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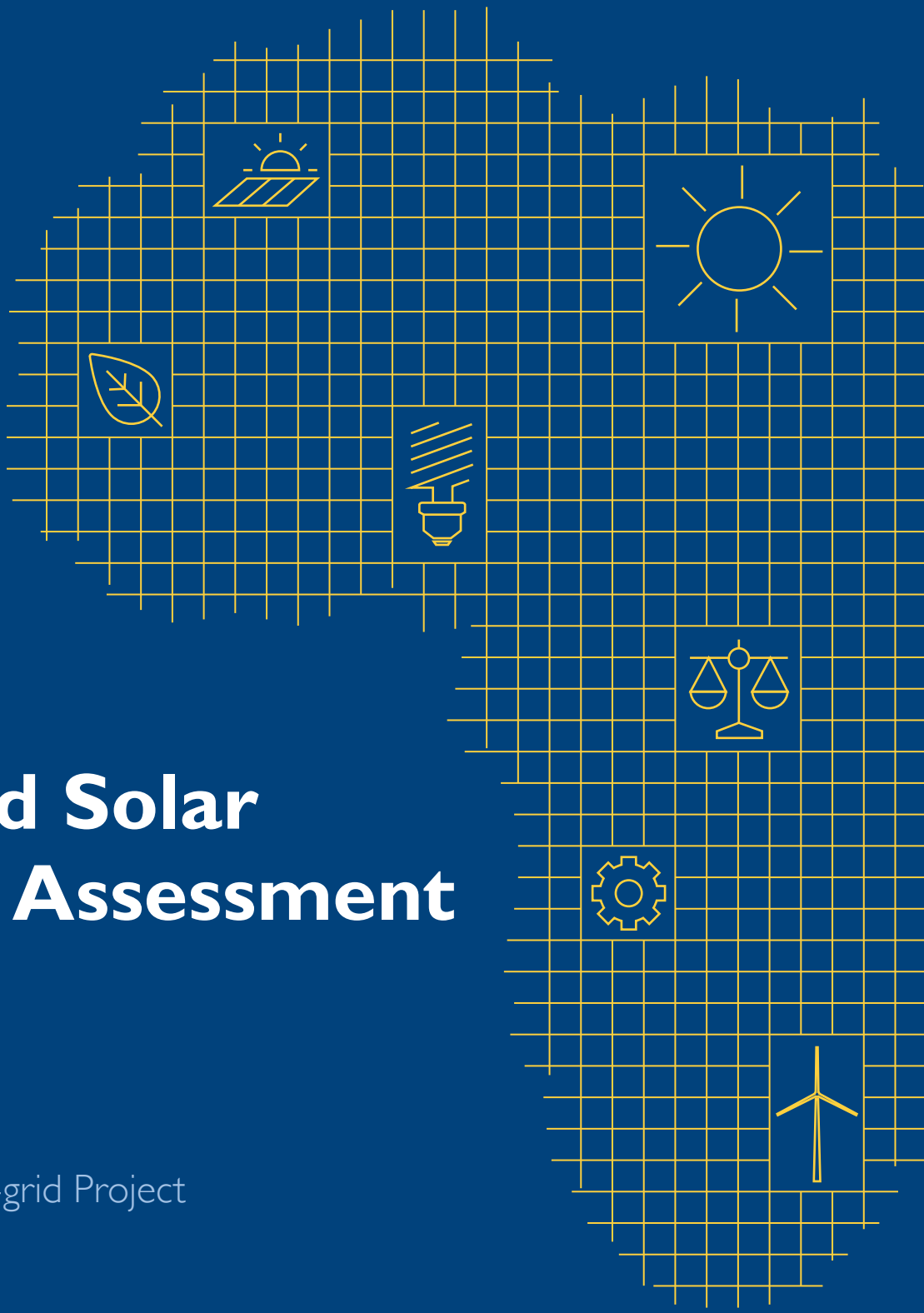

OCTOBER 2019

Off-Grid Solar Market Assessment

Tanzania

Power Africa Off-grid Project

ABOUT POWER AFRICA

The Power Africa Off-grid Project is a four-year program that launched in November 2018 to accelerate off-grid electrification across sub-Saharan Africa. RTI International implements the project in collaboration with Fraym. Norton Rose Fulbright, Practical Action Consulting, and Tetra Tech. Power Africa is comprised of 12 U.S. Government agencies, over 145 private companies, and 18 bilateral and multilateral development partners that work together, supporting sub-Saharan governments to increase the number of people with access to power.

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

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Abbreviations and Acronyms

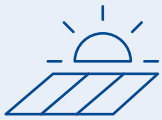
AFD	Agence Française de Développement (French Development Agency)
AECF	Africa Enterprise Challenge Fund
AfDB	African Development Bank
CLASP	Collaborative Labeling and Appliance Standards Program
CRDB	Cooperative and Rural Bank
DFI	Development finance institution
DFID	United Kingdom Department for International Development
EAC	East African Community
EnDev	Energizing Development Program
EPC	Engineering, procurement, and construction
EU	European Union
EWURA	Energy and Water Utilities Regulatory Authority
GOGLA	Global Off-Grid Lighting Association
GOT	Government of Tanzania
HV	High voltage
IPP	Independent power producer
kWh	Kilowatt hour
kVA	Kilovolt-ampere
LED	Light-emitting diode
MCDGC	Ministry of Community Development, Gender, and Children
MEM	Ministry of Energy and Minerals

MFI	Microfinance institution
MV	Medium voltage
MW	Megawatt
MWp	Megawatt peak
NBS	National Bureau of Statistics
NGO	Nongovernmental organization
NMB	National Microfinancing Bank
OPIC	Overseas Private Investment Cooperation
PAOP	Power Africa Off-grid Project
PAYGO	Pay-as-you-go
PUE	Productive use of energy
PV	Photovoltaic
QV	Quality-verified
REA	Rural Energy Agency
REACT	Renewable Energy and Adaptation to Climate Technologies
SACCO	Savings and credit cooperative organization

SCCULT	Savings and Credit Cooperative Union League of Tanzania Limited
SHS	Solar home system
Sida	Swedish International Development Cooperation Agency
SIMA	Social Investment Managers and Advisors
SPP	Small power producer
SRUC	Sector Reform and Utility Commercialization
TAMFI	Tanzania Associations of Microfinance Institutions
TANESCO	Tanzania Electric Supply Company
TANGSEN	Tanzania Gender and Sustainable Energy Network
TAREA	Tanzania Renewable Energy Association
TBS	Tanzania Bureau of Standards
TZS	Tanzania shilling
UK	United Kingdom
USAID	United States Agency for International Development
VAT	Value-added tax
Wp	Watt-peak

INTRODUCTION

This report by Power Africa provides insights into the opportunities and risks associated with Tanzania's off-grid solar energy market and gives companies, investors, governments, and other stakeholders a deeper understanding of the market. While other stakeholders (i.e., development partners) have conducted market assessments, Power Africa has identified market information gaps and seeks to bridge those gaps in the following ways:



This report provides a comprehensive and detailed review of solar home systems (SHSs), mini-grids, productive use of energy, and other aspects of the off-grid solar value chain. Additionally, this report includes details on policy and regulatory issues, the structure and historical context of the energy sector, and gender mainstreaming.

This report draws upon the most up-to-date sales and investment data from GOGLA in order to keep pace with the ever-changing dynamics of the off-grid solar sector. It also includes a geospatial analysis that highlights potential areas for off-grid solar market expansion.

Insights in this report help Power Africa Off-grid Project (PAOP) plan and prioritize activities across work streams of policy and regulations, market intelligence, business performance, access to finance, and cross-sectoral integration throughout sub-Saharan Africa.

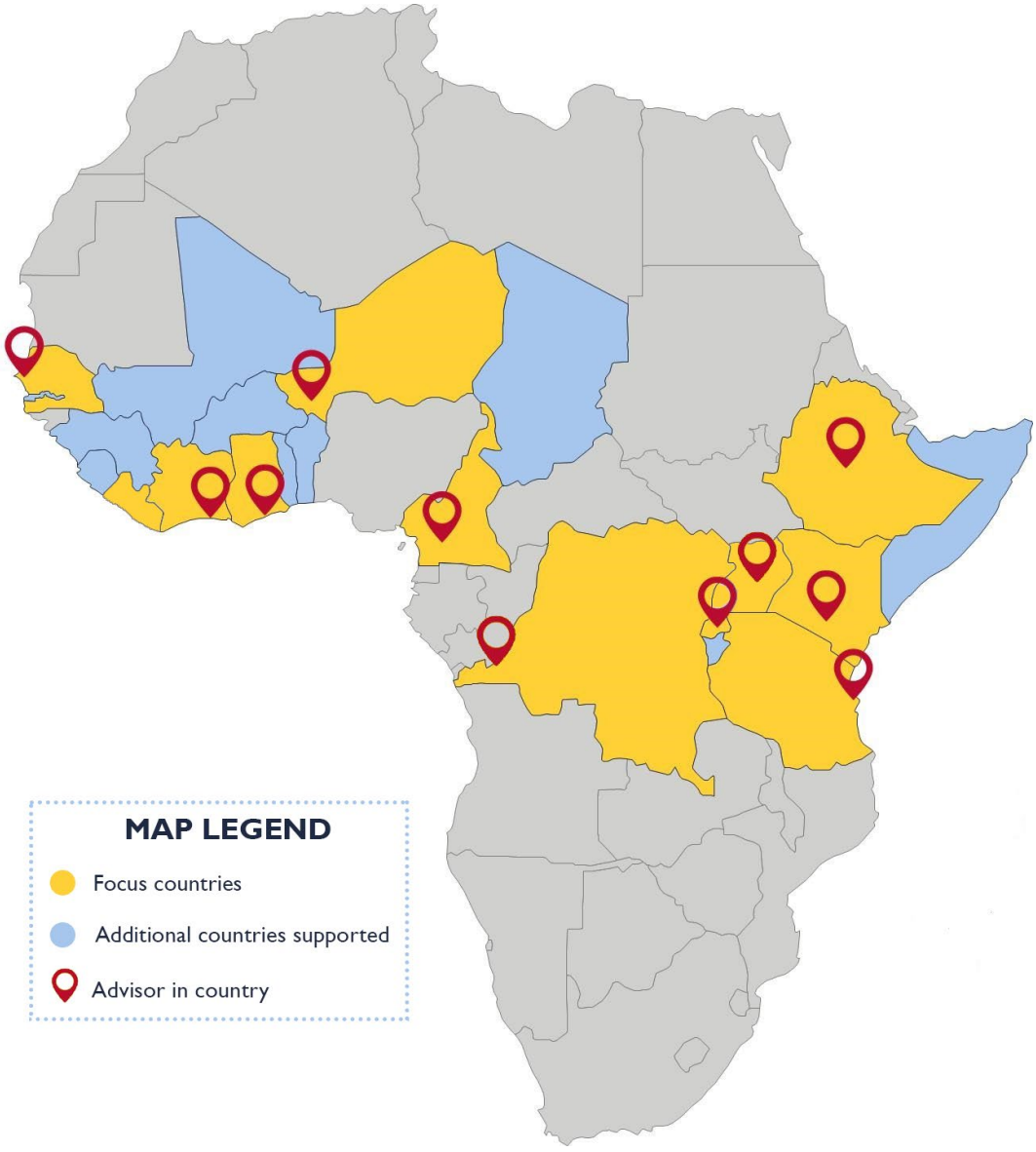
The report also serves as a baseline for Power Africa's technical advisors to guide their continuing work and provides a snapshot that can be used to determine growth and changing dynamics of the market over time. Insights provided in this report include characteristics of Tanzania's electricity sector, electrification targets, government regulations, donor-funded activities, and details on subsectors of the off-grid solar energy market. Additionally, this report includes expert knowledge from Power Africa lead advisors, information gathered from stakeholder interviews, and data from the Global Off-Grid Lighting Association (GOGLA). For five countries (Cameroon, Côte d'Ivoire, the Democratic Republic of the Congo, Ethiopia, and Niger), a geospatial analysis was performed that leveraged machine learning to identify the potential local markets for off-grid solar energy. The geospatial analysis provides granular details (i.e., latent electricity demand by household income) that will assist companies seeking to expand into new geographic markets.

About Power Africa and the Power Africa Off-grid Project (PAOP)

Power Africa aims to accelerate off-grid electrification across sub-Saharan Africa through targeted, context-specific interventions with private-sector companies, governments, investors, and donors. Power Africa's goal is to increase electricity access by adding 30MW of new generation capacity, and 60 million new connections through grid and off-grid solutions by 2030. The goal of the Power Africa Off-grid Project is to provide support to private off-grid companies and make the markets in sub-Saharan Africa more attractive for investment and operations. Power Africa defines "access" as the direct or actual number of new households and businesses connected to electricity via an on- or off-grid solution. The project focuses on accelerating off-grid energy access through household SHSs and mini-grids, with the goal of facilitating

six million new connections by 2022. The project aims to accelerate off-grid electrification across ten focus countries in Africa: Cameroon, the Democratic Republic of the Congo, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Niger, Rwanda, Senegal, and Tanzania. Figure ES-1 identifies the countries in Africa receiving Power Africa support, with the focus countries highlighted. The pins represent the locations of the project's in-country advisors.

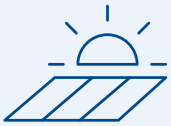
FIGURE ES-1. THE PROJECT PROVIDES SUPPORT TO 20 COUNTRIES IN AFRICA



The Power Africa Off-grid Project (PAOP) is a Power Africa project funded by the U.S. Agency for International Development (USAID). Power Africa brings together technical experts with stakeholders from the public and private sectors to increase energy access rates in sub-Saharan Africa. The Power Africa Off-grid Project is implemented by RTI International and headquartered in Pretoria, South Africa.

1 EXECUTIVE SUMMARY

Tanzania is the sixth most populous country in sub-Saharan Africa. It connects six land-locked countries to the Indian Ocean and has deep natural gas reserves, and there are many opportunities for investment.



Tanzania has abundant and world-class wind and solar resources. The Government of Tanzania (GOT) has committed to reform the operations of the Tanzania Electric Supply Company Ltd. (TANESCO, the national utility) and meet new demand through low-cost solutions.

High reliance on expensive thermal and emergency generation sources have helped make the sector financially unviable. The following statistics provide insight into the Tanzanian country context:

- In 2017, the gross domestic product was $52.09 billion, with a growth rates of nearly seven percent over the past decade.[1]
- In 2018, the population was approximately 56 million people, with approximately 67 percent living in rural areas.[2]
- In 2016 (the most recent data available according to the World Bank), 26.8 percent of the population lived below the poverty line in Tanzania.[3]
- There are more than 120 ethnic groups in Tanzania, with as many languages, and the official languages are English and Swahili.[4]

Grid Electrification. In Tanzania, TANESCO is the state-owned utility, responsible for the full electricity supply chain and for the sale of electricity to mainland Tanzania and to the Zanzibar Electricity Corporation. GOT differentiates between independent power producers (IPPs), small power producers, and emergency power producers. IPPs are all private companies running power plants larger than ten megawatts (MW) under a purchase power agreement. GOT expects to generate 5,000 MW by 2020 and 10,000 MW by 2025. According to the Energy and Water Utilities Regulatory Authority's (EWURA's) 2018 report Regulatory Performance Report on Electricity Sub-Sector, Tanzania's total installed power capacity, as of June 2017, was 1,457.2 MW, of which 1,366.6 MW was for the main grid and 90.6 MW was for isolated mini-grids (Energy and Water Utilities Regulatory Authority 2018). The electricity generation mix consisted of 39.3-percent hydropower, 43.9 percent natural gas, 15.9 percent liquid fuel, and 0.8 percent biomass. Overall electricity access is estimated at 33 percent for the country. Out of all electrified households in Tanzania, 74.9 percent received electricity supplied through the grid.

Support Programs. In Tanzania, several institutions offer technical courses and training sessions about renewable energy, as well as diplomas, undergraduate courses, and master's degrees. There are also several programs and institutions that foster research and growth in the energy sector to promote energy access and the development of new technologies, such as the Tanzania Renewable Energy Business Incubator, the Energy Change Laboratory, and the Innovative Technology and Energy Center.

The Tanzania Renewable Energy Association (TAREA) is a nonprofit grant-making organization with

[1] The World Bank 2019
[2] The World Bank n.d.
[3] The World Bank 2019
[4] CIA

more than 700 local and international, corporate, professional, and student members. TAREA promotes the accessibility and use of renewable energy technologies in Tanzania. Two organizations support the growing microfinance sector in the country. The Tanzania Association of Microfinance Institutions (TAMFI is a national network for microfinance institutions (MFIs), service providers, and the Savings and Credit Cooperative Union League of Tanzania Ltd. (SCCULT), which is an umbrella organization for savings and credit cooperatives in mainland Tanzania.

Pico-solar Sector Overview. The Global Off-Grid Lighting Association (GOGLA) surveyed members to determine pico-solar sales in Tanzania.[5] From mid-2014 until late 2017, portable solar lanterns with single lights or single lights with mobile charging (0–3 watt-peak [Wp]) sold the most, followed by SHSs (11–100 Wp). Most portable solar lantern products were sold on a cash basis.

Eight companies are active in the pico-solar power business in Tanzania, serving all market segments. The companies selling solar products range from importers to wholesalers, retailers, and local solar shops. Most are located around larger cities, particularly in Dar es Salaam, Mwanza, and Arusha. Product offerings include solar lanterns, SHSs, and charging stations.

Some of the primary barriers to growth in the pico-solar market in Tanzania include a lack of access to finance and a lack of quality control standards and enforcement, resulting in low-quality products sold prevalently in the off-grid market. Additional barriers include no well-defined tax exemptions for importation of solar photovoltaic (PV) products, no dedicated policies and regulations in place for small-scale solar PV technologies, and insufficient technical capacity within off-grid solar companies operating in the country.

In Tanzania, there are 39 commercial banks, seven community banks, five microfinance banks, three financial leasing companies, two development finance institutions, two financial institutions, two representative offices of foreign banks, and one mortgage refinancing company. The banking sector includes a few local financing institutions that have renewable energy credit lines. These include the Tanzania Investment Bank, a financing partner to the (Rural Energy Agency [REA]) and the Bank of Africa, a renewable energy facility of the French Development Agency (Agence Française de Développement [AFD]). Other banks have a direct relationship with off-grid companies (e.g., Mobisol's partnership with the Cooperative and Rural Bank [CRDB]).

Mini-grid Sector Overview. Tanzania has 109 mini-grids that serve more than 180,000 customers. The country's mini-grids provide 157.7 MW of installed capacity from hydropower, biomass, hybrid, fossil fuel, and solar PV systems.

In 2008, Tanzania adopted a regulatory framework to encourage low-cost investment mini-grids. The framework created a feed-in-tariff, which is technology-neutral. In 2015, a policy revision encouraged more solar and wind development in the country.

The barriers to mini-grid development are similar to those of the pico-solar sector and include a lack of access to finance and a lack of quality control standards and enforcement, resulting in low-quality products being sold prevalently in the off-grid market. Additional barriers include no well-defined tax exemptions for the importation of solar PV products and insufficient technical capacity within mini-grid companies operating in the country.

Productive Use Sector Overview. In Tanzania, more than 50 percent of the mainland population relies on farming or livestock for income. Most of this income comes from selling food crops. There are at least five off-grid companies in Tanzania that sell productive-use solutions powered by off-grid energy. These solutions include solar water pumps, solar fishing lights, solar milling and grinding, and cold storage solutions.

[5] GOGLA 2018

Barriers to growth in this sector are similar to those of the pico-solar sector and include a lack of access to finance and a lack of quality control standards and enforcement, resulting in low-quality products being sold prevalently in the productive use of energy (PUE) market. Additional barriers include no well-defined tax exemptions for importation of PUE products, no dedicated policies and regulations in place for PUE technologies, and insufficient technical capacity within off-grid solar companies operating in the country.

Regarding gender, the Ministry of Community Development, Gender, and Children oversees the implementation of the National Strategy for Gender Development. In addition, both REA and the National Energy Policy of 2015 have specific provisions for women, including a gender action plan for REA. There are also private-sector initiatives such as the Tanzania Gender and Sustainable Energy Network (TANGSEN) and private companies, such as Solar Sister, that focus on gender mainstreaming in the energy sector.

2 TANZANIA ENERGY SECTOR OVERVIEW

2.1 SOCIOECONOMIC AND DEMOGRAPHIC CONTEXT

Tanzania is one of the largest and most populous East African countries, second only to Ethiopia. However, for the period of 2013 to 2035, national projections show that the Tanzania population growth rate will decrease from 3.1 percent in 2013 (with a population of 46,356,279) to 2.8 percent in 2035 (with a population of 89,204,781).[6] Population distribution is extremely uneven, but greater population clusters occur in the northern half of the country and along the east coast.[7] The country also has an incredibly diverse population with more than 120 ethnic groups.[8]

Tanzania is young. Over 60 percent of the country's population are under age 25.[9] The population is predominantly rural, with nearly 70 percent of people living in rural areas.[10] The demographic information included in Table 1 provides insights on the country context for Tanzania.

TABLE 1. TANZANIA DEMOGRAPHIC INFORMATION

Population size	57.3 million people [11]
Population density	63.4 people/km^2 [12]
Population distribution (rural vs. urban)	66% of population lives in rural areas [13]
Age demographics	63% of population under the age of 25 [14]
Local main languages spoken	Swahili and English are the two official languages [15]

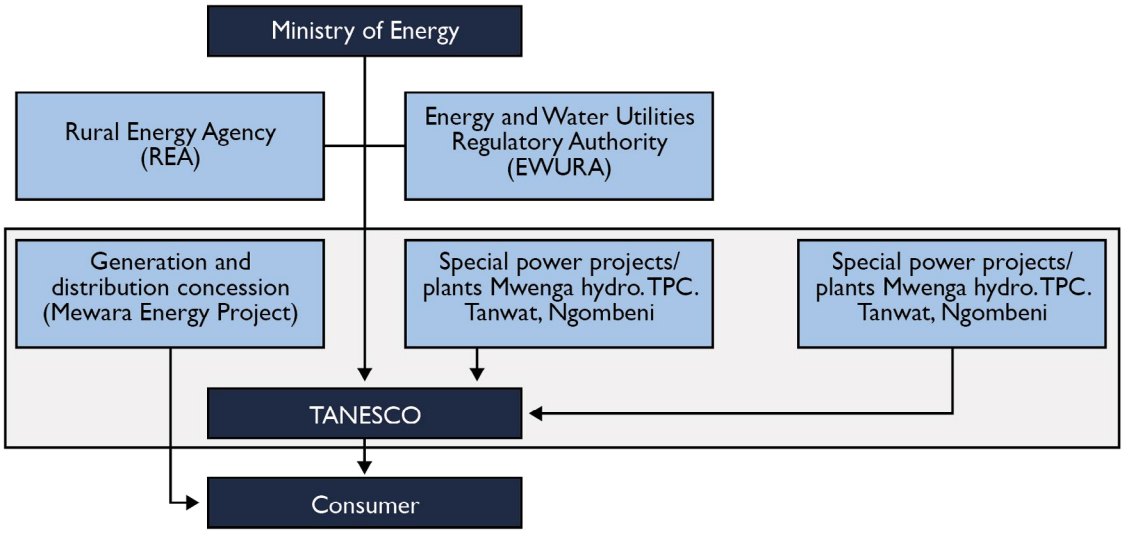
2.2 ENERGY SECTOR SUMMARY

The Tanzania Electric Supply Company Limited (TANESCO) is the state-owned utility in Tanzania, responsible for the full electricity supply chain. The Government of Tanzania (GOT) differentiates between independent power producers (IPPs), small power producers (SPPs), and emergency power producers. Tanzania has moved away from negotiated deals that historically resulted in high rates being paid out to the IPPs. In 2018, GOT initiated requests for quotations from IPPs for the competitive procurement of approximately 950 megawatts (MW) of solar-, wind-, and coal-generated power. For solar, TANESCO intends to procure power generation from a set of solar photovoltaic- (PV-) based power projects with total capacity of up to 150 MW peak (MWp) in Dodoma, Iringa, Mwanza, Shinyanga, Simiyu, and Singida regions between 2018 and 2020. In addition, GOT expects to generate 5,000 MW by 2020 and 10,000 MW by 2025. As a result, a large portion of the funds from the 2018-2019 energy budget has

[6] National Bureau of Statistics, "Population Projections for the Period of 2013 to 2035 at National Level."
[7] CIA, "Africa :Tanzania."
[8] World Population Review, "Tanzania Population 2019."
[9] CIA, "Africa :Tanzania."
[10] The World Bank, "Rural Population (% of Total Population) | Data."
[11] The World Bank, "Population, Total | Data."
[12] The World Bank, "Population Density (People per Sq. Km of Land Area) | Data."
[13] The World Bank, "Rural Population (% of Total Population) | Data."
[14] CIA, "Africa :Tanzania."
[15] CIA.

been allocated to support electricity generation followed by transmission and distribution (GET.Invest n.d.). Figure 1 illustrates the structure of Tanzania's power sector.

FIGURE 1. TANZANIA POWER SECTOR STRUCTURE



Note: IPTL = Independent Power Tanzania Ltd; TANESCO = Tanzania Electric Supply Company; TPC = Tanganyika Planting Company
Source:[16]

2.3 GOVERNMENT INSTITUTIONS

Various government institutions have a stake in the energy or power sector in Tanzania. Some work in off-grid energy as well. Table 2 provides details on a few of these stakeholders.

TABLE 2. GRID CONNECTION STATISTICS

INSTITUTION	MANDATE	RELEVANCE TO OFF-GRID	WEBSITE
Ministry of Energy and Minerals (MEM)	Develop energy and mineral resources and manage the energy sector	Yes	www.nishati.go.tz
Energy and Water Utilities Regulatory Authority (EWURA)	Technical and economic regulator of Tanzania's electricity, petroleum, natural gas, and water sectors	Yes	www.ewura.go.tz
TANESCO	Generation, transmission, and distribution, serving customers on the main grid and isolated grids	Yes	www.tanesco.co.tz
Tanzania Petroleum Development Corporation	Implements petroleum exploration and development policies	Yes	www.tpdc.co.tz
Rural Energy Agency (REA)	Promote modern energy access in rural areas through efficient and rational use of energy, grants, project finance, capacity-building, and technical assistance	Yes	www.rea.go.tz

Source:[17]

[16] Energy for Economic Growth, "Tanzania Energy Sector Overview."
[17] World Resources Institute and TaTEDO, "Mapping Energy Access: Tanzania."

TANESCO owns most of the electricity generating, transmitting, and distributing facilities in mainland Tanzania. Overall electricity access is estimated at 33 percent for the country, according to the World Bank 2017. Areas with the highest electricity access are mostly concentrated in the larger, more populated areas, such as Arusha, Kilimanjaro, and Dar es Salam, where grid access is over 80 percent of households. The lowest grid access rates are mostly in the southern part of the country with rates between 24 percent and 53.3 percent in places such as Lindi, Mtwara, Ruvuma, and Njombe.[18]

According to EWURA's 2018 report Regulatory Performance Report on Electricity Sub-Sector, Tanzania's total installed power capacity, as of June 2017, was 1,457.2 MW of which 1,366.6 MW was for main grid and 90.6 MW was for isolated mini-grids. The electricity generation mix comprises 39.3-percent hydropower, 43.9-percent natural gas, 15.9-percent liquid fuel, and 0.8-percent biomass.[19]

2.4 ON-GRID AFFORDABILITY

Since 2012, TANESCO has added over 800,000 customer connections to its network, bringing its total customer base to 1.9 million. However, it is still working to reach approximately 15 million people who remain unconnected despite living in proximity to the distribution and transmission network. Connecting these households to the grid is a national priority for GOT.[20]

The Sector Reform and Utility Commercialization (SRUC) Task Order is a five-year program that started in April 2014, funded by the U.S. Agency for International Development (USAID).[21] The team is working with the USAID Mission in Tanzania to conduct a low-cost connections assessment to support TANESCO in this effort. More specifically, the SRUC team is helping to identify and address financial barriers facing unconnected households in Dar es Salaam and surrounding regions by investigating lower-cost home wiring solutions.

SRUC conducted five case studies and presented to TANESCO several critical takeaways related to effective project design, monitoring, and execution. These takeaways suggest that TANESCO evaluate existing and prospective community partnerships and relationships to strategize how to maximize brand credibility, respect, community engagement, gender inclusion, and more stakeholder engagement.

REA's 2016 Energy Access Situation Report surveyed grid-connected customers on the perception of electricity connection charges, broken down by rural and urban customers. Figure 2 shows the breakdown of consumers' perception of the cost of electricity connection, while Figure 3 shows their perception of monthly charges for electricity usage.[22]

[18] World Resources Institute and TaTEDO.

[19] Energy and Water Utilities Regulatory Authority, "Regulatory Performance Report on Electricity Sub-Sector."

[20] USAID, "Tanzania."

[21] USAID.

[22] REA, "Energy Access Situation Report, 2016 Tanzania Mainland."

FIGURE 2. URBAN AND RURAL HOUSEHOLDS' PERCEPTIONS OF ELECTRICITY CONNECTION CHARGES

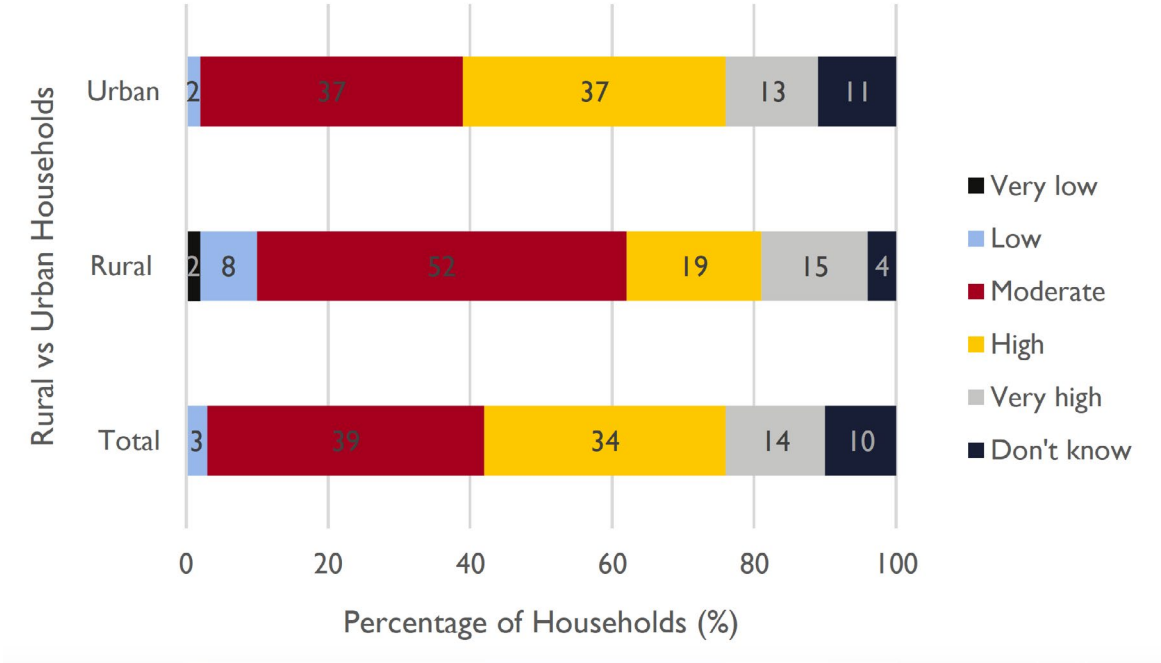
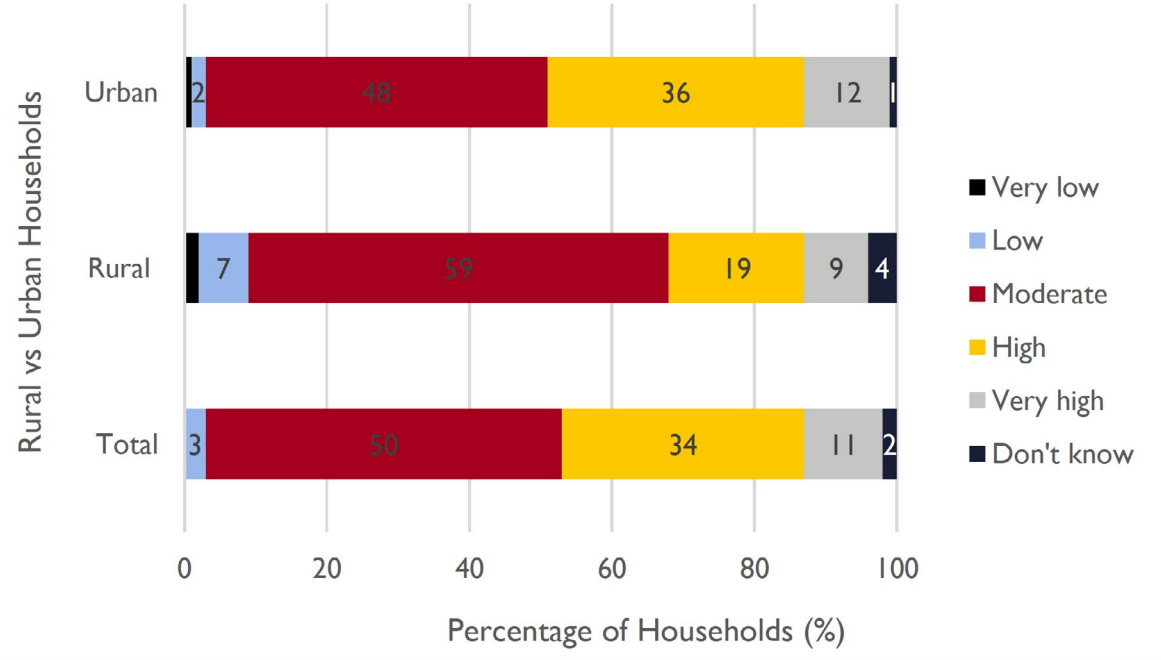


FIGURE 3. URBAN AND RURAL HOUSEHOLDS' PERCEPTION OF MONTHLY ELECTRICITY BILLS



Tanzania's tiered pricing for electricity usage is shown in Table 3. The average use per sector is shown in Table 4.

TABLE 3. TANZANIA'S ELECTRICITY TARIFF SCHEME

CUSTOMER CATEGORY		COMPONENT	TANZANIAN SHILLINGS
D1	Domestic Low Usage	Basic Charge	0
		Energy Charge 0–75 kilowatt hours (kWh)/ month	100
		Energy Charge above 75 kWh/month	350
T1	General Use	Basic Charge	0
		Energy Charge	292
T2	Low Voltage Supply	Basic Charge	14,233
		Energy Charge	195
		Demand Charge kilo-volt amperes (kVA)	15,004
T3/ T3 medium voltage (MV)	MV Supply	Basic Charge	16,769
		Energy Charge	157
		Demand Charge (kVA)	13,200
T3/ T3 high voltage (HV)	HV Supply	Basic Charge	0
		Energy Charge	152
		Demand Charge (kVA)	16,550

Source:[23]

TABLE 4. TANZANIA ELECTRICITY CONSUMPTION BY SECTOR

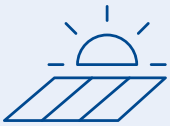
ECONOMIC SECTOR	%	GIGAWATT HOURS
Industry	25.5	1,270
Transport	0	0
Residential	44.8	2,227
Commercial and Public Services	22.9	1,141
Agriculture/Forestry	3.6	180
Fishing	0	0
Other Non-specified	3.2	158
Final Electricity Consumption	100	4,976

Source:[24]

[23] GET.Invest, "Tanzania Energy Sector."

[24] GET.Invest.

2.5 ELECTRIFICATION TARGETS



GOT plans to generate 5,000 MW by 2020 and reach 10,000 MW by 2025.[25] This ambition has been reflected in the Ministry of Energy's budgetary planning. GOT has allocated significant funding to generation, transmission, and distribution.

Approximately 16.9 percent of Tanzania's rural population have access to electricity.[26] According to REA, the Tanzanian government plans to increase rural household connectivity to 50 percent in 2025 and 75 percent in 2033. REA plans to electrify all Tanzania villages by 2021 at a rate of 2,000 villages per year. Over 5,000 are already electrified through the national grid's extension.[27]

2.6 DEMAND FOR ENERGY

In 2016, on behalf of GOT, REA commissioned the National Bureau of Statistics (NBS) to undertake a survey of energy access at both the community and private household levels across 26 regions of mainland Tanzania. The 2016 Energy Access Situation Survey collected data in all regions, which were used to review the accepted targets, activities, and implementation to develop additional medium-term strategic plan, monitoring, and evaluation framework indicators of rural electrification in the country. The resulting 2016 Energy Access Situation Report from REA and NBS revealed the following.[28]

Household Connection to Electricity in Rural and Urban Areas. Electricity connectivity has improved since 2011. In 2016, 16.9 percent of the rural households in mainland Tanzania were connected to electricity in any form, up from 6.1 percent in 2011. Of urban households, 65.3 percent were connected to electricity from any source, and on average, 32.8 percent of households in all areas were connected. The majority of urban households (96.4 percent) were connected to grid electricity, but that proportion drops to only 34.5 percent in rural areas. Five regions had less than ten-percent rural electrification through any form of electricity: Songwe (six percent), Kigoma (6.7 percent), Shinyanga (seven percent), Simiyu (9.3 percent), and Manyara (9.4 percent).

Population Accessing Electricity. Of all electrified households, 74.9 percent received electricity supplied through the grid, 24.7 percent used solar power, and only 0.3 percent use electricity generated from a private entity or individually owned sources (excluding solar). Solar power was more common in rural areas, where it comprised 64.8 percent of electrified households' main sources of power. Only 34.5 percent of electrified households primarily relied on grid electricity.

Regionally, electricity connections varied: Dar es Salaam had nearly universal connection to the grid (99.3 percent), compared to grid connections in less densely populated areas like Lindi (24.5 percent), Njombe (36.6 percent), and Mtwara (38.9 percent). Inversely, solar power use was highest in Lindi at 75.5 percent, and lowest in Dar es Salaam at 0.7 percent.

[25] Export.gov, "Tanzania - Energy | Export.Gov."
[26] REA, "Energy Access Situation Report, 2016 Tanzania Mainland."
[27] TANESCO, "Electricity Supply Industry Reform Strategy and Roadmap 2014 - 2025."
[28] REA, "Energy Access Situation Report, 2016 Tanzania Mainland."

Affordability of Electricity. Salaried households were most likely to be connected to grid electricity (67.8 percent), followed by households headed by wage laborers who worked on or with forest products (62.2 percent) and households headed by transport owners (56.8 percent). In rural areas, households headed by a person employed in wage labor or self-employed in trades like carpentry or masonry were most likely to be connected to grid electricity. Survey findings also revealed that households headed by people with higher levels of education and higher monthly incomes were more likely to be connected to grid electricity.

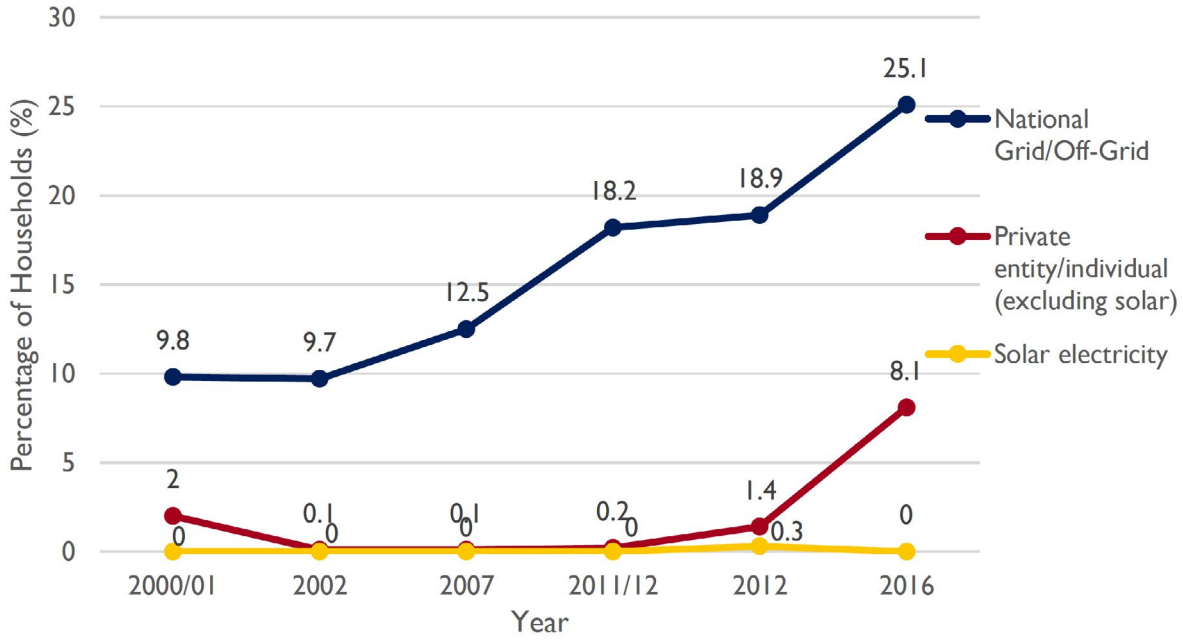
Household Perception of Quality and Connection Charges of Electricity Services. Most households (59 percent) rated the quality of the power supplied to their houses as fair, with a rural-urban difference of 46 percent (rural) and 62 percent (urban). A very small percentage of households rated the quality of their electricity as either very good or very poor. Most rural and urban households thought that interruptions to their power supply were low or moderate in number, although 29 percent of rural households considered interruptions a large or very large problem.

A large proportion of households felt connection costs were moderate (39 percent) or high (37 percent). Urban households were more likely to rate their connection costs as high, given that urban electricity charges are nearly twice as expensive as those in rural areas. The majority of connected households were able to pay the connection fee up front without utilizing credit.

Household Perception of Benefits and Impact of Electrification. In mainland Tanzania, 70.8 percent of heads of households agreed that electrification shortened the distances they traveled to and from grinding and milling machines. Heads of households who worked in small-scale industries were more in urban (71.5 percent) than in rural (42.5 percent) areas. In addition, 70.3 percent of households also supported the opinion that accessible electricity increased business activities and business operating hours. 75.9 percent agreed that accessible electricity increased access to mass media through TV and radio. Further, 41.6 percent of households agreed that electricity made clean water more accessible, and 72.1 percent of households in rural and urban areas agreed that electric lighting enabled students to study after sunset.

Sources of Energy for Lighting. One-quarter of mainland Tanzanian households (25.1 percent) used electricity as one of the sources of energy for lighting. This use of electricity was more pronounced in urban households (63.1 percent) than rural households (6.6 percent), and electricity use was highest in Dar es Salaam (74.6 percent) and lowest in Lindi (5.4 percent). Lindi, Njombe, and Katavi stand out as three regions where the use of solar energy was more common than use of electricity, and Njombe had the highest rate of solar utilization at 32.7 percent. Rechargeable lights and kerosene lighting were other notable sources of electricity, used at higher rates in rural than urban areas. Usage somewhat shifted away from kerosene to rechargeable lights, partially due to an increase in kerosene prices. Other sources of lighting energy like generators, firewood, and charcoal were used by only two percent of mainland Tanzanian households. From 2000, grid connectivity for lighting in Tanzania greatly increased, solar lighting somewhat increased, and use of other sources remained mostly flat. Figure 4 shows lighting energy sources in Tanzania from about 2000 on.

FIGURE 4. HOUSEHOLDS SOURCES OF ENERGY FOR LIGHTING, MAINLAND TANZANIA



Source: REA (2016) Energy Access Situation Report, Tanzania Mainland

Sources of Energy for Cooking. Firewood was the predominant energy source for cooking in Tanzania, used by 71.2 percent of households. Charcoal was second most common at 37 percent, followed by kerosene at five percent. Firewood was more commonly used in rural areas (92 percent) than in urban areas (28.4 percent). Dar es Salaam had the highest usage of kerosene (22.1 percent), industrial gas (26.7 percent), and charcoal (88.2 percent). Use of modern energy sources for cooking was still low, with only 8.2 percent using industrial or bottled gas and only 0.3 percent using electricity for cooking. The poorest households relied most on firewood (96.6 percent), and the wealthiest used charcoal the most (83.7 percent).

Cost of Energy for Lighting and Cooking. Grid electricity had the highest average costs, with a monthly expenditure of 9,152 Tanzanian shillings (TZS) on average, while candles at TZS 2,282 ($1) per month were the least expensive. Energy costs also varied regionally, with electricity costs ranging from TZS 25,981 ($11) per month in Dar es Salaam to TZS 5,521 ($2.50) in Simiyu. For cooking, industrial gas was most expensive at TZS 31,874 ($13.85) per month, and kerosene was least expensive at TZS 18,156 ($8) on average per month.

Community Access to Electricity. The survey also reported information about community-level access to electricity, defined as "a population having clean, reliable, and affordable access to energy services for cooking and heating, lighting, communication, and for productive uses." With this measure, 67.5 percent of the mainland Tanzanian population had access to grid electricity, 97.3 percent in urban areas and 49.3 percent in rural areas. Community leaders identified which alternative sources of energy were popular in their communities, and after grid electricity, 94.1 percent agreed that solar power was the alternative source of electricity for the majority of households in their administrative areas. Leaders ranked educational services, health services, retail shops and carpenters, welders, and milling centers as most likely to be connected to grid electricity. Leaders also ranked buildings like water services, police stations, post offices, recreational places, and veterinary and livestock services as least likely to be connected to grid electricity.

Availability and Cost of Alternative Energy Sold. Torch batteries were the most easily available in rural and urban communities, reportedly sold in 95.4 percent and 96.5 percent of rural and urban areas, respectively. Kerosene, charcoal, and firewood were also sold in significant quantities in all areas. There was a large differential between urban and rural areas in the availability of some alternative energy sources, such as generators (sold in 36 percent of urban and 20 percent of rural areas), biogas (sold in 20.3 percent of urban and six percent of rural areas), solar panels (sold in 46.5 percent of urban and 32.3 percent of rural areas), and others.

3 OFF-GRID SECTOR OVERVIEW

Off-grid solar is still a growing sector in Tanzania, and business and financing models are still refining. The solar home system (SHS) segment shows great promise as a sustainable, commercially viable opportunity, but access to financing is a big challenge. Solar products available in Tanzania include portable lanterns, multi-light systems, SHS, household, and productive-use appliances (Table 5).

TABLE 5. PICO SOLAR TECHNOLOGIES AND THEIR APPLICATIONS

	STAND-ALONE		GRIDS	
	OFF-GRID		OFF-GRID/ON-GRID	
Systems	Solar lighting kits/ lanterns	SHS	Nano-grid	Micro/Mini-grid
Application	Lighting	Lighting and appliances	Lighting and appliances, emergency power	All uses including industrial
Key Components	Generation, storage, lighting, cell charging	Generation, storage, direct current (DC) special appliances	Generation plus single-phase distribution	Generation plus three-phase distribution plus controller
Typical sizes	0–10 W	11 W–5 kW	5 kW–1 MW	

Source: Power Africa in-country technical advisor expertise

3.1 PICO-SOLAR AND SHS COMPANIES

3.1.1 PICO-SOLAR COMMERCIAL OVERVIEW

The Global Off-Grid Lighting Association (GOGLA) surveys members to determine pico-solar sales in Tanzania. The data reported are limited to the sales of Lighting Global-verified products by GOGLA and its member companies. Tables 5 through 13 present the information gathered by GOGLA.[29]

In Table 6, GOGLA estimates close to six million people were impacted with improved energy access from 2016 to 2018. About 1.8 million had access to Tier 1 energy services and around 1.1 million Tier 2 energy services.[30]

[29] GOGLA, "Publications."

[30] ESMAP, "Multi-Tier Framework for Measuring Energy Access."

TABLE 6. GOGLA ESTIMATED IMPACT FROM 2016 UP TO DEC 2018	
METRICS RESULTS	TANZANIA
People with improved energy access – cumulatively	5,795,172
People with improved energy access – currently	5,419,844
People with access to Tier 1 energy services – currently	1,882,306
People with access to Tier 2 energy services – currently	1,103,486
People that have started a new job – cumulatively	40,278
Additional income - cumulatively	$214,811,718
Change in light hours used – cumulatively	1,616,106,272
Change in energy spending - cumulatively	$160,204,712
Change in energy spending - household	$990
Greenhouse gas emissions avoided- cumulatively	1,708,454

Table 7 shows that from mid-2014 until late 2017, portable lanterns with single lights or single lights with mobile charging (0–3 Watts-peak [Wp]) sold the most followed by SHS (11–100 Wp). Businesses sold most portable lantern products on a cash basis and a small fraction with the pay-as-you-go (PAYGO) model. Similar to multi-light systems, PAYGO sales dominate the SHS segment. The number of SHS units sold was still relatively low compared to the number of lanterns, but the market segment experienced consistent growth largely due to the growing penetration of PAYGO end-customer financing.

TABLE 7. GOGLA SALES DATA BY PRODUCT CATEGORY AND SIZES								
ROW LABELS	SUM OF TOTAL	SUM OF 0–1.5 WP	SUM OF 1.5–3 WP	SUM OF 3–10 WP	SUM OF 11–20 WP	SUM OF 21–49 WP	SUM OF 50–100 WP	SUM OF 100+WP
Tanzania	**1,801,028**	**612,409**	**114,266**	**81,157**	**48,134**	**21,612**	**45,342**	**13,024**
Jul–Dec 2014	397,077							
Jan–June 2015	180,000							
Jul–Dec 2015	473,009	379,963	21,541	615			9,057	
Jan–June 2016	187,694	78,575	18,116	5,663				
Jul–Dec 2016	185,073	124,101	18,060	12,598	9,829			
Jan–June 2017	69,143	29,770	2,995	7,635	8,221			
Jul–Dec 2017	103,299		19,950	25,172	10,535	6,576	19,698	
Jan–June 2018	103,695	0	4,998	12,397	5,868	7,384	11,873	
Jul–Dec 2018	102,038		28,606	17,077	13,681	7,652	4,714	13,024

In Table 8, the value of cash products is calculated from the reported freight on board price, while for PAYGO products is calculated from the reported total cost of ownership. Total cost of ownership is the average sum in U.S. dollars received from a customer repaying the product in full and on time without applying a financial discount rate.[31]

TABLE 8. GOGLA SALES VOLUME BY BUSINESS MODEL

SALES VOLUMES	BUSINESS MODEL		
ROW LABELS	CASH+PAYGO	CASH ONLY	PAYGO ONLY
Tanzania	**1,801,028**	**98,469**	**107,264**
Jul–Dec 2014	397,077		
Jan–June 2015	180,000		
Jul–Dec 2015	473,009		
Jan–June 2016	187,694		
Jul–Dec 2016	185,073		
Jan–June 2017	69,143		
Jul–Dec 2017	103,299		
Jan–June 2018	103,695	52,691	51,004
Jul–Dec 2018	102,038	45,778	56,260

TABLE 9. GOGLA MARKET VALUE BY PRODUCT CATEGORY AND BUSINESS MODEL

ROW LABELS	SUM OF TOTAL IN USD	SUM OF 0–1.5 WP	SUM OF 1.5–3 WP	SUM OF 3–10 WP
Tanzania	**$11,662,647**	**1,039,232**	**1,536,153**	**170,085**
Jul–Dec 2015	$5,305,388			
Jan–June 2016	$1,862,303			
Jul–Dec 2016	$1,586,221	831,074	753,815	
Jan–June 2017	$342,369	208,158	94,033	
Jul–Dec 2017	$778,222		658,357	20,391
Jan–June 2018	$339,108		29,948	
Jul–Dec 2018	$1,449,036			149,694

[31] GOGLA, "Publications."

TABLE 10. GOGLA SALES VOLUME BY BUSINESS MODEL		
SALES VOLUMES	BUSINESS MODEL	
ROW LABELS	CASH ONLY	PAYGO ONLY
Tanzania	**$11,662,647**	**$38,480,185**
Jul–Dec 2015	$5,305,388	
Jan–June 2016	$1,862,303	
Jul–Dec 2016	$1,586,221	
Jan–June 2017	$342,369	
Jul–Dec 2017	$778,222	
Jan–June 2018	$339,108	$16,745,601
Jul–Dec 2018	$1,449,036	$21,734,584

TABLE 11. GOGLA SALES DATA BY QUALITY VERIFIED (QV) AND NON-QUALITY			
ROW LABELS	SUM OF TOTAL	SUM OF QV	SUM OF NON-QV
Tanzania	**1,801,028**	**1,244,286**	**159,665**
Jul–Dec 2014	397,077		
Jan–June 2015	180,000	170,000	10,000
Jul–Dec 2015	473,009	408,715	64,294
Jan–June 2016	187,694	171,264	16,430
Jul–Dec 2016	185,073	169,169	15,904
Jan–June 2017	69,143	57,323	11,820
Jul–Dec 2017	103,299	97,638	5,661
Jan–June 2018	103,695	88,885	14,810
Jul–Dec 2018	102,038	81,292	20,746

Table 12 features sales volumes from certain off-grid solar appliances (TVs and fans) sold to customers living in off- or weak-grid areas.

TABLE 12. GOGLA ESTIMATED SALES DATA OF BUNDLED APPLIANCES FOR EAST AFRICA REGION		
APPLIANCES	**PERIOD**	**SALES VOLUMES**
Fans	Jul–Dec 2016	–
	Jan–June 2017	–
	Jul–Dec 2017	27,140
TVs	Jul–Dec 2016	21,042
	Jan–June 2017	113,502
	Jul–Dec 2017	126,701

TABLE 13. GOGLA COUNTRY LEVEL TRENDS		
TREND TYPE	**PERCENT CHANGE FROM SECOND HALF OF 2018 TO FIRST HALF OF 2018**	**PERCENT CHANGE SECOND HALF OF 2018 TO SECOND HALF 2017**
Total Sales	-2%	-1%
Solar Lanterns	472%	43%
Multi-light Systems	38%	-32%
SHS Sales	56%	6%

Generally, 2018 was a positive year for fundraising for the East Africa off-grid solar sector, though it did not match the previous record year of 2017. The year witnessed a growth in debt investments, mainly driven by development finance institutions (DFIs). Major increases in debt investment included both debt raised from banks or financing institutions, which increased by 57 percent, and debt raised through crowdfunding platforms, which saw an increase of more than 600 percent.

Another impressive shift came from the increase in the number of off-grid transactions, which went up from 36 in 2017 to 107 in 2018. Key uses of funds included scaling up businesses, expanding geographically, and bridging working capital needs.

Governments, including DFIs, remain top investors in the off-grid space, with investment growth of eight percent in 2018.[32] Table 14 shows energy-funding sources in East Africa from 2012 through 2018.

[32] GOGLA.

TABLE 14. GOGLA BREAKDOWN OF EAST AFRICA REGION FUNDING TYPES, TRANSACTIONS, BUSINESS MODEL, USE OF FUNDING, AND FUNDING FLOW BY INVESTOR TYPE

Geography		2012	2013	2014	2015	2016	2017	2018
Type of Investment	**Total**	**$9,164,448**	**$9,340,391**	**$47,517,751**	**$158,733,313**	**$146,884,361**	**$172,223,400**	**$153,712,881**
	Grant	$2,642,965	$5,875,826	$4,929,570	$6,500,000	$3,000,000	$0	$1,458,211
	Equity - common shares	$6,521,483	$1,900,000	$27,458,230	$91,476,170	$97,533,144	$45,585,405	$16,076,046
	Equity - preferred shares	$0	$0	$0	$0	$5,575,000	$0	$0
	Debt - note / bond	$0	$0	$350,000	$6,957,143	$12,940,000	$5,936,940	$1,693,556
	Debt - bank or financial institution loan	$0	$1,564,565	$5,000,000	$13,300,000	$24,692,315	$45,146,950	$71,109,311
	Debt - crowdfunding	$0	$0	$0	$0	$1,143,902	$2,554,104	$19,728,048
	Debt - securitization and/or factoring	$0	$0	$9,779,951	$40,500,000	$2,000,000	$73,000,000	$43,647,710
	Other	$0	$0	$0	$0	$0	$0	$0
Transactions	Number of transactions	7	10	10	21	42	36	107
	Average transaction size	$1,309,207	$934,039	$4,751,775	$7,558,729	$3,497,247	$4,783,983	$1,436,569
	Median transaction size	$642,965	$925,000	$3,629,115	$4,500,000	$997,439	$743,470	$182,664
Business Model	**Total**	**$9,164,448**	**$9,340,391**	**$47,517,751**	**$158,733,313**	**$146,884,361**	**$172,223,400**	**$153,712,881**
	PAYGO	$3,364,448	$8,590,391	$47,517,751	$158,733,313	$144,821,783	$171,993,068	$138,781,163
	Non-PAYGO	$5,800,000	$750,000	$0	$0	$2,062,578	$230,331	$14,931,718
Use of Funding	**Total**	**$9,164,448**	**$9,340,391**	**$47,517,751**	**$158,733,313**	**$146,884,361**	**$172,223,400**	**$153,712,881**
	Uncertain	$0	$0	$0	$0	$0	$0	$0
	Business plan development, corporate setup, and proof of concept	$400,000	$1,900,000	$7,000,000	$0	$0	$0	$441,332
	Introduction of product to the market and/or product refinement	$8,764,448	$7,440,391	$17,479,570	$49,750,000	$180,346	$964,632	$2,724,169
	Scale up business and reach critical mass of customers	$0	$0	$13,258,230	$42,883,313	$44,828,456	$36,819,877	$54,061,278
	Geographic expansion, add new products, and/or make acquisition	$0	$0	$0	$15,100,000	$79,485,181	$37,936,940	$17,509,157
	Bridge working capital needs including financing of consumer loans extended	$9,164,448	$9,340,391	$9,779,951	$48,500,000	$22,390,378	$96,501,950	$66,676,945
	Refinancing existing liabilities	$0	$0	$0	$2,500,000	$0	$0	$12,300,000
	other	$1,642,965	$5,125,826	$0	$0	$0	$0	$0
Funding Flow by Investor Type	**Total**	**$0**	**$750,000**	**$47,517,751**	**$158,733,313**	**$146,884,361**	**$172,223,400**	**$153,712,881**
	Crowdfunding	$0	$0	$0	$0	$1,143,902	$2,554,104	$20,062,280
	Government including DFI	$1,642,965	$5,125,826	$4,929,570	$23,383,313	$24,735,181	$57,154,050	$61,947,724
	Strategic corporates	$0	$750,000	$0	$1,500,000	$0	$22,000,000	$0
	For-profit finance	$400,000	$1,564,565	$9,779,951	$2,500,000	$54,000,000	$34,000,000	$4,410,930
	Family office/foundation	$7,121,483	$0	$6,150,000	$54,100,000	$23,690,000	$1,406,940	$1,514,639
	Impact finance	$0	$1,900,000	$26,658,230	$75,050,000	$36,965,378	$55,108,305	$38,167,710
	Unknown	$0	$0	$0	$2,200,000	$6,349,900	$0	$27,609,598

3.1.2 PICO-SOLAR COMPANIES OVERVIEW

Various solar companies are active in Tanzania, serving different market segments. These companies sell solar products through cash or PAYGO business models. Private investments, government, and donor-funded programs have supported the rapid growth of solar market in Tanzania. To date, most customers buy solar products for household use (lighting and phone charging). Other applications include installations in hospitals, schools, businesses, and health centers. Off-grid electrification represents a large portion of annual connections in the country.

Table 15 provides information on pico-solar companies operating in Tanzania.

TABLE 15. PICO SOLAR COMPANY SNAPSHOTS

COMPANY	YEARS OF OPERATIONS	OPERATIONS	BUSINESS MODEL	PRODUCTS
mobisol plug in the world	9	Tanzania, Rwanda, Kenya, Nigeria	PAYGO Cash- Carry Partnerships	Solar systems for home or business ranging from 40 Wp to 200 Wp
ZOLA	8	Tanzania, Rwanda, Ghana, and Cote d'Ivoire	PAYGO Cash- Carry Partnerships	Solar systems for home or business ranging from 40 Wp to 200 Wp
greenlight planet	12	Africa and Asia	PAYGO Cash- Carry Partnerships	Lanterns and solar systems for home or business up to 40 W
d.light SOLAR	12	Kenya, Nigeria, Tanzania, Uganda, India	PAYGO Cash- Carry Partnerships	Lanterns and solar systems for home or business up to 40 W
azuri	7	Kenya, Nigeria, Tanzania,	PAYGO Cash- Carry Partnerships	Solar systems for home or business up to 50 W
SOLAR SISTER	10	Nigeria, Tanzania	PAYGO Cash- Carry Partnerships	Works exclusively with women to sell lanterns and SHS from several manufacturers
SOLARIS TANZANIA	10	Tanzania	PAYGO Cash- Carry Partnerships	Solar systems for home or business ranging from 40 Wp to 200 Wp
Jaza	4	Tanzania	PAYGO	Build energy hubs (charging stations) and electrify households

Table 16 presents common barriers that impact market penetration in the pico-solar sector and potential ways to overcome those barriers.

TABLE 16. COMMON BARRIERS AND POSSIBLE SOLUTIONS FOR THE PICO SOLAR MARKET IN TANZANIA

GAPS/BARRIER	CAUSE	POSSIBLE SOLUTIONS
Policy and regulations	Lack of dedicated renewable energy policies in the country (i.e., policy and regulations that directly target the Pico & SHS segment)	Find a way to include Pico/SHS targets and regulations into a broader national energy policy to help grow the off-grid sector. Discussions about how off-grid technologies are beneficial to country electrification targets will also help grow the sector and attract much-needed investments.
Duties and taxes	Exemptions for Pico/SHS products are not well-defined	Update tax regulations to include solar products and components exemptions.
Access to finance	Lack of affordable funding opportunities targeting Pico/SHS	Promote affordable and targeted financing for the growth of the Pico/SHS segment in Tanzania. Tools such as concessional financing, repayments grace periods, and longer repayment periods may help cater to renewable energy-financing needs.
	Low awareness and lack of understanding of available funding opportunities targeting Pico/SHS companies	Share key information about available off-grid financing opportunities for off-grid companies to access.
	Lack of in-house capacity for Pico/SHS companies to develop sound investment proposals	Provide technical assistance to Pico/SHS companies in drafting business plans and loan applications.
	Financial barriers related to real and perceived risks of investing in Pico/SHS companies	Support financing institutions and off-grid companies to develop sound risk mitigation mechanisms. Risk instruments, such as guarantees and insurance, can help mitigate the real and perceived risks of investing in off-grid companies.
Capacity-building	Development of skills to support the off-grid sector remains a crucial challenge	Provide crucial trainings and technical assistance to off-grid companies for the growth of the sector. Manufacturers, suppliers, nongovernmental organizations (NGOs) and local associations can play a major role.
Consumer protection and quality assurance	Large quantities of low-quality Pico/SHS products in the market	Support government initiatives to combat and monitor importation of low-quality off-grid solar products into the market. Programs like Lighting Tanzania are key in providing consumer education on quality and the importance of procuring approved products.

Table 17 identifies policies and regulations common in the off-grid energy sector and the specific provisions that apply to the pico-solar market in Tanzania.

TABLE 17. POLICIES AND REGULATIONS

TYPE OF POLICY OR REGULATION	EXIST (YES/NO)	ADDITIONAL INFORMATION	OFF-GRID ENERGY RELEVANCE
National Energy Policy	Yes	National Energy Policy, 2003; Energy and Water Utilities Authority Act, 2001 and 2006; Rural Energy Act, 2005; Electricity Act, 2008; Public-Private Partnership Act. No. 18, 2010.	Policies broadly address off-grid energy policies.
Electricity Regulations	Yes	The Electricity Act, Cap. 131 (2008), The EWURA Act, Cap. 414	Smaller projects can register their businesses. They do not require the approval of the regulator but do need to inform the regulator and other government agencies of their enterprises and activities. The process, procedures, and requirements needed to register a company in Tanzania can be found in an information portal for micro, small, and medium enterprises and on the Tanzania Investment Center website.
Tax and Import Regulations	Yes	Regulations under value added tax (VAT): The VAT (General) Regulations, 2015 The VAT General Regulation, Amendments, 2018 East African Community (EAC) Customs Management (Compliance and Enforcement) Regulations, 2016 EAC Customs Management Regulations, 2010 EAC Customs Management (Duty Remission) Regulations, 2008 Regulations under the EAC Customs Management Act:	In the past the government has provided support through the exemption of import taxes (import duty and VAT) on main solar components (panels, batteries, inverters, and regulators, etc.) to make SHS more affordable. The 2015 VAT Act and 2016 Customs Law amendments removed exemptions for some items that make up a solar system. For example, no exemption applies to wire/cables, switches, light emitting diode (LED) lights, and other solar energy system components.
Quality Control Regulations	Yes	In 2018, the Tanzanian Bureau of Standards (TBS) announced the basic standards required for solar products. Through TBS, quality of pico-PV products can now be tested, verified, and registered.	TBS adopted the Lighting Global Standard for small renewable energy and hybrid systems for rural electrification. The basic standards (TZS 1951-9-5 and TZS 1952) involve all solar power and related products manufactured inside the country or imported.

TABLE 17. POLICIES AND REGULATIONS (CONTINUED)			
TYPE OF POLICY OR REGULATION	EXIST (YES/NO)	ADDITIONAL INFORMATION	OFF-GRID ENERGY RELEVANCE
Financial Regulations	Yes	The Central Bank of Tanzania manages all domestic lending activities, regulation of banks, and financial institutions.	There are no specific financial regulations regarding lending to solar companies in Tanzania. In 2018 the government enacted a microfinance bill to regulate licensing and registration of microfinance businesses that do and do not accept deposits.
National Credit Bureau	Yes	There are two licensed credit-reference bureaus from privately owned companies: Dun & Bradstreet Credit Bureau Tanzania Limited and CreditInfo Tanzania.	Through the approved credit reference bureaus, solar companies can conduct credit investigations on individual borrowers or potential borrowers.
Mobile Payment Regulations	Yes	Over the years the government through Tanzania Communication and Regulatory Authority has put into place several legal and regulatory frameworks to govern and support mobile payments in the country. The frameworks include: - Tanzania Communication and Regulatory Authority Electronic and Postal Communications (Licensing) Regulations 2011 - Electronic Payment Schemes Guidelines 2007 - Bank of Tanzania Act 2006 (S. 6) - Tanzania Communication and Regulatory Authority Act 2003 - Mobile Payments Regulations (Draft) - Terms and conditions for agents and customers	Through mobile money, solar companies that can partner with Telkom and intermediaries are able to offer PAYGO options to their customers.
Environmental Regulations	Yes	Environmental Management Act No. 20 of 2004	There are no specific environmental regulations that refer to the sale of decentralized solar systems.
e-Waste Regulations	No	Tanzania has no specific policy or regulation related to e-waste management.	

3.2 MINI-GRID COMPANY SNAPSHOTS

3.2.1 COMMERCIAL OVERVIEW

The 2018 World Resources Institute report Accelerating Mini-grid Deployment in Sub-Saharan Africa: Lessons from Tanzania found that Tanzania now has 109 mini-grids, serving over 180,000 customers. The country's mini-grids provide 157.7 MW of installed capacity from hydropower, biomass, hybrid, fossil fuel, and solar systems.[33]

Tanzania has a progressive SPP regulatory framework. In 2008, Tanzania adopted a new regulatory framework to encourage low-cost investment mini-grids. The framework created a feed-in tariff which is technology-neutral. In 2015, a policy revision encouraged more solar and wind development. In June 2017, the EWURA approved a third-generation mini-grid framework.[34] This framework is aimed at enhancing the enabling regulatory environment. Specific provisions include:

> *"allowing mini-grids at multiple locations to acquire a single license (above one MW) or registration for mini-grids using the same technology (below one MW); defining eligible customers that need not have their tariffs reviewed by EWURA; providing for provisional registrations for mini-grids; allowing grid-connected mini-grids to operate in islanded mode when power supply is not available from the main grid; and, providing additional clarity and credibility on the calculation of compensation for distribution assets when the main grid connects to a previously isolated mini-grid".*[35]

TABLE 18. MINI GRID COMPANY SNAPSHOTS

COMPANY	YEARS OF OPERATIONS	OPERATIONS	BUSINESS MODEL
PowerGen Renewable Energy	8	Tanzania, Kenya, Zambia; expanding to West Africa	Mini-grid developer, solar engineering, procurement, and construction (EPC) and asset management company
Ensol Energy with a smile	18	Tanzania, Burundi	Mini-grid developer and solar EPC company
REDAVIA Rental Solar Power	9	Ghana, Tanzania	Install solar farms for business and communities
JUMEME Rural Power Supply	5	Tanzania	Mini-grid developer
powercorner brighten up your life	5	Tanzania, Zambia	French electric utility company (ENGIE) mini-grid initiative and subsidiary

[33] Odarno et al., "Accelerating Mini-Grid Deployment in Sub-Saharan Africa."
[34] WRI, "Accelerating Mini-Grid Deployment in Sub-Saharan Africa."
[35] World Resources Institute, "RELEASE."

Through a national task force led by MEM, the Tanzanian government developed a mini-grid portal aimed at providing information to investors and developers. The portal contains detailed information on GOT's grid expansion network (existing and planned), licensing requirements, electrification plans (on- and off-grid), and hydropower potential, shown at the district level.

Table 19 presents common barriers that impact market penetration in the mini-grid sector and potential ways to overcome those barriers.

TABLE 19. COMMON BARRIERS AND POSSIBLE SOLUTIONS FOR MINI GRID COMPANIES IN TANZANIA

GAPS/BARRIER	CAUSE	POSSIBLE SOLUTIONS
Tariffs	When mini-grid tariffs set by the regulator are not cost-reflective, developers tend to seek grants and subsidies to cover expenditures	Discuss with the regulator to find cost-reflective tariffs that reflect individual technologies.
Access to finance	Lack of affordable funding opportunities targeting mini-grid technologies	Promote affordable and targeted financing for the growth of the mini-grid market. Tools such as concessional financing, repayments grace periods, longer repayment periods may help cater to mini-grid companies financing needs.
	Low awareness and lack of understanding of available funding opportunities targeting mini-grid developers	Share key information about available mini-grid financing opportunities for off-grid companies to access.
	Lack of in-house capacity for mini-grid companies to develop sound investment proposals	Promote technical assistance like REA and the Renewable Energy Project Development Facility (REPDF) to support mini-grid companies by providing consultation and grant funding for project development activities, such as feasibility studies and business plans.
	Financial barriers related to real and perceived risks of investing in mini-grid companies in Tanzania	Support financing institutions and mini-grid companies to develop sound risk mitigation mechanisms. Risk instruments, such as guarantees or insurance, can help mitigate the real and perceived risk of investing in mini-grid companies.
Capacity-building	Development of skills to support the mini-grid sector remains a crucial challenge	Provide crucial trainings and technical assistance to mini-grid companies for the growth of the segment. Manufacturers, suppliers, NGOs and local associations can play a major role.

Table 20 identifies policies and regulations common in the off-grid energy sector and the specific provisions that apply to the mini-grid market in Tanzania.

TABLE 20. POLICIES AND REGULATIONS

TYPE OF POLICY/ REGULATION	EXIST (YES/NO)	ADDITIONAL INFORMATION	MINI-GRID RELEVANCE
National Energy Policy	Yes	National Energy Policy, 2003; Energy and Water Utilities Authority Act, 2001 and 2006; Rural Energy Act, 2005; Electricity Act, 2008; Public-Private Partnership Act. No. 18, 2010.	These policies broadly address off-grid energy policies.
Electricity Regulations	Yes	The Electricity Act, Cap. 131 (2008), The EWURA Act, Cap. 414 Small power projects including mini-grids are governed by following regulations: The Electricity (Development of Small Power Projects) Rules, 2019 The Electricity (Standardized Small Power Projects Tariff) Order, 2019	Licenses for private mini-grids are required only for projects that exceed 1 MW. Standardized small power purchase agreements/tariffs for private producers providing less than 10 MW. Below 1 MW, mini-grid projects are further categorized into very small power projects (below 100 kW) and small power projects. For site allocation, both top-down and bottom-up approaches (unsolicited proposals from developers) are possible. Very small power projects need a letter of support from the Ministry of Energy, while SPPs need to register with EWURA using a two-step process. For situations when the main grid encroaches on an isolated mini-grid, there is a provision which specifies who pays to take over the mini-grid and how it should be done. SPPs and small power distributors as well as very small power projects must apply to EWURA for tariff approval.

TABLE 20. POLICIES AND REGULATIONS (CONTINUED)			
TYPE OF POLICY/ REGULATION	**EXIST (YES/NO)**	**ADDITIONAL INFORMATION**	**MINI-GRID RELEVANCE**
Tax and Import Regulations	Yes	Regulations under VAT: The VAT (General) Regulations, 2015 The VAT General Regulation, Amendments, 2018 EAC Customs Management (Compliance and Enforcement) Regulations, 2016 EAC Customs Management Regulations, 2010 EAC Customs Management (Duty Remission) Regulations, 2008 Regulations under the EAC Customs Management Act:	In the past the government has provided support through the exemption of import taxes (import duty and VAT) on main solar components (panels, batteries, inverters, and regulators, etc.) to make SHS more affordable. The 2015 VAT Act and 2016 Customs Law amendments removed exemptions for some items that make up a solar system. For example, no exemption applies to wire/cables, switches, light emitting diode (LED) lights, and other solar energy system components.
Quality Control Regulations	Yes	In 2018 the TBS announced the basic standards required for solar products. Through TBS quality of pico-PV products can now be tested, verified and registered.	TBS adopted the Lighting Global Standard for small renewable energy and hybrid systems for rural electrification. The basic standards (TZS 1951-9-5 and TZS 1952) involve all solar power and related products manufactured inside the country or imported.
Financial Regulations	Yes	The Central Bank of Tanzania manages all domestic lending activities and regulation of banks and financial institutions.	There are no specific financial regulations regarding lending to solar companies in Tanzania. In 2018, the government enacted a microfinance bill to regulate licensing and registration of microfinance businesses that do and do not accept deposits.
National Credit Bureau	Yes	There are two licensed credit reference bureaus from privately owned companies, Dun & Bradstreet Credit Bureau Tanzania Limited and CreditInfo Tanzania.	Through the approved credit reference bureaus, solar companies can conduct credit investigations on individual borrowers or potential borrowers.

TABLE 20. POLICIES AND REGULATIONS (CONTINUED)			
TYPE OF POLICY/ REGULATION	EXIST (YES/NO)	ADDITIONAL INFORMATION	MINI-GRID RELEVANCE
Mobile Payment Regulations	Yes	Over the years GOT through Tanzania Communication and Regulatory Authority has put into place several legal and regulatory frameworks to govern and support mobile payments. The frameworks include: - Tanzania Communication and Regulatory Authority Electronic and Postal Communications (Licensing) Regulations 2011 - Electronic Payment Schemes Guidelines 2007 - Bank of Tanzania Act 2006 (S. 6) - Tanzania Communication and Regulatory Authority Act 2003 - Mobile Payments Regulations (Draft) - Terms and conditions for agents and customers	Through mobile money, solar companies can partner with Telkom, and intermediaries are able to offer PAYGO options to their customers.
Environmental Regulations	Yes	Environmental Management Act No. 20 of 2004	Companies implementing off-grid projects like mini-grids have to register with the National Environment Management Council and undertake environmental impacts assessments .
E-Waste Regulations	No	Tanzania has no specific policy or regulation related to e-waste management.	

3.3 PRODUCTIVE USE OF ENERGY COMPANY SNAPSHOTS

3.3.1 CURRENT STATE OF SECTOR

Productive-use-of-energy (PUE) principles can be applied to generate income and productivity in a number of sectors powered by renewable energy sources, including agriculture, commercial enterprises, and industrial activities. The PUE principles can be employed at various levels to power machines for drying, pumping, irrigation, milk cooling, refrigeration for food and medicine, mobile charging, information technology, processing, storage, and others. Lighting extends business hours, which increases income. Home power extends learning hours, which improves human capital.

Productive use is possible in even the smallest renewable energy systems. Pico-solar lanterns and solar micro-grids can provide tens of watts of lighting per household for working on crafts and recharging mobile phones. Some solar PV systems with hundreds of watts of power are useful in agro-processing, such as grating cassava, shredding coconut, and pressing coconut oil. Solar PV and diesel mini-grids can deliver even more kW per connection. Such mini-grids can power carpentry tools, such as saws, drills, and sewing machines. They can also power larger-scale agricultural processing machines for milling, grinding, pumping, welding, and modest refrigeration. The largest systems can power large-scale refrigeration operations and factories for processing tea products.

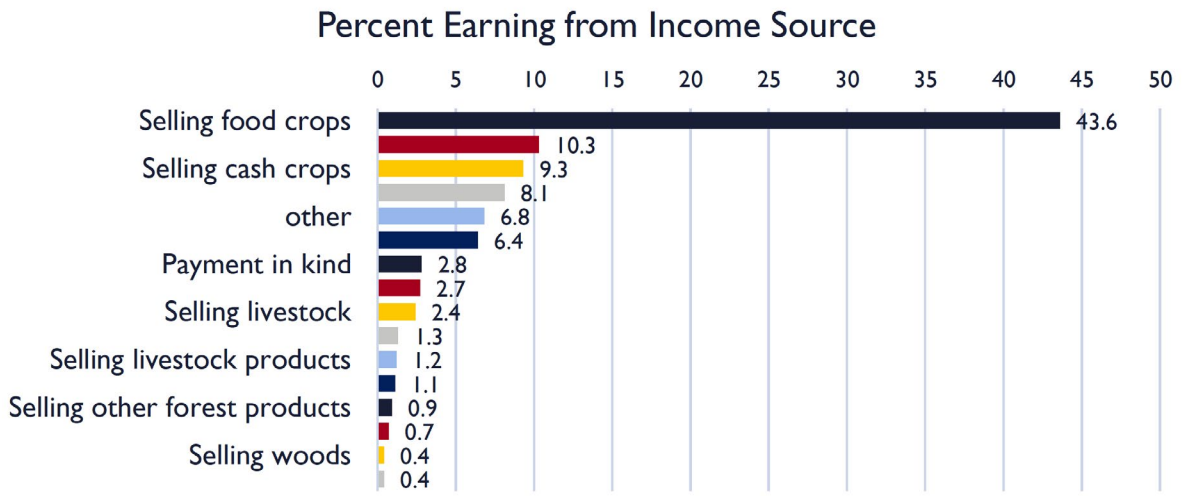
Table 21 offers profiles on some PUE companies in Tanzania.

TABLE 21. PUE COMPANY SNAPSHOTS

COMPANY	YEARS OF OPERATIONS	OPERATIONS	PUE BUSINESS MODEL
Simusolar	13	Tanzania	Provides and finances energy-efficient systems designed for smallholder farmers and fishers; products include solar water pumps, solar fishing lights
Ensol Energy with a smile	18	Tanzania, Burundi	Installs and sells solar water pumps for residential and commercial purposes
mobisol plug in the world	9	Tanzania, Rwanda, Kenya, Nigeria	Powers small businesses and sells appliances
JUMEME RURAL POWER SUPPLY	5	Tanzania	Provides milling, grinding, welding, water pumping, and cold storage
powercorner brighten up your life	5	Tanzania, Zambia	Provides milling, grinding, welding, and water pumping

Rural populations rely heavily on farming or livestock for income. The 2016 Energy Access Situation Report from REA and NBS provides information on household income sources across Tanzania, as shown in Figure 5.

FIGURE 5. MAIN SOURCES OF HOUSEHOLD INCOME IN TANZANIA



Source:[38]

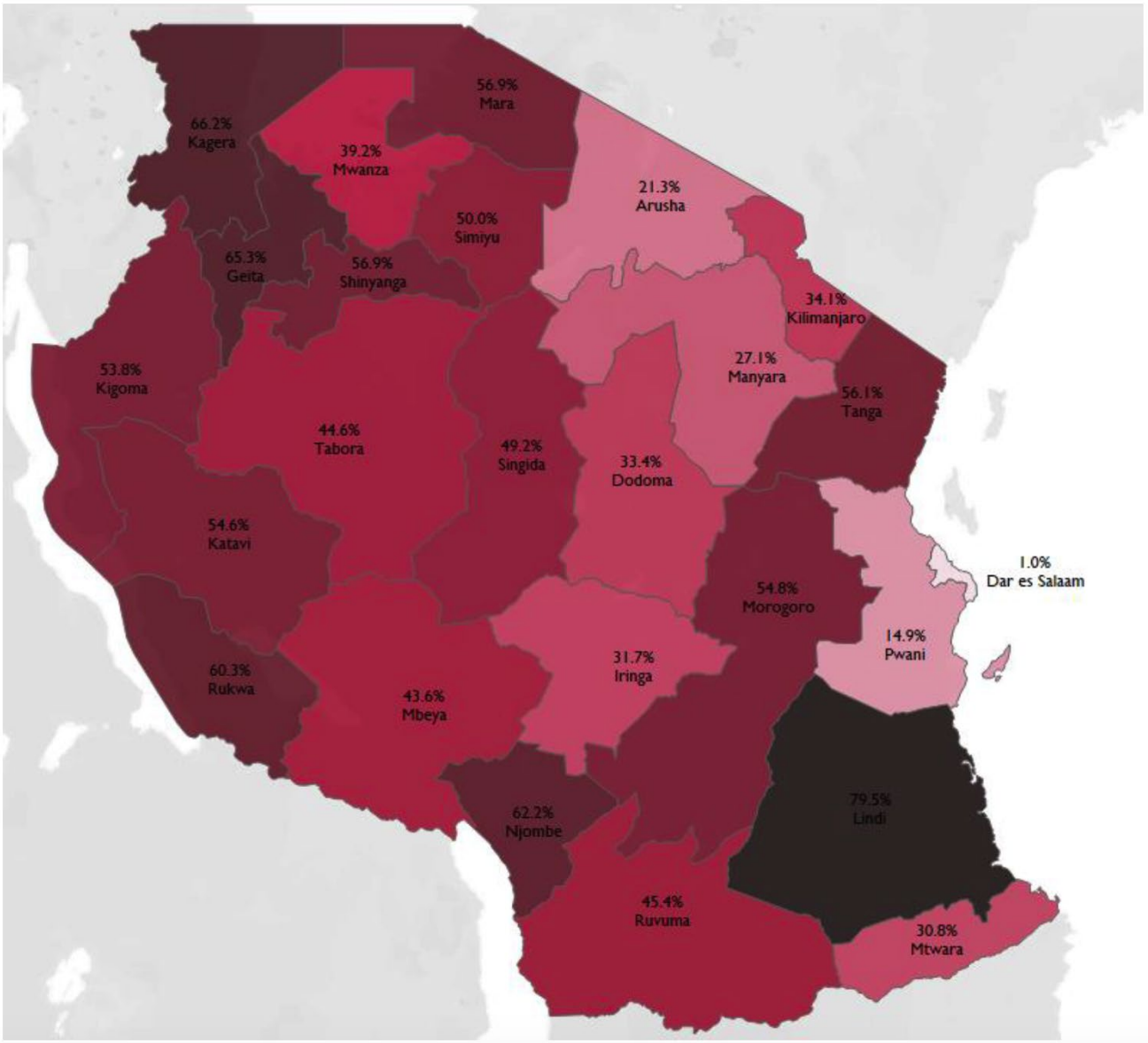
The Energy Access Situation Report indicates that selling crops was the main source of income for most households in mainland Tanzania. Selling food crops accounted for 43 percent of household income.

Business income ranked second at ten percent. Additionally, five out of ten households in rural areas depended on selling food crops as their main source of income. The common food crops grown in Tanzania included maize, sorghum, millet, rice, wheat, beans, cassava, and potatoes.

Figure 6 shows each region's percentage total of income from food crops in 2016. Pwani led the regions in food crop sales, which accounted for 80 percent of the region's income. Arusha, Dar es Salaam, Mtwara, and Pwani were not dependent on selling food crops. The main source of income for households in Arusha was from business (21.8 percent). In Dar es Salaam, it was salaried or wage labor (30.0 percent), in Pwani, it was income from business (25.4 percent), and in Mtwara, it was from selling cash crops (32.2 percent).

[38] REA, "Energy Access Situation Report, 2016 Tanzania Mainland."

FIGURE 6. PERCENT EARNING INCOME FROM SELLING FOOD CROPS



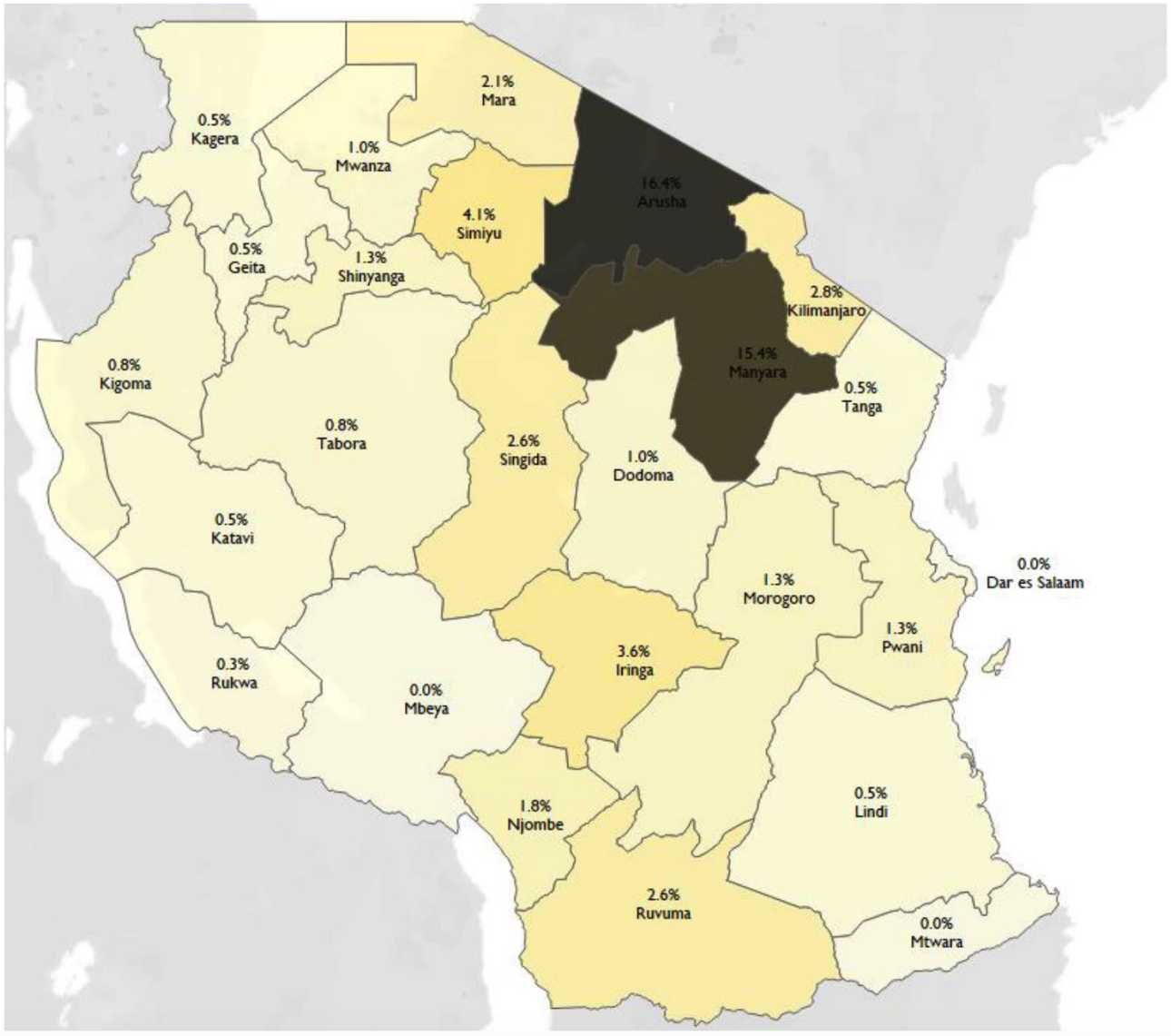
Source:[39]

The 2015 Tanzania Livestock Modernization Initiative Report indicates that Tanzania has the third largest livestock population on the African continent. The report also highlights that 50 percent of all households kept livestock. 62 percent of households with livestock were rural and 23 percent were urban.[40] From the Energy Access Situation Report, Arusha and Manyara regions are leaders in income generated from selling livestock. Figure 7 shows what percentage of Tanzanians earned income selling livestock.

[39] REA.

[40] Tanzania Ministry of Livestock and Fisheries Development, "Tanzania Livestock Modernization Initiative."

FIGURE 7. PERCENT EARNING INCOME FROM SELLING LIVESTOCK

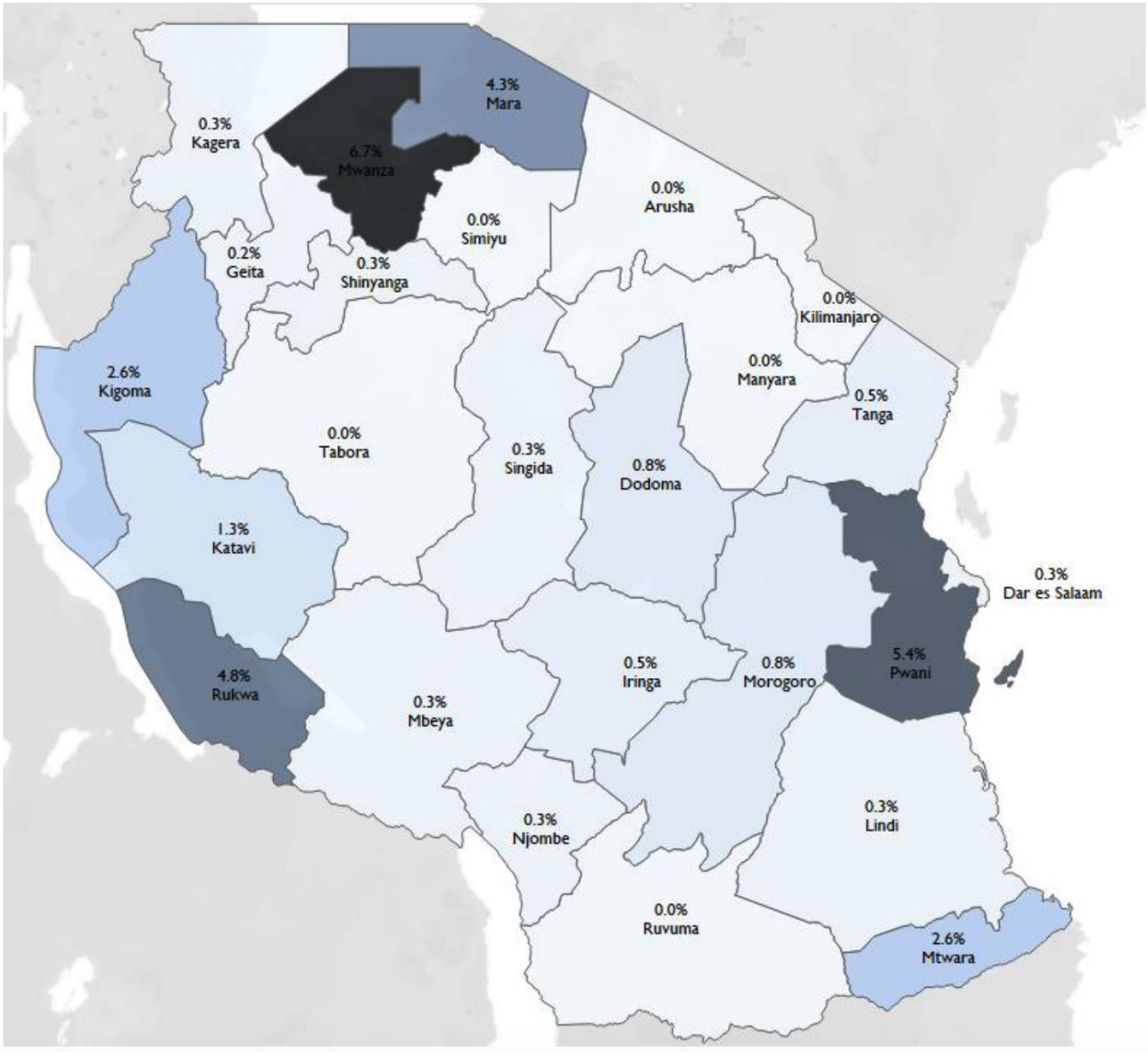


Source:[41]

[41] REA, "Energy Access Situation Report, 2016 Tanzania Mainland."

The fishing industry in Tanzania can be divided in three sub-sections; fish processing, marine and inland capture, and aquaculture. Fishing operations range from small-scale to industrial-scale. Figure 8 shows what percentage of Tanzanians earned income from fishing across the regions.

FIGURE 8 . PERCENT EARNING INCOME FROM FISHING OR SELLING FISH



Source:[42]

[42] REA, "Energy Access Situation Report, 2016 Tanzania Mainland."

SIMUSOLAR

Country of operations: Tanzania

Years of operations: Five

Areas of operations: Lake, Central, Northern, and Coastal zones.

Business model: PAYGO – 97%, Cash Carry 3%

Products: Solar fishing lights and solar water pumps

FIGURE 9. SIMUSOLAR EMPLOYEES

Source: Simusolar

SimuSolar was founded in 2014. At first, SimuSolar operated as a PAYGO SHS company, but it quickly became a more financially inclusive company with products that increase the income opportunities of low income Tanzanians, mainly fishermen and smallholder farmers.

The company's current portfolio of solar product equipment includes PAYGO enabled fishing lights and solar water pumps. The solar water pump package offers technology, financing, training, installation, and a warranty with after sales service, which goes much further than warranties offered by other solar water pump providers in Tanzania. SimuSolar's proprietary PAYGO technology allows the company to quickly turn any solar pump into a PAYGO pump, thus allowing farmers to conveniently pay for their solar pump through mobile money.

As part of the package, SimuSolar offers its customers financing to purchase products over time. For 86 percent of customers, a Simusolar purchase was the first product they had ever bought on credit.

In 2018, data collected by Acumen found that 78 percent of fishing light customers and 94 percent of water pump customers reported that since their purchase they had experienced increased yields and an overall increase in income (Dennis Otieno 2019).

Forty six percent of fishing light owners felt their quality of life had "very much improved," and an additional 42 percent reported that it had "slightly improved" (Dennis Otieno 2019). Fishers frequently mentioned that the brighter and longer lasting light increased their productivity. Combined with the reduced kerosene costs, the fishers enjoyed increased incomes and improved quality of life.

To continue to advance its work, SimuSolar has partnered with the Collaborative Labeling and Appliance Standards Program (CLASP) to study the demand for solar water pumping in Tanzania, develop farmer profiles, estimate the potential market for surface and submersible pumps, and develop recommendations for a new market strategy. This will help SimuSolar provide further productive use equipment to low income households in Tanzania.

Table 22 presents common barriers that impact market penetration in the pico-solar sector and potential ways to overcome those barriers.

TABLE 22. COMMON BARRIERS AND POSSIBLE SOLUTIONS FOR THE AGRICULTURAL AND PRODUCTIVE USE SOLAR COMPANIES IN TANZANIA

GAPS/BARRIER	CAUSE	POSSIBLE SOLUTIONS
Policy and regulations	Lack of dedicated renewable energy policies in the country (i.e., policy and regulations that directly target agricultural and the productive use of solar segment)	Include agricultural and productive-use solar technologies into a broader national energy policy for the growth of the PUE segment. Discussions on how off-grid technologies are beneficial to country electrification targets will also help grow the sector and attract much-needed investments.
Duties and taxes	No clear exemptions on PUE products	Update tax regulations to include PUE technologies, products, and components exemptions.
Access to finance	Lack of affordable funding opportunities targeting the PUE segment	Promote affordable and targeted financing for the growth of the off-grid market. Tools such as concessional financing, repayments grace periods, longer repayment periods may help cater renewable energy financing needs.
	Low awareness and lack of understanding of available funding opportunities targeting agricultural and productive-use solar technologies	Share key information about available PUE financing opportunities for off-grid companies to access.
	Lack of in-house capacity for agricultural and productive-use solar companies to develop sound investment proposals	Provide technical assistance to PUE companies in drafting business plans and loan applications.
	Financial barriers related to real and perceived risks of investing in agricultural and productive-use solar companies	Support financing institutions and PUE companies to develop sound risk mitigation mechanisms. Risk instruments, such as guarantees or insurance, can help mitigate the real and perceived risk of investing in PUE companies.
Capacity-building	Development of skills to support the off-grid sector remains a crucial challenge	Provide crucial trainings and technical assistance to PUE companies for the growth of the segment. Manufacturers, suppliers, NGOs, and local associations can play a major role.
Consumer protection and quality assurance	Large quantities of low-quality agricultural and productive-use solar technologies and products in the market	Supporting government initiative to combat and to monitor importation of low-quality PUE products in the market. Program like Lighting Tanzania are key in providing consumer education on quality and importance of procuring approved products.

Table 23 identifies policies and regulations common in the off-grid energy sector and the specific provisions (if any) that apply to the PUE market in Tanzania.

TABLE 23. PUE POLICIES AND REGULATIONS

TYPE OF POLICY/ REGULATION	EXIST (YES/NO)	ADDITIONAL INFORMATION	PUE RELEVANCE
National Energy Policy	Yes	National Energy Policy, 2003; Energy and Water Utilities Authority Act, 2001 and 2006; Rural Energy Act, 2005; Electricity Act, 2008; Public-Private Partnership Act. No. 18, 2010.	Policies broadly address off-grid energy policies.
Electricity Regulations	Yes	The Electricity Act, Cap. 131 (2008), The EWURA Act, Cap. 414	Smaller projects can register their businesses. They do not require the approval of the regulator but need to inform the regulator and other government agencies of their enterprises and activities. The process, procedures, and requirements needed to register a company in Tanzania can be found in an information portal for micro, small and medium enterprises and on the Tanzania Investment Center website.
Tax and Import Regulations	Yes	Regulations under value added tax (VAT): The VAT (General) Regulations, 2015 The VAT General Regulation, Amendments, 2018 EAC Customs Management (Compliance and Enforcement) Regulations, 2016 EAC Customs Management Regulations, 2010 EAC Customs Management (Duty Remission) Regulations, 2008 Regulations under the EAC Customs Management Act:	In the past the government has provided support through the exemption of import taxes (import duty and VAT) on main solar components (panels, batteries, inverters, and regulators, etc.) to make SHS more affordable. The 2015 VAT Act and 2016 Customs Law amendments removed exemptions for some items that make up a solar system. For example, no exemption applies to wire/cables, switches, light emitting diode (LED) lights, and other solar energy system components.
Quality Control Regulations	Yes	In 2018 TBS announced the basic standards required for solar products. Through TBS quality of pico-PV products can now be tested, verified and registered.	TBS adopted the Lighting Global Standard for small renewable energy and hybrid systems for rural electrification. The basic standards (TZS 1951-9-5 and TZS 1952) concern all solar power-related products manufactured inside the country or imported.

TABLE 23. PUE POLICIES AND REGULATIONS (CONTINUED)			
TYPE OF POLICY/ REGULATION	**EXIST (YES/NO)**	**ADDITIONAL INFORMATION**	**PUE RELEVANCE**
Financial Regulations	Yes	The Central Bank of Tanzania manages all domestic lending activities and regulation of banks and financial institutions.	There are no specific financial regulations regarding lending to solar companies in Tanzania. In 2018 the government enacted a microfinance bill to regulate licensing and registration of microfinance businesses that do and do not accept deposits.
National Credit Bureau	Yes	There are two licensed credit reference bureaus from privately owned companies, Dun & Bradstreet Credit Bureau Tanzania Limited and CreditInfo Tanzania.	Through the approved credit reference bureaus, solar companies can conduct. credit investigations on individual borrowers or potential borrowers.
Mobile Payment Regulations	Yes	Over the years the government through Tanzania Communication and Regulatory Authority has put several legal and regulatory frameworks to govern and support mobile payments in the country. The frameworks include: - Tanzania Communication and Regulatory Authority Electronic and Postal Communications (Licensing) Regulations 2011 - Electronic Payment Schemes Guidelines 2007 - Bank of Tanzania Act 2006 (S. 6) - Tanzania Communication and Regulatory Authority Act 2003 - Mobile Payments Regulations (Draft) - Terms and conditions for agents and customers	Through mobile money, solar companies can partner with Telkom, and intermediaries are able to offer PAYGO options to their customers.
Environmental Regulations	Yes	Environmental Management Act No. 20 of 2004	There are no specific environmental regulations that refer to the sale of decentralized solar systems.
E-Waste Regulations	No	Tanzania has no specific policy or regulation related to e-waste management.	

4 INTERNATIONAL DONORS

International donor programs play a key role in supporting off-grid electrification and incentivizing off-grid activities and investments. Table 24 shows a list of donor programs active in Tanzania.

TABLE 24. INTERNATIONAL DONOR PROGRAMS ACTIVE IN TANZANIA

PROGRAM	DONOR	FUNDING AMOUNT	DATES	PROGRAM OBJECTIVES	TYPES OF SUPPORT
Power Africa Off-Grid Project	USAID	$50 million Focus: Multiple countries, including Tanzania	Nov. 2018–Nov. 2022	Increase the number of actual off-grid connections Increase the availability of private and commercial finance for off-grid companies and projects Improve the enabling environment for off-grid investment, sales, distribution, and operation	Technical assistance Capacity-building Grants
East Africa Energy Program	USAID	$65 million Focus: Multiple countries, including Tanzania	2019–2023	Optimize the region's power supply, increase grid-based power connections, strengthen utilities, and increase the region's power trade	Technical assistance Capacity-building
Tanzania: Swedish Support to Electricity Access and Regulation in Tanzania	Swedish International Development Cooperation Agency (Sida) (through World Bank Trust Fund)	$7.7 million	2009–2019	Increase access to electricity in rural areas Scale up the supply of renewable energy in rural areas while strengthening sector institutional capacity	Technical assistance Capacity-building
Rural Electrification Tanzania	Sida	$58 million	2015–2021	Connect 335,000 rural households, either through grid connection or by off-grid solutions such as isolated mini-grids and stand-alone SHS	Infrastructure development (grid extension)
Renewable Energy and Adaptation to Climate Technologies Window, Africa Enterprise Challenge Fund	UK Department for International Development (DFID)	$8.32 million	2010–2019	Provide interest-free repayable loans and grants targeting for-profit companies up to a maximum of $1.5 million	Loans and grants
Results-Based Financing for Rural Market Development of Pico-Solar; Stage 2	Energizing Development (EnDev) and DFID	€1.5 million	2019–2020	Provide results-based financing for solar market development in the Lake-Central Zones of Tanzania for 2019–2020	Grants Capacity-building Technical assistance

TABLE 24. INTERNATIONAL DONOR PROGRAMS ACTIVE IN TANZANIA (CONTINUED)

PROGRAM	DONOR	FUNDING AMOUNT	DATES	PROGRAM OBJECTIVES	TYPES OF SUPPORT
Tanzania Rural Electrification Expansion Project	World Bank	Norway ($80 million), Sweden ($70 million), European Union ($50 million), United Kingdom ($42 million), African Development Bank (AfDB) ($25 million)	2016–2022	Provide working capital and term loans to renewable energy companies and SPPs Provide renewable energy companies a credit line of $10 million and SPPs a credit line of $32 million	Technical assistance Capacity-building Grants

4.1 SOLAR/RENEWABLE ENERGY ASSOCIATION(S)

The Tanzania Renewable Energy Association (TAREA), formerly the Tanzania Solar Energy Association, is a nonprofit grant-making organization that brings together actors in the renewable energy sector.[43] TAREA was established in 2000 and works to promote the accessibility and use of renewable energy technologies in Tanzania. Companies focusing on individual energy sources also have their own associations, including the Africa Mini-Grid Developer's Association (AMDA). All local associations are also members of global renewable energy associations, including GOGLA.

4.2 TRAINING INSTITUTIONS, INCUBATORS, ACCELERATORS, ETC.

With the growth of renewable energy, several institutions have started to provide training on the associated technologies and business practices. A range of institutions, business incubators, and technology centers offer short- and long-term courses on renewable energy. Table 25 shows a list of available renewable energy training in Tanzania.

TABLE 25. TRAINING SUPPORT AVAILABLE TO OFF GRID COMPANIES IN TANZANIA

A range of institutions offer technical courses in renewable energy, including solar trainings, through established curricula and short courses	Dar es Salaam Institute of Technology offers a diploma course in renewable energy. Tanzania Vocational Education Training Authority has incorporated solar energy courses in its curriculum. Arusha Technical College, through the support of the World Bank, is establishing a renewable energy course for technicians. The College of Engineering and Technology of University of Dar es Salaam has been running master's-level courses in renewable energy. Other high learning institutions, such as University of Dodoma and Mbeya Institute of Technology, offer undergraduate courses in renewable energy. REA also organizes regular short courses for solar technicians as a capacity-building program for energy project developers.
Tanzania Renewable Energy Business Incubator	The incubator supports small and medium renewable energy entrepreneurs by providing short and long-term business courses. The Business Incubator was implemented by a partnership between the Institute of Management and Entrepreneurship Development (IMED) Foundation and the Royal Norwegian Society for Development.

[43] Tanzania Renewable Energy Association, "Overview."

TABLE 25. TRAINING SUPPORT AVAILABLE TO OFF GRID COMPANIES IN TANZANIA	
A range of institutions offer technical courses in renewable energy, including solar trainings, through established curricula and short courses	Dar es Salaam Institute of Technology offers a diploma course in renewable energy. Tanzania Vocational Education Training Authority has incorporated solar energy courses in its curriculum. Arusha Technical College, through the support of the World Bank, is establishing a renewable energy course for technicians. The College of Engineering and Technology of University of Dar es Salaam has been running master's-level courses in renewable energy. Other high learning institutions, such as University of Dodoma and Mbeya Institute of Technology, offer undergraduate courses in renewable energy. REA also organizes regular short courses for solar technicians as a capacity-building program for energy project developers.
Tanzania Renewable Energy Business Incubator	The incubator supports small and medium renewable energy entrepreneurs by providing short and long-term business courses. The Business Incubator was implemented by a partnership between the Institute of Management and Entrepreneurship Development (IMED) Foundation and the Royal Norwegian Society for Development.
The Energy Change Lab	This is an initiative jointly initiated by Netherlands development organization Hivos and the International Institute for Environment and Development (IIED), working with local partners. The lab started in Tanzania in 2015 and is hosted at the Tanzania Commission for Science and Technology. The lab enables and support individuals and businesses in and outside of the energy sector to design, test, and learn about interventions and technologies that promote PUE.
The Innovative Technology and Energy Center	The center opened in August 2017 in Arusha with the support of the Korean government and the Nelson Mandela African Institute of Science and Technology. The center aims to train local technicians in order to support and promote renewable energy technologies in rural areas.

5 GENDER MAINSTREAMING

The Ministry of Community Development, Gender, and Children (MCDGC) is responsible for facilitating community development in Tanzania. MCDGC oversees implementation of the National Strategy for Gender Development, which aims to bridge gaps at all levels of policies, programs, strategies, budgets, and activities. MCDGC and the Ministry of Energy must work together steward gender development strategy in all energy policy making and implementation.

The Tanzania National Energy Policy of 2015 includes a section on gender mainstreaming in the energy sector. The policy acknowledges that the management and development of energy resources requires the effective participation of men and women in decision making, and accordingly, includes a policy objective to promote and support gender-related activities in the energy sector. The policy considers the promotion of gender equality within energy sub-sectors on the demand and supply side, equitable gender participation in formulation and implementation of energy interventions, training on appropriate technologies, and enhanced gender considerations in energy planning. The policy also calls for the government to raise awareness on "cultural structures and practices hindering access by both and women to alternative sources of energy".[44]

Several private-sector initiatives support energy as well. The Tanzania Gender and Sustainable Energy Network (TANGSEN) is a professional network advocating for women's empowerment and increased access to modern energy technologies and services in Tanzania.[45] Companies such as Solar Sister, operating in Tanzania, call upon a network of African women to bring affordable clean energy to communities. Solar Sister recruits, trains, and supports local women as clean-energy entrepreneurs who sell and deliver solar lights and efficient cookstoves to those who need it most.[46]

[44] United Republic of Tanzania, "National Energy Policy 2015."
[45] TANGSEN, "TANGSEN."
[46] Solar Sister, "Solar Sister: Home."

6 FINANCE LANDSCAPE

6.1 DEBT FINANCING

Table 26 includes a list of funding facilities available in Tanzania for various types of off-grid energy. This is a comprehensive list and includes funds that are not just specific to Tanzania but also those that offer opportunities for Tanzania.

TABLE 26. FUNDING FACILITIES FOR OFF GRID ENERGY IN TANZANIA

FACILITY	MANAGED BY	SPONSOR/ PARTNERS	CAPITAL TYPE/ FUNDING INSTRUMENT	FOCUS/SCOPE
Green Climate Fund	Deutsche Bank	Multi-donor	Grants, debt, equity, and guarantees	Phase 1: Tanzania, Kenya, Rwanda, Uganda, Namibia, Zambia Phase 2: Any country active in sub-Saharan Africa
ElectriFi and AgriFi	Entrepreneurial Development Bank (FMO), European Development Finance Institutions (EDFI)	Multiple donor projects, including the EU	Broad debt financing, and project preparation; All instruments; Fund of funds to DFIs (Swedfund, FMO, CDC)	Energy access (solar, cook stoves, grid and off-grid) Early to later stage
ResponsAbility - Energy Access Fund	Responsibility AG	Shell, International Finance Corporation (IFC), OPEC	Short and long-term debt; working capital-focused	Coverage: sub-Saharan Africa. Focus: Hydropower, solar, biomass, geothermal, and wind
Lendahand Crowdfunding	Lendahand Ethex Ltd.	Private funders	Short-term working capital and debt	Solar energy: Kenya, Uganda, Tanzania, Mozambique, Namibia
Facility for Energy Inclusion Off-Grid Energy Access Fund	Lion's Head	AfDB, the Global Environment Facility, , Nordic Development Fund, Calvert Impact Capital	Debt: Long, short-term, U.S. dollars, and local currency	Off-Grid Energy Facility ($100 million) for emerging PAYGO off-grid small and medium enterprises, affordable working capital in local currency and mini-/ micro-grid lending

TABLE 26. FUNDING FACILITIES FOR OFF GRID ENERGY IN TANZANIA

FACILITY	MANAGED BY	SPONSOR/ PARTNERS	CAPITAL TYPE/ FUNDING INSTRUMENT	FOCUS/SCOPE
AfDB's Distributed Energy Service Companies (DESCO) Financing Program	AfDB	Managed by AfDB and partners	Local currency, off-balance sheet receivables debt financing	The DESCO Program is a project of AfDB in collaboration with the European Union to provide blended finance to unlock local private investment. Target countries are Togo, Democratic Republic of the Congo, and Mali
EnDev	Germany Development Agenncy (GIZ), (Netherlands Enterprise Agency (RVO)	Multi-donor partnership: the Norway, Netherlands, Germany, Australia, U.K., Sweden, and Switzerland	Grants	Financing and support to promote modern energy services
Energy and Environment Program (EEP Africa)	KPMG	Multi-donor fund: Finland (delegated authority), DFID (largest donor by financial size), and Austria	Debt, grants	Renewable energy and energy efficiency projects with a development impact, including household solar businesses
Renewable Energy and Adaptation to Climate Technologies (REACT) East Africa Window of the Africa Enterprise Challenge Fund (AECF)	Alliance for a green revolution Africa (AGRA)/KPMG	Multi-donor project: Denmark, Sweden (Sida), Netherlands, DFID	Pioneer grants and interest-free loans	Full spectrum of renewable energy technologies, including small-scale/ household solar (and adaptation technologies)
REACT Solar (potential) Window of the AECF	AGRA/KPMG	Norway ($80 million), Sweden ($470 million), EU ($50 million), UK ($42 million), and AfDB ($25 million)	Renewable energy companies credit line, $10 million SPP credit line $32 million	Working capital and term loans to renewable energy companies and small power producers
Tanzania Rural Electrification Expansion Project	The World Bank, Tanzania Investment Bank, and REA	The World Bank, Tanzania Investment Bank, and REA	Renewable energy companies credit line, $10 million SPP credit line $32 million	Working capital and term loans to renewable energy companies and small power producers

TABLE 26. FUNDING FACILITIES FOR OFF GRID ENERGY IN TANZANIA

FACILITY	MANAGED BY	SPONSOR/ PARTNERS	CAPITAL TYPE/ FUNDING INSTRUMENT	FOCUS/SCOPE
Sustainable Use of Natural Resources and Energy Finance (SUNREF), Agence Française de Développement (French Development Agency [AFD]) Green Finance	Bank of Africa, Tanzania	AFD	Debt, short and long term	$11 million to finance renewable energy and energy efficiency projects in Tanzania through the Tanzania Bank of Africa
Development Innovation Ventures (DIV)	USAID	U.S. Government through USAID	Flexible grants to test new ideas and scale the most effective solutions	DIV is sector-agnostic and generally funds innovations in any country where USAID operates
Kiva	Kiva.org	Crowdfunding	Interest-free loans	Broad: Includes off-grid energy Direct to social enterprise loan sizes will range from $10,000–50,000 with terms of 18 months or less
Lendable	Lendable	Shell Foundations, FMO, KawaSafi, Fenway SummerVentures, Omidyar Ventures	Receivables financing	Including off-grid energy companies across Africa
REACT Solar (potential) Window of the AECF	AGRA/KPMG	Norway ($80 million), Sweden ($470 million), EU ($50 million), UK ($42 million), and AfDB ($25 million)	Renewable energy companies credit line, $10 million SPP credit line $32 million	Working capital and term loans to renewable energy companies and small power producers
Tanzania Rural Electrification Expansion Project	The World Bank, Tanzania Investment Bank, and REA	The World Bank, Tanzania Investment Bank, and REA	Renewable energy companies credit line, $10 million SPP credit line $32 million	Working capital and term loans to renewable energy companies and small power producers
Social Investment Managers and Advisors (SIMA) Solar Off-Grid and Financial Access Markets Debt Fund I	SIMA Funds	Multi-donor and impact investors	Senior debt fund facility	Off-grid energy and financial access in sub-Saharan Africa

TABLE 26. FUNDING FACILITIES FOR OFF GRID ENERGY IN TANZANIA

FACILITY	MANAGED BY	SPONSOR/ PARTNERS	CAPITAL TYPE/ FUNDING INSTRUMENT	FOCUS/SCOPE
Solar Energy Transformation Fund (SET Fund)	SunFunder	Overseas Private Investment Corporation (OPIC), IKEA Foundation, Calvert Impact Capital, Ceniarth	Senior debt fund facility, receivables financing, local currency	Off-grid energy companies and projects in Africa
Solar Beyond the Grid Fund	SunFunder	OPIC, Calvert Impact Capital	Debt	Off-grid energy companies and projects in Africa (and Southeast Asia)
Cross Boundary Energy Access Fund I	Cross Boundary Energy	Rockefeller Foundation, Ceniarth, Shell Foundation	Debt	Mini-grids in Africa
BetterVest CrowdFunding	BetterVest GMBH	Crowdfunding	Debt, mainly inventory financing	Energy efficiency projects in general, worldwide
Trine Crowdfunding	Trine Solar	Crowdfunding	Debt: short-term, working capital, off balance sheet	Off-grid energy in Africa

6.2 COMMERCIAL BANKS

The Bank of Tanzania Annual Report 2017–2018 [47] lists 39 commercial banks, seven community banks, two financial institutions, two DFIs, five microfinance banks, one mortgage refinancing company, three financial leasing companies, and two representative offices of foreign banks.

Importantly, six banks—Cooperative and Rural Bank (CRDB), National Microfinancing Bank (NMB), National Bank of Commerce, Standard Chartered, Stanbic, and Exim Bank—own more than half of the total assets of the local banking industry in Tanzania and also control the majority of the customer deposits in the sector. CRDB and NMB are the two largest banks and have branches across the country.

There are a few local financing institutions that have renewable energy credit lines, including the Tanzania Investment Bank (financing partner to REA) and Bank of Africa (AFD renewable energy facility). Other banks have a direct relationship with off-grid companies, such as the Mobisol partnership with CRDB Bank.

According to Financial Inclusion Insights (FII), 56 percent of Tanzanians are financially included, meaning they have access to financing products and services. In addition, 55 percent of Tanzanians have access to mobile money platforms, nine percent have bank accounts, and three percent use non-bank financial institutions for money management.[48]

[47] Bank of Tanzania, "Annual Report 2017-2018."

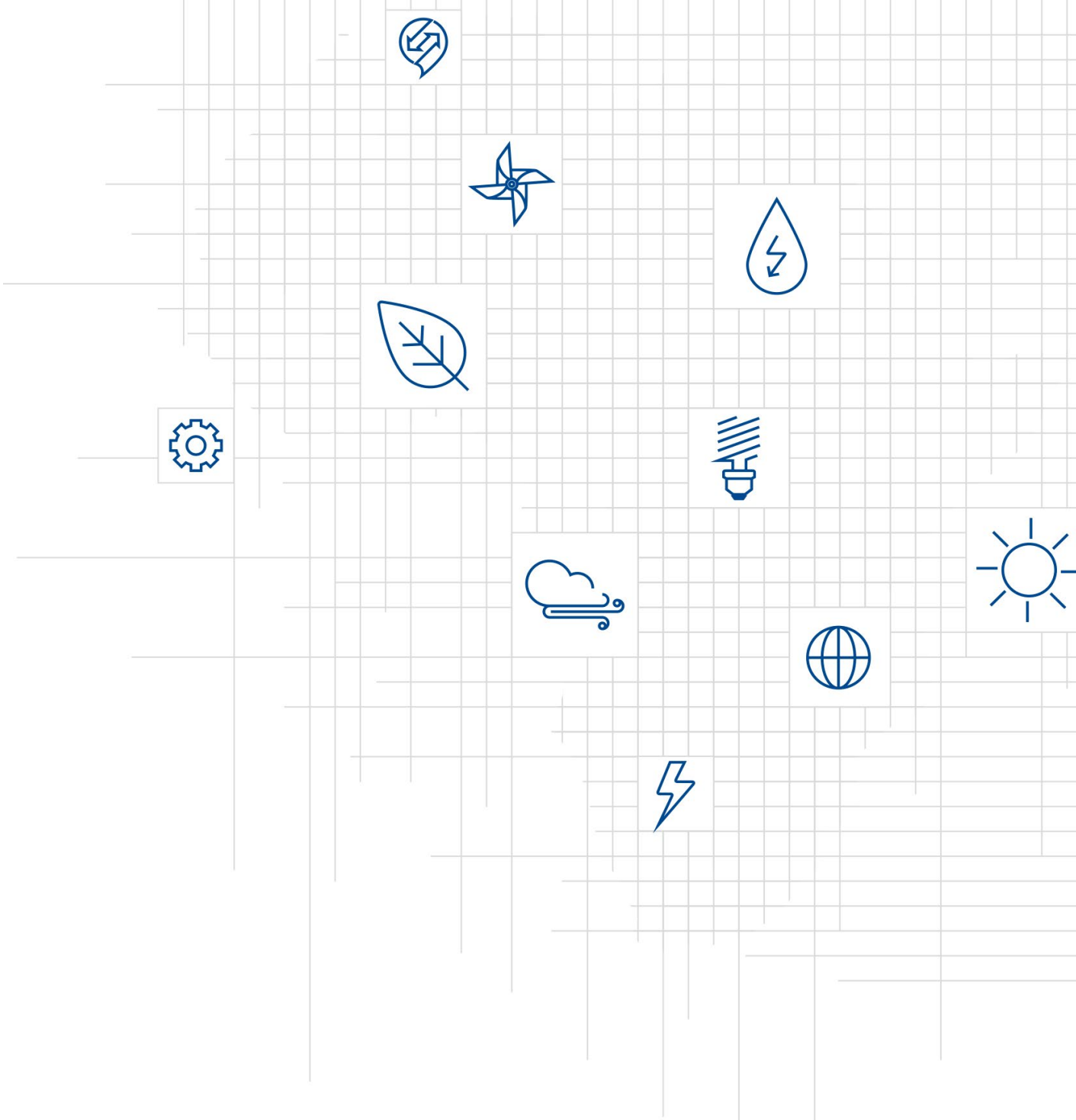
[48] Financial Inclusion Insights, "Tanzania."

6.3 MFIS AND SAVINGS AND CREDIT COOPERATIVES (SACCOS)

Tanzania has a rapidly developing microfinance sector and relies heavily on semi-formal or informal institutions. There is a growing interest and opportunity for MFIs to partner with off-grid solar companies to distribute solar products. Notable partnerships include those of the Tujijenge MFI with Greenlight Planet to distribute solar products across their branch network and BRAC Tanzania's partnership with Signify Foundation and Solar Sister.

Two organizations support the growing microfinance sector in the country: the Tanzania Association of Microfinance Institutions (TAMFI), a national network for MFIs service providers, and the Savings and Credit Cooperative Union League of Tanzania Limited (SCCULT), which is an umbrella organization for SACCOs in mainland Tanzania. TAMFI plans to provide solar-sector training to its members. The training will focus on raising interest and knowledge among MFIs about working in the solar sector and sharing experiences.[49] [50]

[49] TAMFI, "Tanzania Association of Microfinance Institutions."
[50] SCCULT, "Savings and Credit Cooperative Union Legue of Tanzania."



IMPORTANT NOTICES:

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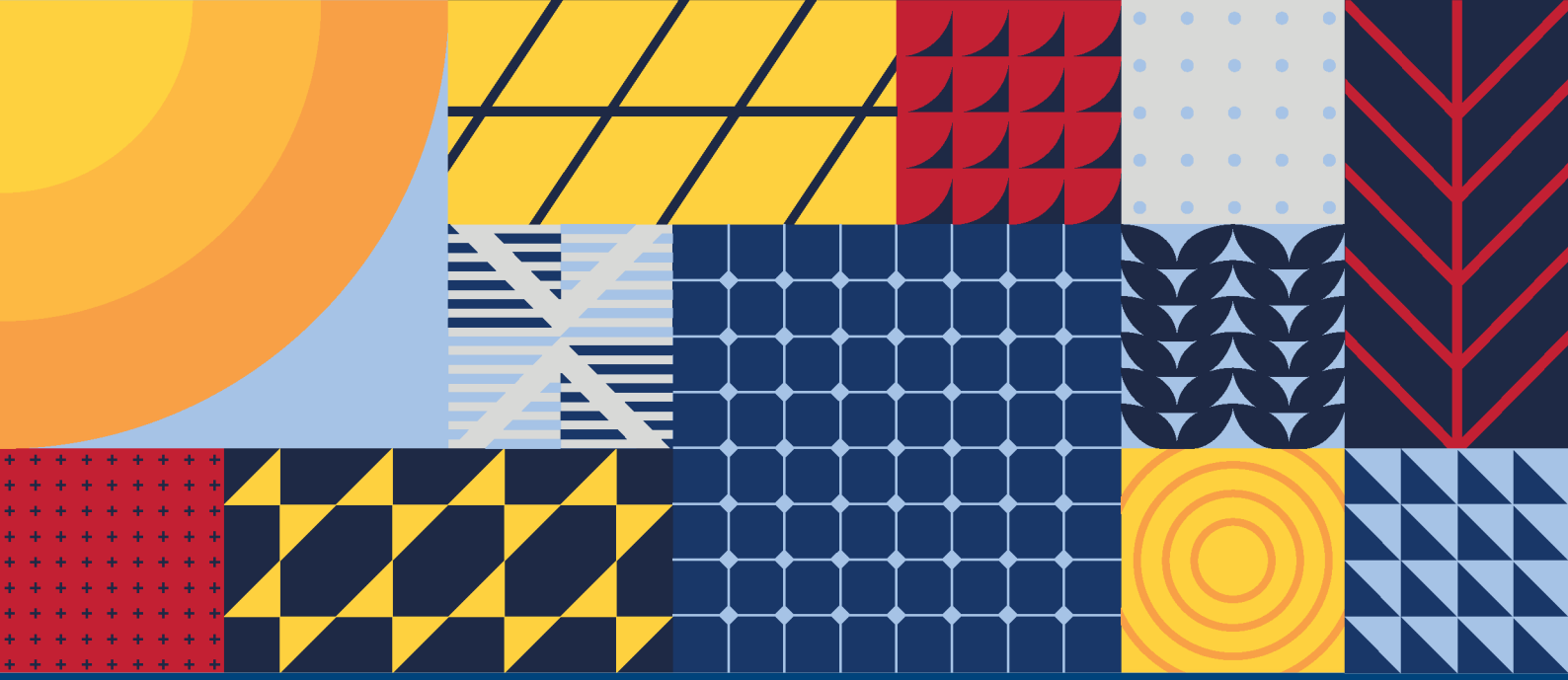

Power Africa aims to achieve 30,000 megawatts of new generated power, create 60 million new connections, and reach 300 million Africans by 2030.