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SENEGAL

OFF-GRID SOLAR ENERGY MARKET SENEGAL

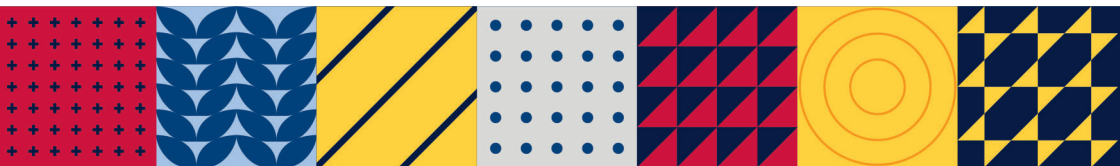
Summary Version of the 2019 Power Africa Off-grid Solar Market Assessment Report

Full report available online at: [usaid.gov/powerafrica/beyondthegrid](https://www.usaid.gov/powerafrica/beyondthegrid)



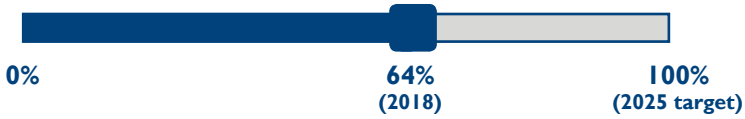
INVESTMENT OPPORTUNITIES

- In 2017, Senegal's gross domestic product (GDP) was approximately \$21 billion and anticipated to grow annually by 7% through 2022. **Senegal's economic and political stability continues to attract donor support for social, institutional, and infrastructure developments.**
- Nearly 80% of workers in Senegal are employed in agriculture, and agricultural land accounts for 47% of Senegal's total land area. **Agricultural productive use, especially solar pumping, is emerging as a key opportunity for off-grid companies to reach remote customers.**
- While 90% of urban residents have access to electricity, just 30% of rural residents are connected. **Despite Senegal being a hub for SHS companies in West Africa, large portions of the country remain underserved, creating an opportunity for new players in a stable and vibrant market.**
- While PAYGO has started to gain momentum, cash and carry sales of SHS have historically dominated in Senegal. Additionally, mobile money has been slow to take off in the country presenting a barrier to PAYGO expansion in the regions where financing options are needed most. **As mobile money providers build awareness and make it easier to integrate with their platforms, demand for SHS is likely to increase.**
- Mini-grids in Senegal have had mixed success thus far, with many existing mini-grids (over 75) no longer operating due to tariff structures that are not cost-reflective. **Additionally, the framework for developing mini-grids has thus far been too complex to attract much private investment.**



ON-GRID AND OFF-GRID ELECTRIFICATION

Actual access rate vs. electrification target



Main provider of electricity. State-owned Senelec operates Senegal's grid, serving over 90% of the urban population. In 2017, Senelec's customer base was over 1.3 million. Grid quality is relatively high, with grid interruptions in 2017 totaling only 72 hours.



Plan to increase electricity access. The National Rural Electrification Program (Programme National d'Électrification Rurale [PNER]) stands as Senegal's current electrification strategy. PNER informs the Priority Rural Electrification Program (Programme Prioritaire de l'Électrification Rurale [PPER]), a private concessions scheme; and the Local Rural Electrification Initiative (Électrification Rurale d'Initiative Locale [ERIL]), a mechanism for rural electrification via small, independent mini-grid and standalone power developers.



Constraints to rural electrical grid extension. Government budgetary constraints can cause long wait times for electrification of localities (i.e., an estimated 6,000 to 8,500 localities do not have access or scheduled connection dates in the future). The high cost of getting connected to the grid is another barrier for less affluent populations.



Policy and regulation. The Ministry of Energy and Petroleum (MEP) leads the development of energy sector strategy and policy. The Senegalese Agency for Rural Electrification (Agence Sénégalaise d'Électrification Rurale [ASER]) oversees rural electrification, including the administration of the PPER and ERIL policy frameworks.

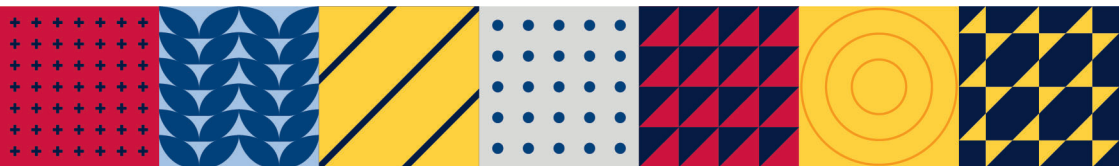


Associations. Senegal has one major association, the Council of Professionals of Renewable Energies in Senegal (Conseil Patronal des Energies Renouvelables du Sénégal [COPERES]). Aside from 2 off-grid companies, Coser and Bonergie, COPERES is comprised entirely of EPCs (engineering, procurement, and construction) and importers, thus its efforts are primarily focused on on-grid development and policy.

Map of Senegal, source: freeworldmaps.net



KEY STATISTICS	
GDP	\$21 billion
GDP growth potential	7% over 5 years
Population size	16.7 million
Population density	68 people per km ²
Population growth rate	2.8%
Household size	8.3
Rate of urbanization	3.53% (2015—2020)
Urban Rural population	Urban: 45% Rural: 55%
Languages	Wolof, French



SHS AND PICO-SOLAR

Senegal is a hub for SHS companies operating in francophone West Africa and has served as a launching point for the adoption of new business models throughout the region. Development of the sector has been led by two major local companies, both utilizing PAYGO business models: Oolu Solar and Baobab+. Contributing to Senegal's position as a regional leader are a strong human resource pool and transportation links. Despite these strengths, Senegal has yet to reach its full potential in SHS penetration, and SHS availability across the country's departments remains patchy at 19% coverage, mostly in the western departments and almost entirely missing in the eastern.

Consumer Finance. Microfinance institution (MFI) partnership has been a significant feature of the Senegalese market for several years and continues to grow in importance.

Baobab+ is the earliest example of a SHS-MFI partnership in Senegal. Microcred launched Baobab+ as a way of offering energy systems to its existing client base, while at the same time attracting new clients through SHS sales.

Bonergie has been ahead of the market due to its relationship with Caurie Microfinance. Their collaboration is focused on selling solar refrigerators, and they intend to expand to TVs. Bonergie is able to access consumer credit for higher-end appliances, while Caurie Microfinance has improved its ability to use PAYGO technology.

Commercial Finance. Local banks, like National Agricultural Credit Fund of Senegal (Caisse Nationale de Cr dit Agricole du S n gal [CNCAS]), International Bank of Commerce and Industry of Senegal (Banque Internationale pour le Commerce et l'Industrie du S n gal [BICIS]), and Priority Investment Guarantee Fund (Fonds de Garantie des Investissements Prioritaires [FONGIP]), are looking into the off-grid productive use sector, but their ability to offer favorable terms to the sector, even with an 80% guarantee instrument like that of FONGIP, remains unclear.

Productive Use. Off-grid productive use in Senegal is dominated by solar pumping, which offer a great deal of potential cost-saving to farmers. Success in off-grid productive use projects include the following:

Bonergie has been operating in rural Senegal for 7 years, specializing in energy and agricultural products, including solar pumps (Lorentz, Grundfos, and SunCulture), water tanks, solar cold storage, and solar fruit dryers. It has 15 regional offices with 52 employees (30% of whom are women), and around 1,000 customers including more than 200 solar pump installations. 80% of sales are on credit, and they have a 95% reimbursement rate.

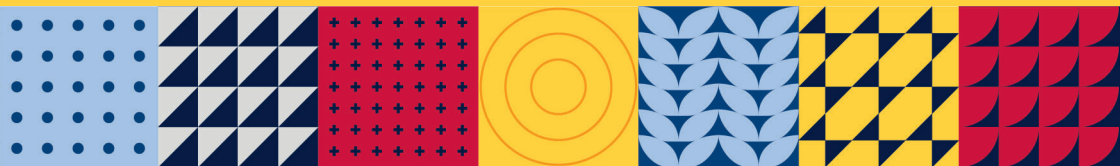
E3C is a consulting and engineering firm that also develops climate change projects. E3C has recently developed a pilot project in Senegal to solar-hybridize 7,000 pumps and they are seeking to expand the project throughout the country. The project has received a guarantee from FONGIP and is funded by CNCAS for more than \$800,000.

MINI-GRID

Mini-grid development in Senegal is defined by the ERIL framework, which incorporates several principles meant to ensure continuity with the PPER's top-down concession model: i) a bottom-up electrification driven by small and medium enterprises, NGOs, and communities; ii) applicability only to villages not included in the 3-year electrification plans submitted by the concessions; iii) cost-reflective tariffs and a mechanism for absorption into concessions upon grid arrival; and iv) eligible villages defined by number of households.

In practice, mini-grid development has been financed predominately by donor organizations, with final ownership falling on the GOS (either Senelec or ASER). Senelec and concessionaires have the first right to develop mini-grids within their service territories, but to date, neither actor has shown interest. Nominally, ERIL policy promotes mini-grids that are privately financed, owned, and operated. In practice, though, no private companies have successfully navigated the process of developing and owning a mini-grid. Additionally, non-operational mini-grids demonstrate a pattern of poor O&M planning. Failure to ensure long-term operation is especially problematic, as capital expenditure for mini-grid programs range between \$100,000 and \$250,000 per site. Issues contributing to the unsustainability of O&M include non-cost-reflective tariffs, under-sizing of the grid, and lack of metering and monitoring.

Despite this history, Senegal has a strong pipeline of market entrances. Companies currently pursuing the development of their own mini-grids include Engie, Ilemel, Valerium, Eneki, Theloze, Coselec, and Prosolia.



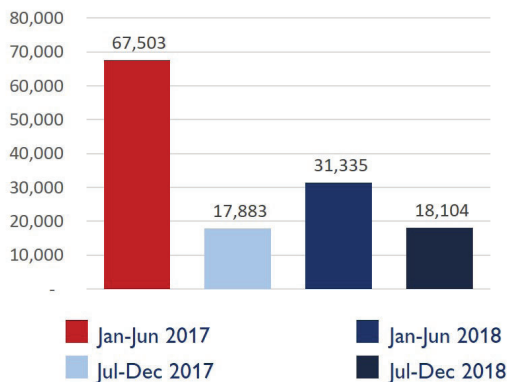
MARKET INTELLIGENCE USING GOGLA DATA

Sales and investment data from the Global Off-Grid Lighting Association (GOGLA) provides details on the off-grid solar sector in Senegal. Solar home systems (SHS) have currently reached about 19% of Senegal's previously unelectrified population. Despite growth, the Senegalese market remains in early stages and prone to fluctuation. After peaking at 67,500 units in the first half of 2017, sales fell significantly, likely due to an already saturated market in terms of customer ability to pay and regional coverage.

The introduction of pay-as-you-go (PAYGO) business models in Senegal has been successful in terms of sales, investment, and cultural acceptance. In the second half of 2018, the number of sales using PAYGO surpassed those in cash, from 30% in the first half to 70% in the second. The key players leading this dynamic have been Oolu Solar and Baobab+, which, since first introducing the technology in 2016, have reached over 50,000 customers and raised more than \$10 million in grants, debt, and equity.

Sales of pico/SHS units

Jan 2017 - Dec 2018



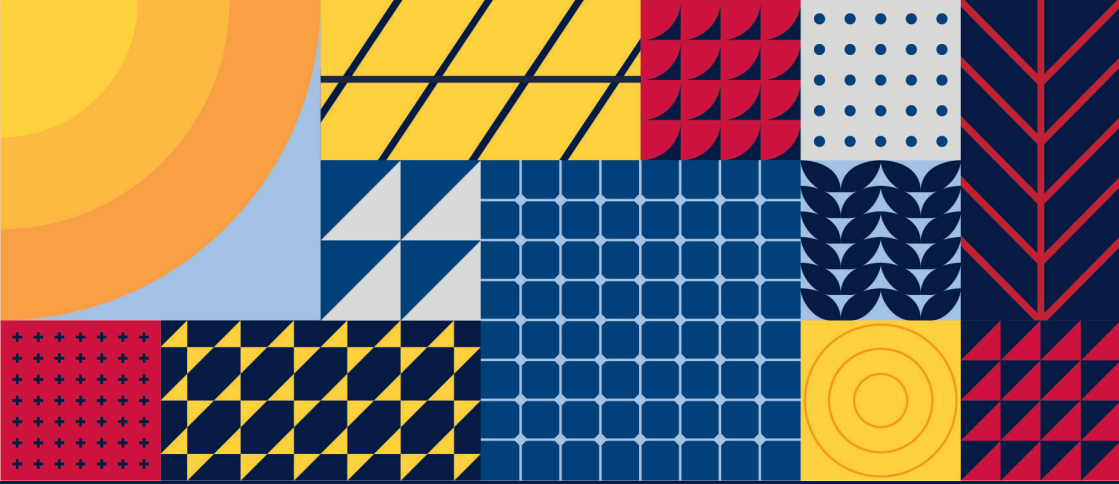
Sales by business model

Jul-Dec 2018



In West Africa, broadly, 2018 was a positive year for fundraising for the off-grid solar sector, with amounts invested continuing to rise precipitously compared with previous years. The year witnessed a growth primarily in equity (\$61 million), while debt transactions lagged substantially (\$4 million). The acceleration of sales in early 2017 may be explainable by the enormous flow of funding to West Africa in 2016: \$107.4 million, 55% of which was government funding and 45% of which was for-profit financing. For-profit financing soared in 2018 to \$60.1 million (89% of all 2018 funding), indicating private investors see potential in the West African off-grid solar market.





Power Africa aims to achieve 30,000 megawatts of new generated power, create 60 million new electrical connections, and reach 300 million Africans by 2030.



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