds, and SunFunder, and crowdfunding platforms like Lendahand, Solylend, and Bettervest
- GoS plans to **raise \$44.2 Mn for the rural electrification fund during 2018-2025**. This could be used to provide subsidies, loans and guarantees to rural electrification companies (including off-grid solution providers)
- **Energy4Impact** provided **grant support of \$1.3 Mn to 12 off-grid projects in Senegal** under the Multi-sector Energy Programme (Programme Énergétique Multisectoriel [PREM])

## Barriers to Scale: High distribution costs in East Senegal is also a deterrent for OGS suppliers to scale in this region

### Barriers

#### High Distribution Cost In The East

- **Lower population densities** in the eastern region **increase sales and services expense** due to higher transport and agent travel costs
- **Relatively low incomes** in eastern Senegal, also **reduce overall sales potential**

### Initiatives/Opportunities

- **Increasing competition country-wide could lead to greater penetration** into remote eastern districts, which are relatively less explored. **Matam, Ferlo, and Kedougou are among the poorly electrified regions that many SHS companies have yet to penetrate**





# DEMAND TRENDS

3.1 Affordability

3.2 Demand Barriers

## Affordability: Willingness to pay (WTP) for reliable electricity is high for both off-grid households and businesses in Senegal

### WILLINGNESS TO PAY FOR ELECTRICITY

- A recent survey\* found that off-grid households and businesses in both very rural and peri-urban areas have a high willingness to pay for reliable electricity
  - WTP for improved electricity supply in Senegal i.e. electricity available 24 hrs./ day and 7 days/week without outages and stable power or voltages – is \$27 every two months for men and \$23 for women in non-connected households
  - For the connected households, maximum WTP for men is \$37.79 and \$38.18 for women billed every two months
- Willingness to pay for electricity is greatest around urban centers like Dakar (capital city of Senegal), with lowest willingness to pay in regions that are both relatively populated and electrified, but not necessarily urban. Willingness to pay outside of urban settings increases as geography becomes more remote due to lack of access to viable electrification options

#### Willingness to Pay (WTP) for electricity among non-grid connected households and informal businesses

WTP Metric	Household		Informal Business
	Men	Women	
Current energy cost per month (candles, batteries, etc.) (\$)	12.86		4.63
Connection fee (\$)	32.78	25.5	32.84
2-month bill (\$) (non-connected HHs)	27.09	23.24	36.68
\$/kWh	0.31	0.22	0.28

## Affordability: Ability to pay for OGS products remains low in Senegal, even though willingness to pay for electricity is high. PAYGO models can significantly improve consumer's ability to pay

### SENEGAL SCORES LOW ON ABILITY TO PAY FOR OGS DEVICES. BUT HIGH ON WILLINGNESS TO PAY

#### Market Attractiveness Index, IFC

Country	Demand Score			Supply Score				Enabling Environment Score			
	Market Size	Ability to Pay	Willingness to Pay	Access to Finance	Operational Considerations	Market Penetration	Human Capital	ICT	Legal and regulatory	Trade and Commerce	
Angola											
Cameroon											
Congo Dem Rep.											
Cote d'Ivoire											
Ethiopia											
Guinea											
Kenya											
Madagascar											
Malawi											
Mozambique											
Niger											
Nigeria											
Senegal											
Sierra Leone											
Tanzania											
Togo											
Uganda											
Zambia											
Zimbabwe											

- Low income of the target off-grid population limits the type of systems they can afford
- High taxation (18% VAT and 16% import duty on SHS) increases the price of off-grid solar home systems

#### However, PAYGO models can boost a household's ability to pay

- ▶ Increase in access to and use of mobile money from 6% to 32% in 2015-2017 creates potential for higher PAYGO penetration in the OGS sector
- ▶ Flexible payment schedules for PAYGO solar will be key in increasing the ATP as rural consumers have a seasonal income



## Demand Barriers: Low purchasing power and limited mobile money penetration in many areas, hamper demand for OGS devices in Senegal




Barriers	Initiatives
<p><b>Low Purchasing Power</b></p> <ul style="list-style-type: none"> <li>• High electricity tariff rates are a deterrent for poor households to access electricity</li> <li>• There is limited access to consumer financing options</li> </ul>	<ul style="list-style-type: none"> <li>• Some of the solar companies are providing OGS solutions through <b>lease-to-own models</b> on a <b>PAYGO basis with micro-installments</b> over payment periods of 6,12 or 24 months</li> <li>• Various <b>MFIs</b> in partnership with solar companies are providing <b>top-up loans and credit options</b> for <b>off-grid energy services to consumers</b></li> </ul>
<p><b>Low Mobile Money Penetration</b></p> <ul style="list-style-type: none"> <li>• Poor access to and awareness of mobile payment technology in remote areas of Ferloou, Matam, and Kedougou where mobile coverage is incomplete</li> <li>• Low awareness of mobile money in rural departments (Kedougou, 54%; Kolda, 55%; Kaffrine, 40%; Tambacounda, 46%), compared to urban zones</li> <li>• Most rural customers do not have e-wallets</li> <li>• Poor coverage and lack of interoperability</li> </ul>	<ul style="list-style-type: none"> <li>• Companies like <b>Sunna Designs</b> are developing their <b>own e-wallets</b> to increase PAYGO transactions and lower mobile money fees for consumers (compared to current MNO rates)</li> <li>• <b>Mobile regulations</b> set by GoS <b>allow for PAYGO energy plans</b></li> </ul>
<p><b>Poor Quality Of Off-Grid Products</b></p> <ul style="list-style-type: none"> <li>• Limited testing of RE equipment results in inflow of poor-quality products</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Two labs</b> have been set up under the <b>Senegalese Association for Standardization (ASN)</b> to <b>ensure national standards for solar PV components</b> are adopted</li> </ul>



# ENABLING ECOSYSTEM

- 4.1 Government
- 4.2 Development partners
- 4.3 Financiers
- 4.4 Association and others

## Government: To achieve universal electricity access by 2025, an investment of at least \$56 Mn is needed in decentralized solutions (including individual solar systems and solar/hybrid minigrids)

Programmes	Mandate	Off-Grid Solar Targets
<p><b>Plan for Emerging Senegal, 2014</b></p>	<p>The strategy forms the reference framework for the country's economic and social policy over the mid- and long-term. The plan is based on three pillars a) structural transformation of the economic framework b) promotion of human capital and c) good governance and rule of law</p>	<p><b>By 2025</b></p> <p><b>15% renewable energy in Senegal's energy generation mix by 2025</b></p> 
<p><b>Senegal's Sustainable Energy for All (SE4ALL) Rural Electrification, 2018</b></p>	<p>Provides targets to achieve universal access to electricity by 2025, develops investment programs/plans for implementation, and assesses the financial requirements. It comprises on-grid generation, grid extension and densification, energy and off-grid electrification</p>	<p><b>By 2025</b></p> <p><b>8.5% and 3.3% villages electrified by minigrids and stand-alone solar systems respectively by 2025</b></p> 
<p><b>Senegal Intended Nationally Determined Contribution (INDC), 2015</b></p>	<p>States the climate change mitigation and adaptation actions along with the implementation costs to achieve 21% relative emission reduction compared to the business as usual scenario by 2030</p>	<p><b>By 2030*</b></p> <p><b>Reduce GHG emissions by 21% (to 27 metric tons) by 2030 conditional upon financing</b> OR <b>Reduce GHG emissions by 5% on the unconditional trajectory by 2030</b></p> 

\*The Business As Usual trajectory uses a baseline year of 2010

## Government and Quasi-Government: Ministry of Energy and Petroleum and Senegalese Rural Electrification Agency are the main institutions dedicated towards advancing access to energy through OGS solutions

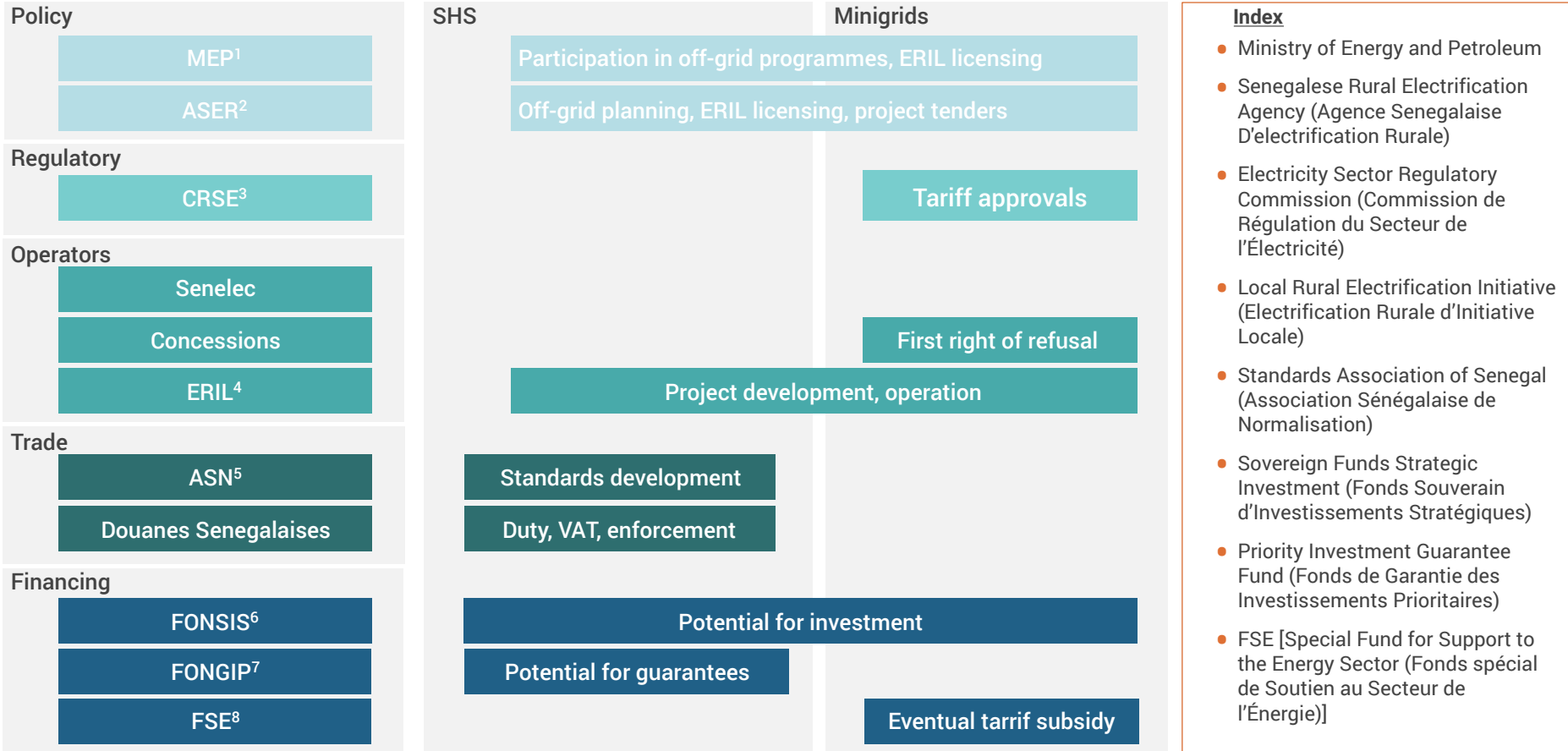
Institutions	Mandate
<b>Ministry of Energy and Petroleum (MEP)</b>	<ul style="list-style-type: none"> <li>Leads the development of the energy sector policy and strategy</li> <li>Houses the directorate of electricity who focuses on all the sub sectors including off-grid minigrid and SHS</li> </ul>
<b>Senegalese Electricity Utility (Société nationale d'électricité du Sénégal [Senelec])</b>	<ul style="list-style-type: none"> <li>Senelec is the national electricity company with monopoly over transmission and distribution</li> <li>It is responsible for development of generation capacity by using new facilities of its own or through Independent Power Producers (IPPs)</li> </ul>
<b>National Agency for Renewable Energy (Agence Nationale pour les Energies Renouvelables [ANER])</b>	<ul style="list-style-type: none"> <li>Contributes to the development of renewable energy policies and regulatory frameworks</li> <li>Promotes the implementation of RE projects and undertakes monitoring of the projects</li> <li>Conducts research and development for technological innovations in RE</li> </ul>
<b>Electricity Sector Regulatory Commission (Commission de Régulation du Secteur de l'Électricité [CRSE])</b>	<ul style="list-style-type: none"> <li>CRSE is Senegal's electricity regulator responsible for the preparation of licenses and tariff approvals for all industry actors, including minigrids. While CRSE is involved in the licensing process, final approval is required from Ministry of Energy and Petroleum.</li> </ul>
<b>Senegalese Rural Electrification Agency (Agence Senegalaise D'électrification Rurale [ASER])</b>	<ul style="list-style-type: none"> <li>ASER oversees all rural electrification efforts, including the administration of the Rural Electrification Priority Programme and Local Rural Electrification Initiative (ERIL)</li> <li>Provides financial and technical assistance to support rural electrification initiatives</li> <li>Spearheads its own electrification programmes, including those for off-grid minigrids</li> </ul>
<b>Senegalese Customs (Douanes Sénégalaises)</b>	<ul style="list-style-type: none"> <li>Responsible for import inspection and tariffs enforcement, including categorization of SHS</li> </ul>
<b>Standards Association of Senegal (Association Sénégalaise de Normalisation [ASN])</b>	<ul style="list-style-type: none"> <li>Responsible for developing and promoting national and international standards</li> </ul>

## Government and Quasi-Government (Financing): Senegalese Government has various funds that can potentially promote investments in OGS and renewable energy

Institutions	Mandate
<b>Sovereign Funds Strategic Investment (Fonds Souverain d'Investissements Stratégiques [FONSIS])</b>	<ul style="list-style-type: none"> <li>● FONSIS is Senegal's sovereign investment fund</li> <li>● It invests equity and quasi-equity in projects with high potential for economic growth and job creation mainly in the strategic sectors of renewable energy and agriculture</li> </ul>
<b>Priority Investment Guarantee Fund (Fonds de Garantie des Investissements Prioritaires [FONGIP])</b>	<ul style="list-style-type: none"> <li>● FONGIP seeks to improve access to credit for small enterprises</li> <li>● It has a guarantee program in place for pumping projects that replace diesel with solar and has expressed some interest in supporting SHS companies</li> </ul>
<b>Special Fund for Support to the Energy Sector (Fonds spécial de Soutien au Secteur de l'Énergie [FSE])</b>	<ul style="list-style-type: none"> <li>● FSE is used to support several energy sector subsidies, including those for the transport of petroleum products</li> <li>● In the electricity sector, FSE is used to subsidize the government's tariff harmonization scheme, providing funds to both Senelec and concession operators to ensure that they can charge the same tariffs</li> <li>● It offers similar subsidies for minigrids under the Local Rural Electrification Initiative (ERIL), though this development has yet to take place</li> </ul>



## Government: Off-Grid Institutional Framework



## Government: There are various government policies regulating and guiding the country's off-grid market (1/3)

Policy /Programme/Plan	Actions
<b>Electricity Act: Law no. 98-29 (Loi n° 98-29 du 14 avril 1998 relative au secteur de l'électricité), 1998</b>	<ul style="list-style-type: none"> <li>● Recommends the institutional reforms of the electricity sector, with the goal of privatizing and liberalizing the market</li> <li>● Splits the electricity market into three entities: Senelec (transmission and distribution of electricity), Electricity Sector Regulatory Commission (preparation of licenses and tariffs), and Senegalese Rural Electrification Agency (promotion of on-grid and off-grid rural electrification programmes)</li> </ul>
<b>Energy Sector Development Policy Letter (Lettre Politique de Développement du Secteur de l'Énergie [LPDSE]), 1999 (Revised 2012)</b>	<ul style="list-style-type: none"> <li>● Comprises the government's high-level strategy for energy sector development and is intended to inform all other sector-facing policies and programs</li> <li>● Provides policy guidelines for operationalization of incentive schemes, identification of investment opportunities for improving access to electricity (grid and off-grid sector), and establishment of a feed-in tariff for electricity generation</li> <li>● Recommends strategies to improve the reliability and affordability of; and access to modern electricity services in a sustainable manner</li> <li>● Created the National Agency for Renewable Energy (Agence Nationale pour les Énergies Renouvelables [ANER]) to guide the design and implementation of RE policies/programmes</li> </ul>
<b>National Action Plan for Renewable Energies (Plan d'Actions National des Énergies Renouvelables [PANER])</b>	<ul style="list-style-type: none"> <li>● Defines the targets for provision of electricity through renewable energy (RE) sources. Electricity generated through solar and wind is targeted at 440 MW and 550 MW for 2025 and 2030 respectively</li> <li>● Lays down strategies for improving access to electricity which include: Implementation plan for integration of RE in the grid; Promotion of private electricity generation from RE sources; and Finalization of the legislative and regulatory framework on RE (feed-in tariffs, taxation, etc.)</li> </ul>

## Government: There are various government policies regulating and guiding the country's off-grid market (2/3)

Policy /Programme/Plan	Actions
<b>Senegalese Rural Electrification Plan of Action (Plan d'Action Senegalais d'Électrification Rurale [PASER]), 2002</b>	<ul style="list-style-type: none"> <li>● Lays down the framework for achieving rural electrification targets through off-grid and on-grid solutions by implementing the following programs/policies: Priority Rural Electrification Program (Programme Prioritaire de l'Électrification Rurale [PPER]), Multi-Sector Energy Programme (Programme Énergétique Multisectoriel [PREM]) and Local Rural Electrification Initiative (Électrification Rurale d'Initiative Locale [ERIL])</li> <li>● Seeks to increase rural electrification from 8% in 2000 to 62% in 2022 through both on-grid and off-grid solutions</li> </ul>
<b>Rural Electrification Priority Program (Programme Prioritaire de l'Électrification Rurale [PPER]), 2003</b>	<ul style="list-style-type: none"> <li>● Divides Senegal into 11 service territories: 1 belonging to Senelec and 10 territories slated for concession to private operators</li> <li>● Mandates operators to undertake grid extension through generation, transmission, and distribution operations within those territories</li> </ul>
<b>Local Rural Electrification Initiative (Électrification Rurale d'Initiative Locale [ERIL]), 2005</b>	<ul style="list-style-type: none"> <li>● Provides for small, local minigrid development or SHS distribution to supplement extension</li> <li>● Permits local SMEs and NGOs to provide electricity in communities not targeted for grid expansion within a 3-year timeframe</li> </ul>
<b>Multi-sector Energy Programme (Programme Énergétique Multisectoriel [PREM])</b>	<ul style="list-style-type: none"> <li>● Aims to maximize the effects of RE on poverty reduction, by promoting the electrification of revenue-generating activities/social facilities and encouraging knowledge-sharing</li> <li>● Proposes installation of photovoltaic systems for the electrification of community services (such as schools, clinics etc.) in villages with more than 250 inhabitants without access to electricity before 2020</li> <li>● Promotes productive activities (e.g. farming, dairy etc.) in settlements electrified with 100% solar based solutions</li> </ul>

## Government: There are various government policies regulating and guiding the country's off-grid market (3/3)

Policy /Programme/Plan	Actions
<b>Rural Electrification Program (Programme National d'Électrification Rurale [PNER]), 2015</b>	<ul style="list-style-type: none"> <li>● Accelerated rural electrification through the launch of an "Urgency Programme" (2015 – 2017)</li> <li>● Prepared an investment plan for implementation of the Plan Senegal Emergent (PSE) to achieve goal of universal access until 2025</li> <li>● Defines the strategy and targets for rural electrification (on-grid and off-grid solutions)</li> </ul>
<b>Urgency Plan for Rural Electrification (Programme National d'Urgence d'Électrification Rurale [PNUER]), 2015</b>	<ul style="list-style-type: none"> <li>● Suggests strategies and initiatives to improve electricity access through grid extension and off-grid services; and achieve the target set under the Rural Electrification Program (Programme National d'Électrification Rurale [PNER])</li> <li>● Key areas for electrification through grid connectivity include building a series of Medium Voltage (MV) lines called "dorsales" to bring the interconnected grid closer to rural areas; densification along existing MV grid; and densification of the low voltage network to improve the electrification rate of already connected villages</li> <li>● Constructs decentralized minigrids, either diesel, solar or hybrid solar-diesel for the electrification of villages. In this context, a total of 392 villages will be electrified, enabling access to electricity for 17,936 additional households away from the networks</li> </ul>
<b>National Action Plan for Renewable Energies (Plan d'Actions National des Energies Renouvelables [PANER])</b>	<ul style="list-style-type: none"> <li>● Defines the targets for provision of electricity through renewable energy (RE) sources. Electricity generated through solar and wind is targeted at 440 MW and 550 MW for 2025 and 2030 respectively</li> <li>● Lays down strategies for improving access to electricity which include: Implementation plan for integration of RE in the grid; Promotion of private electricity generation from RE sources; and Finalization of the legislative and regulatory framework on RE (feed-in tariffs, taxation, etc.)</li> </ul>
<b>Renewable Energy Law (La Loi d'Orientation sur les Energies Renouvelables), 2010</b>	<ul style="list-style-type: none"> <li>● Regulates the renewable energy sector in Senegal</li> <li>● Covers tax relief, certificate of origin (to help RE producers to unlock incentives), and feed-in tariffs for on-grid and off-grid RE Sector</li> <li>● Includes strategies for generation of electricity through renewable energy sources</li> </ul>

## Development Partners: Programmes being implemented in Senegal to develop the OGS market, are extensively contributing to BD support, transaction advisory and policy advocacy

Programme	Consumer awareness	Policy enabling	Access to finance		Transaction advisory	BD support and TA*	Quality assurance	Market intelligence	Funding (Mn USD)
			Consumer	Enterprise					
Lighting Africa	●	●		●	●	●	●	●	14.5
Get.Invest	●	●	●	●	●	●		●	
SE4All		●		●	●	●	●	●	18.8**
SREP		●		●	●	●	●	●	12.7
ROGEP		●		●	●	●	●	●	200***
EnDev	●					●	●	●	4.8****
Power Africa		●		●	●	●			
Scaling Solar				●	●	●		●	41.5

Programmes covering minigrids



Exchange Rate: 1 EUR = 1.09 USD and 1 GBP = 1.26 USD


\*BD support includes skills development and capacity building; TA – technical assistance

\*\*Covers Africa and Asia (donor income as on Dec 2018)


\*\*\*Covers 14 African countries

\*\*\*\*Covers Senegal, Benin and Burkina Faso


## Development Partners: GIZ has provided electricity access to 65,000 people in Senegal through PV-diesel hybrid minigrids and solar home systems

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
 <p>Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH</p>	<p><b>Energising Development (EnDev)</b> (2005 - 2019)</p>	<ul style="list-style-type: none"> <li>● Improve electricity access by installing village grids (PV-diesel hybrid) or individual solar home systems (in smaller villages)</li> <li>● Conduct training and capacity building for private sector operators with respect to off-grid solution on topics such as: business models/ procedures, technical skills, and operations and maintenance</li> <li>● Rehabilitate existing but non-operational minigrid systems</li> <li>● Promote SHS distribution through local youth associations in 2019</li> </ul>	<ul style="list-style-type: none"> <li>● Developed technical packages for minigrids (includes potential sites, technical assessment criteria, willingness to pay by HHs, cost benefit analysis etc.)</li> <li>● Provided access to electricity to 65,000 people through RE minigrids or SHS</li> <li>● Delivered access to modern energy services to 822 social institutions and 291 Small and Medium Enterprises (SMEs)</li> <li>● Provided subsidy of 70% on hardware cost of PV-diesel hybrid minigrids and SHS</li> </ul>	<ul style="list-style-type: none"> <li>● Ministère en charge de l'Energie (MEP)</li> <li>● Agence Sénégalaise de l'Electrification Rurale (ASER)</li> <li>● Agence Nationale des Energies Renouvelables (ANER)</li> <li>● Agence pour l'Economie et la Maîtrise de l'Energie (AEME)</li> <li>● Direction en charge des Combustibles Domestique</li> </ul>	<p><b>\$4.8 Mn</b> (Senegal, Benin, Burkina Faso)</p>

## Development Partners: GET.Invest is a platform that is mobilizing investment for OGS solutions (specifically with respect to productive use technology) and providing business development support to OGS enterprises




Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
 <p>giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH</p>	<p>GET.Invest (2018-21)</p>	<ul style="list-style-type: none"> <li>• Enable access to finance for project and business developers by providing advisory services through a finance catalyst team</li> <li>• Develop market insights studies to help entrepreneurs identify markets and opportunities</li> <li>• Support industry associations, in organizing networking and information sharing events</li> <li>• Help regulators implement regulatory processes for private investments to accelerate transactions and balance the risk for all parties</li> </ul>	<p>The programme is hosted on the multi-donor platform GET.pro (Global Energy Transformation Programme), implemented by GIZ. Some key interventions in Senegal include the following:</p> <ul style="list-style-type: none"> <li>• Developed a database of 8 funds that provide investment for RE-based technology in Senegal, to enable private developers to apply for financing of projects</li> <li>• Published market insight reports and case studies on RE applications in agriculture value chains in Senegal</li> <li>• Created a database of energy sector information including relevant data, key stakeholders, policy framework etc</li> </ul>	<ul style="list-style-type: none"> <li>• EU (DG DEVCO)</li> <li>• Germany (BMZ)</li> <li>• Austrian Development Cooperation</li> <li>• Ministry of foreign affairs of the Netherland</li> <li>• Sweden (Sida)</li> </ul>	

## Development Partners: Power Africa has supported the GoS in establishing the largest solar farm in West Africa with a capacity of 29 MW



Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
	<b>Power Africa</b>	<ul style="list-style-type: none"> <li>● Build regulatory capacity of key government ministries/ departments</li> <li>● Conduct training and capacity building of Senegal's utility (Senelec)</li> <li>● Provide transaction advisory support to private sector off-grid companies and rural concession holders, helping to strengthen business models and expand services</li> <li>● Assess opportunities to pursue off-grid electrification projects via USAID projects in agriculture</li> </ul>	<ul style="list-style-type: none"> <li>● Supported in financing a new transaction i.e. the 29MW Senergy 1 solar PV plant – currently the largest solar farm in West Africa</li> <li>● Enabled 99,292 new electricity connections through both on-grid and off-grid solutions</li> <li>● Provided technical assistance (on areas such as strengthening business models, expanding market share, and market assessment of products) to OGS companies like Oolu Solar and Baobab+</li> <li>● Prepared an updated generation and transmission Master Plan in collaboration with the MEP, Senelec, and other key stakeholders</li> <li>● Led trainings with government stakeholders</li> <li>● Provided transaction advisory support to help connect Independent Power Producers (IPPS) to Senelec</li> </ul>	<ul style="list-style-type: none"> <li>● United States Government</li> <li>● World Bank Group</li> <li>● African Development Bank</li> <li>● African Trade Insurance Agency</li> <li>● European Union</li> <li>● DFID</li> <li>● 140 private companies</li> </ul>	



## Development Partners: The World Bank is supporting GoS through a \$14.5 Mn fund for improving OGS market and improving off-grid energy access

Implementing agency	Programme	Intervention areas	Results	Donors/ Partners	Funding
  	<b>Scaling Solar (2016-2020)</b>	<ul style="list-style-type: none"> <li>● Provide business development support and assistance in tendering process for enabling private sector engagement in solar</li> <li>● Support GoS to procure solar power at low cost through auctions</li> <li>● Enable financing for solar power projects</li> </ul>	<ul style="list-style-type: none"> <li>● Constructed two solar plants that will provide 79 MWp, sponsored by Engie, Meridiam, and Senegalese Sovereign Wealth Fund for Strategic Investments (FONSIS) <ul style="list-style-type: none"> <li>▶ Kael Plant – 35 MWp</li> <li>▶ Kahone Plant – 44 MWp</li> </ul> </li> <li>● Reduced emissions by 9,000 tons of CO2 equivalent per year</li> </ul>	<ul style="list-style-type: none"> <li>● Ministry of Foreign Affairs of the Netherlands</li> <li>● USAID's Power Africa</li> <li>● European Investment Bank (EIB)</li> <li>● Finland-IFC Blended Finance for Climate Program</li> <li>● Proparco</li> </ul>	<b>\$41.5 Mn</b> (Investment by IFC, Finland-IFC Blended Finance for Climate Program, EIB, Proparco)
	<b>Lighting Africa (2014 onwards)</b>	<ul style="list-style-type: none"> <li>● Provide technical and financial assistance to projects on off-grid solutions</li> <li>● Support private companies on quality certification of OGS</li> <li>● Advise GoS to institutionalize favorable regulatory &amp; legislative reforms for expansion of off-grid market</li> <li>● Generate consumer awareness on OGS solutions</li> </ul>	<ul style="list-style-type: none"> <li>● Improved off-grid energy access for 651,800 people</li> <li>● Sold 205,400 quality verified products</li> <li>● Avoided 42,800 thousand tons of GHG emissions</li> <li>● Funded the Lighting Library project implemented by Sunny Money, distributing 4,798 solar lights and giving 6,115 students direct access to the solar lights</li> </ul>	<ul style="list-style-type: none"> <li>● World Bank</li> </ul>	<b>\$14.5 Mn</b>

## Development Partners: ECREEE is supporting Senegal's off-grid sector targeting solar lanterns, SHS, solar water pumping, and solar-driven agricultural processing

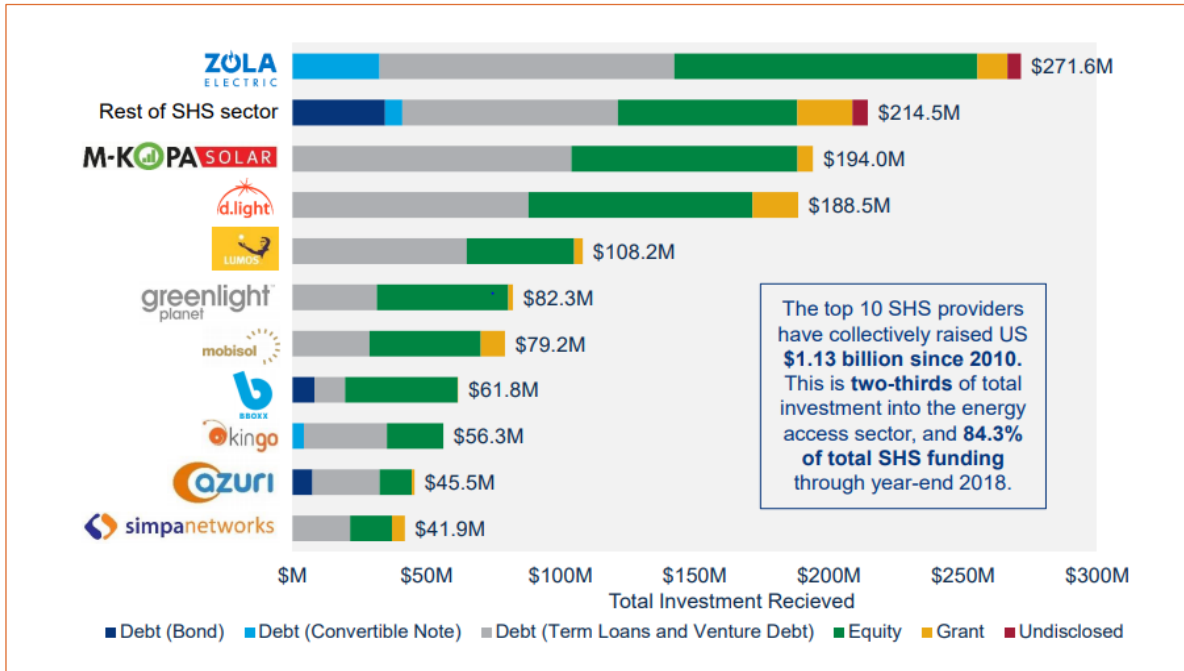
Implementing agency	Programme	Intervention areas	Results	Donors/Partners	Funding
	<b>Regional Off-Grid Electrification Project (ROGEP) (2019-2024)</b>	<ul style="list-style-type: none"> <li>Conduct market assessment studies for solar products identifying barriers</li> <li>Develop a guarantee fee to mitigate risk exposure of banks and solar companies</li> <li>Provide regulatory support</li> <li>Support electrification through stand alone systems by enabling access to credit lines from World Bank to financial institutions</li> <li>Improve financial landscape by matching grants from impact investors</li> </ul>	<ul style="list-style-type: none"> <li>Undertaking examinations and operationalising the Regional Certification Scheme (RCS) for solar PV technicians in 8 pilot countries (Senegal, Ghana Benin, Burkina-Faso, Mali, Nigeria and Sierra Leone)</li> <li>Conducted regional workshops on promoting investments in standalone off-grid systems in West Africa and the Sahel Region</li> </ul>	<ul style="list-style-type: none"> <li>World Bank</li> <li>IFC</li> <li>Lighting Africa</li> </ul>	<b>\$200 Mn</b> (19 countries)
	<b>Senegal Rural Electrification Program (SREP) (2016 onwards)</b>	<ul style="list-style-type: none"> <li>Introduce a range of clean technology solutions including grid extension, solar/diesel minigrids, solar home systems and solar lanterns</li> <li>Use carbon-linked results-based payment scheme to support the GoS in its agenda of rural electrification</li> <li>Provide subsidies in the form of coupons/vouchers to rural households</li> </ul>	<p>Expected outcomes:</p> <ul style="list-style-type: none"> <li>Improve access to electricity by increasing the number of HH connections</li> <li>Enable GHG reductions (tonnes of CO<sub>2</sub>)</li> <li>Provide connection fee subsidies through coupons/vouchers to at least 51% female beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>UNFCCC</li> </ul>	<b>\$12.7 Mn</b>

## Development Partners: SE4All provides the strategy and framework for implementation of rural electrification policies and programmes (including off-grid sector) of the GoS

Implementing agency	Programme	Intervention areas	Results	Donors/Partners	Funding
	<b>Sustainable Energy for All (SE4All) (2016-19)</b>	<ul style="list-style-type: none"> <li>● Provide market Intelligence on OGS solutions</li> <li>● Provide business development support services</li> <li>● Support GoS in designing policy frameworks for achieving the target of universal access by 2025</li> <li>● Develop RE financing mechanisms for HHs and developers</li> <li>● Assist GoS on technical standardization and quality control of off-grid solutions</li> </ul>	<ul style="list-style-type: none"> <li>● Developed the Draft Action Agenda in 2018 - framework for achieving SE4All objectives and monitoring process (universal access of electricity by 2025)</li> <li>● Developed the draft Investment prospectus (key activities, investment opportunities etc.) to operationalize the Action Agenda</li> </ul>	<ul style="list-style-type: none"> <li>● AfDB</li> <li>● African Union Commission</li> <li>● NEPAD Planning and Coordination Agency</li> <li>● UNDP</li> </ul>	<b>\$18.8 Mn</b> (Donor income as on Dec 2018)

## Financiers (Enterprise): Globally, off-grid access companies raised \$1.7 Bn since 2010, of which 80% (\$1.1 Bn) went to SHS providers (90% of whom used PAYGO models) and 80% was deployed in Africa

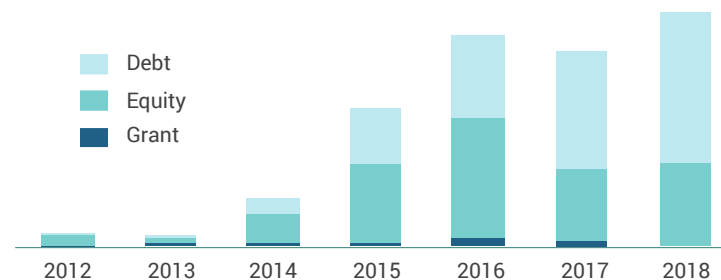
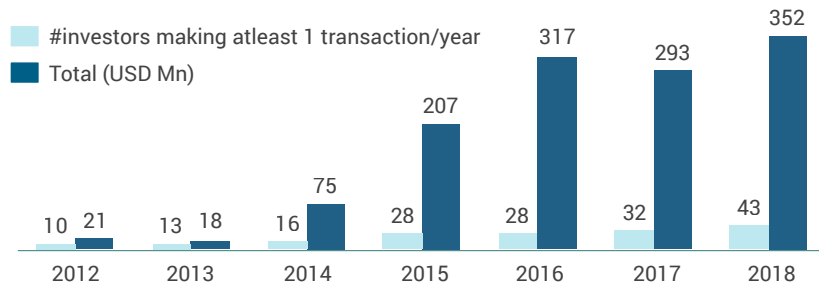
### TOP 10 SHS RECIPIENTS BY DISCLOSED FINANCING TYPE, CUMULATIVE TO YEAR-END 2018



- Country:** Africa is an attractive market for investors absorbing 80% of total OGS funding globally. The customers of the top scaled companies in the OGS sector are concentrated in East Africa. Mobile money penetration and sensitization has helped attract 58% of disclosed capital to East Africa but market saturation is a risk
- Product segment and financing models:** Companies deploying solar home systems (SHS), pay-as-you-go (PAYGO) business models have attracted 81% and 91% of investment, respectively
- Asset Class:** Over 50% of total capital raised is debt, ~44% is equity and ~6% is grants
- Source of financing:** 71% of energy access finance is sourced from private capital markets while 86% of investments are dollar-denominated, but local currency is on the rise

A few of these SHS market leaders such as Greenlight Planet and Bboxx have presence in Senegal

**Financiers (Enterprise):** In 2018, the OGS energy sector attracted a total investment of \$352 Mn, 20% more than 2017, and highest since 2012. However, investment by local banks remained low



## Funding overview

- West Africa has high market potential as East African markets get saturated:** While East Africa received the largest amount of investment (44% of total) in 2018, it received the lowest absolute amounts of investment since 2012. Companies and investors are seeing growth potential in West Africa which attracted 19% of investments
- Highest debt funding of \$225 Mn since 2012:** Specialised intermediary debt finance providers along with crowdfunding platforms and DFIs have contributed significant amounts of debt funding for inventory finance, working capital and financing of receivables
- Concentration of transactions dipped slightly from 2017 levels:** Top 10 fund recipients attracted 77% of the total funding compared to 85% in 2017 suggesting that more recipients now have access to capital

## Barriers to investment in OGS by local FIs in East Africa

- Investments from local banks and MFIs is limited due to the following factors:
- Mid-sized banks:** Inadequate data quality of OGS players, weak credit management systems and controls, default risk due to poor product quality and limited internal capacity of banks in OGS sector
  - Regional banks:** Limited data transparency, management related challenges, inability to meet disbursement criteria and mismatched interest of banks and other providers of guarantees/credit lines
  - MFIs:** Competition from PAYGO businesses, high transaction cost of small sized loans for low cost SHS systems, low quality standards and limited internal capacity







## Financiers (Enterprise): Listed below are a few recent deals in OGS sector involving players who have operations in Senegal

Investor	Company	Asset class	Amount (USD)	Date	Sources Of Fund Deployment
Apis Partners	<b>Greenlight Planet</b>	Debt and equity	60 Mn	Dec 2017	Expand its solar-energy product lines, distribution networks, and financing capabilities in Africa and Asia
Persistent Energy Capital (PEC), Y Combinator	<b>Oolu Solar</b>	Equity	3.2 Mn	Oct 2017	Further invest in its current operations in Senegal and Mali, and expand into a third market in 2018
Bamboo Capital Partners	<b>Bboxx</b>	Debt	50 Mn	2018	Enable distributed energy service companies (DESCO*) to benefit from BBOXX's data-driven smart technology to improve operational efficiency and enhance customer service across Africa and Asia
TRINE	<b>Bboxx</b>	Debt	1.12 Mn	Mar 2019	Support the installation of SHS in 7 countries (including Senegal) impacting the lives of over 200,000 underserved people
SunFunder, CDC Group	<b>PEG Africa</b>	Equity	2.5 Mn	May 2019	Scale up financing for PAYGO contract receivables from its rapidly expanding customer base
ElectriFi	<b>PEG Africa</b>	Debt	5 Mn	Sep 2019	Expand its PAYGO OGS and productive use by solar business in West Africa (including Senegal)
TRINE	<b>Touba Solar Rama</b>	Debt	0.35 Mn	n/a	Facilitate sale of SHS to Vitalite Senegal (a solar company)

Sources: Greenlight Planet Raises \$60 Mn for Off-Grid Solar Financing Business, Dec 2017 ([Link](#)); PEG Africa raises EUR 4.57 Mn from ElectriFi to Continue Expansion in West Africa, ElectriFi ([Link](#)); Kedougou Senegal Project, Trine ([Link](#)); Senegalese Solar Startup Oolu Raises \$3.2 Mn Funding, Disrupt-Africa, Oct 2017 ([Link](#)); SunFunder provides \$2.5 Mn for PEG Africa in Partnership with CDC Group, SunFunder, May 2019 ([Link](#)); BEAM Investment Platform launched to Deploy \$50 Mn for Renewable Energy in Developing Markets, Pv-Tech, Feb 2018 ([Link](#)) Source: The Top 5 Investment Trends in the Off-Grid Solar Energy Sector, GOGLA, May 2019 ([Link](#)); Increasing Local Financial Institution Investment in the Off-grid Solar Sector, GOGLA, Sep 2018 ([Link](#))

\*DESCOs: These companies install SHS or minigrids and collect recurring payment for energy from consumers

## Financiers: Funding opportunities in Senegal

Financiers	Overarching Goal	Funding Amount
	<b>Global LEAP – RBF Refrigerators &amp; Solar Water Pumps</b> <ul style="list-style-type: none"> <li>Aims to catalyze the uptake of high-quality efficient appliances by 1) lowering the cost to procure large volumes of off-grid appliances and 2) facilitating new business partnerships for appliance suppliers that have invested in the production of high quality off-grid appliances</li> </ul>	<b>\$23.5 Mn for off-grid refrigerators and solar pumps across 7 countries including Senegal</b>
	<b>REACT Window of the Africa Enterprise Challenge Fund (II)</b> <ul style="list-style-type: none"> <li>Focusses on off-grid electrification solutions in Ethiopia, Senegal, Nigeria, Ghana and Somalia by providing financing through a household solar challenge fund window. The competition was launched in quarter two of 2019</li> </ul>	<b>\$20.8 Mn commitment across 5 countries including Senegal</b>
	<b>Power Africa Off-Grid Project – West and Central Africa Market Entry and PAYGO integration</b> <ul style="list-style-type: none"> <li>Aims to facilitate 6 Mn new electricity connections through SHS and microgrids by 2022. There are two opportunities for which companies can apply. These include 1) Establishing a market entry in a new off-grid product or new geographical location and 2) PAYGO integration into off-grid solutions</li> </ul>	<b>\$100K and \$250K across 12 African countries including Senegal</b>
	<b>Electrifi</b> <ul style="list-style-type: none"> <li>Provides debt and equity financing for small scale private companies focusing on new or improved electricity connections as well as generation capacity from sustainable energy sources in emerging markets</li> </ul>	
	<b>TRINE</b> <ul style="list-style-type: none"> <li>Supports financing for clean energy initiatives aimed at improving access to electricity through a crowdfunding platform</li> </ul>	
	<b>GAIA Impact Fund</b> <ul style="list-style-type: none"> <li>Provides funding support for renewable energy investments with a high focus on start-ups, SMEs, and infrastructure projects</li> </ul>	<b>Invested in Oolu Solar to expand in Senegal</b>

## Financiers: Other sources of funds in Senegal

Financiers	Overarching Goal and Intervention Example
<b>SUNREF</b>	<ul style="list-style-type: none"> <li>● SUNREF is a green credit line financed by AFD for commercial banks to lend to smaller renewable energy and energy efficiency projects. The credit line is available to participating banks including Orabank and Societe Generale de Banques in Senegal.</li> <li>● In 2017, the SUNREF facilitated potential global investments amounting to \$20 Mn for RE &amp; energy efficiency (EE) projects in Senegal across various sectors, including services, agro industry and industry</li> </ul>
<b>Powering Agriculture</b>	<ul style="list-style-type: none"> <li>● It is an energy challenge fund for clean energy innovations in the agriculture sector for developing countries.</li> <li>● It has granted a fund to the Earth Institute at Columbia University for a Pilot Acacia Irrigation project in Senegal. This project has installed 3 central solar energy units which are powering irrigation pumps of 21 farmers. The farmers are paying for the service through a PAYGO system (prepaid electricity cards)</li> </ul>
<b>Renewable and Efficient Energy Fund (REEF)</b>	<ul style="list-style-type: none"> <li>● Established in 2017, the fund provides subordinated debt to renewable energy, energy efficiency and solar off-grid projects and aims to address the financial, technical and institutional barriers which these projects encounter in Senegal.</li> <li>● In its first cycle from 2017-19, the fund will accelerate access of local private sector to climate finance ranging from \$50 Mn up to \$200 Mn</li> </ul>
<b>Social Investment Managers and Advisors (SIMA) Funds</b>	<ul style="list-style-type: none"> <li>● SIMA's Off-Grid Solar Fund 1 provides senior debt to companies that finance, manufacture, and/or distribute individual solar home systems in Sub-Saharan Africa and South Asia. This is one of the largest funds in the off-grid solar sector at \$90 Mn</li> </ul>



## Associations: There are a few associations that represent private sector interests in Senegal and work with the government to promote the development and adoption of RE technologies

Organization	Work In Senegal
 <p><b>GOGLA (Global Off-Grid Lighting Association)</b></p>	<ul style="list-style-type: none"> <li>● GOGLA is the global association for the off-grid solar energy industry established in 2012, representing 150 members</li> <li>● It supports members with the following services:           <ul style="list-style-type: none"> <li>▶ Market intelligence, building an understanding of market opportunities and impact</li> <li>▶ Knowledge-sharing and networking through events and communications</li> <li>▶ Advocacy, for creating an enabling policy environment and investment climate</li> <li>▶ Creation and promotion of industry standards and guidelines</li> </ul> </li> </ul>
<p><b>Association of Renewable Energy Sector Developers (Conseil patronal des énergies renouvelables du Sénégal [COPERES])</b></p>	<ul style="list-style-type: none"> <li>● Represents the private sector actors in the renewable energy sector with a mission to formulate initiatives and proposals for policy makers</li> <li>● Works with the government to foster research and promote the development of renewable energy technologies in Senegal</li> </ul>

## Others: There are some research institutions, non-governmental organizations and universities active in Senegal working to support the adoption of renewable energy technologies

Organization	Work In Senegal
 <p><b>Enda Energie</b></p>	<ul style="list-style-type: none"> <li>● Provides consultancy, training and research services in the field of energy, climate change and sustainable development</li> <li>● Advises local government and regional intergovernmental institutions such as ECOWAS on design and implementation of policies on energy and sustainable development</li> <li>● Implements projects on improving access to electricity through off-grid solutions</li> </ul>
 <p><b>University Cheikh Anta Diop de Dakar and its subsidiaries</b></p>	<ul style="list-style-type: none"> <li>● Hosts a "Research and Study Centre for Renewable Energy" and an "International Centre for Research and Training in Solar Energy". Activities covered include studies about renewable energy potential, as well as pilot projects in wind and solar thermal energy</li> </ul>
 <p><b>Practical Action</b></p>	<ul style="list-style-type: none"> <li>● Undertakes policy advocacy and technical consulting across thematic areas of energy, agriculture, renewable technology, climate change and sustainable development in Senegal</li> </ul>

## Others: There are some research institutions, non-governmental organizations and universities active in Senegal working to support the adoption of renewable energy technologies

Organization	Work In Senegal
	<ul style="list-style-type: none"> <li>● Conducts research in the renewable energy sector including analysis of renewable energy in agricultural value chains and the role of renewable energy in production or post harvest losses</li> </ul>
	<ul style="list-style-type: none"> <li>● Supports the implementation of the Multi-sector Energy Programme (Programme Énergétique Multisectoriel [PREM]) of GoS</li> <li>● Implements projects on renewable energy and off-grid solutions in rural areas, partly through a women's empowerment programme</li> </ul>
	<ul style="list-style-type: none"> <li>● Delivers green growth programs in collaboration with GoS, and helps achieve poverty reduction, social inclusion, environmental sustainability and economic growth</li> <li>● Operationalizes the National Climate Fund to prepare bankable projects on climate change mitigation (including energy) and adaptation for submission to national and international funds</li> </ul>

## About The Organizations

### foundation

The Signify Foundation is dedicated to supporting underprivileged and underserved communities across the world by enabling access to light. When pursuing this mission, the Foundation expects to leverage Signify's expertise and knowledge to help develop and provide easily-accessible, sustainable lighting systems that have a meaningful impact on people's lives.

For more details please visit <https://www.signify.com/global/our-company/signify-foundation>



Intellectap, a part of the Aavishkaar Group, is a pioneer in building enabling ecosystems and channelling capital to create and nurture a sustainable & equitable society. Founded in 2002, Intellectap works across critical sectors like clean energy, climate change, agriculture, livelihoods, financial services, gender and inclusion, healthcare, water and sanitation. The organization has delivered over 500 global engagements across 40+ countries and syndicated investments of over \$500 Million USD in Capital. Intellectap through its presence in India and Africa, provides a broad range of consulting, research and investment banking services, to multilateral agencies, development finance institutions, social enterprises, corporations, investors, policy makers and donors.

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