POWER FOR ALL

Schneider Electric Foundation

The ROCKEFELLER FOUNDATION

Powering Jobs Census 2019:

Focus on Kenya

In collaboration with:

Strathmore University
Energy Research Centre

1. Report Objectives

This report is part of the first annual job survey for the decentralized renewable energy (DRE) sector in emerging economies. Power for All conducted its inaugural Powering Jobs census in 2018, which captures DRE company employment data for 2017–18, the purpose of which is to establish a baseline that explores the link between Sustainable Development Goal 7, defined as access to affordable, reliable, sustainable, and modern energy for all, and Sustainable Development Goal 8, defined as inclusive and sustainable economic growth, employment, and decent work for all.

The census explores companies working across the range of DRE technologies, including pico-solar appliances, solar home systems (SHS), standalone commercial and industrial (C&I) systems, mini-grids, and productive use systems such as solar water pumps. The main report covers three emerging markets, India, Kenya and Nigeria, each representing different sizes and stages of DRE market development. Key stakeholders across these three countries also participated in focus groups to discuss their experiences and policy recommendations based on the survey data.

This report disaggregates the research findings for Kenya, specifically exploring the Kenyan DRE employment landscape, skills trends, and future projections across the different DRE technologies surveyed. These findings can be used to increase awareness about the potential for DRE job creation, and to stimulate discussion about how to develop the energy access workforce. The deployment of DRE systems for energy access is emerging as a major opportunity to create jobs, which is critical as Kenya's unemployment challenges deepen. In Kenya, young men and women between the ages of 15 to 24 account for over 34% of the working-age population, but are also 40% of the unemployed [1].

2. DRE Policy in Kenya

Kenya has made great strides, successfully electrifying hundreds of thousands of households. As of December 2018, 75% of the population had access to electricity either through on-grid or off-grid applications [2]. In its recently released Kenya National Electrification Strategy (KNES), the Kenyan government stated that it aims to achieve universal electrification by 2022 [2]. The Kenyan government laid out several electrification programs that will finance grid extension, intensification, and densification, including mini-grids. This will involve the deployment of DRE solutions in areas beyond the national grid, including the Last Mile Connectivity Program, Global Partnership of Output Based Aid Program, and the Rural Electrification Program, among others [2].

DRE plays a key role in the Kenyan government's electrification strategy. The KNES envisions that 269,000 new connections will be added through grid extension and 2.77 million through grid intensification and densification, including 100,000 from extending existing mini-grid projects. Another 35,000 will come from almost 150 new mini-grids and 1.96 million through standalone SHS [2]. This vision is partly funded by the World Bank through the Kenya Off-Grid Solar Access Project (KOSAP). KOSAP plans to support the deployment of SHS, solar water pumps, and mini-grids in 14 counties, serving more than 1.2 million people by 2023 [3].

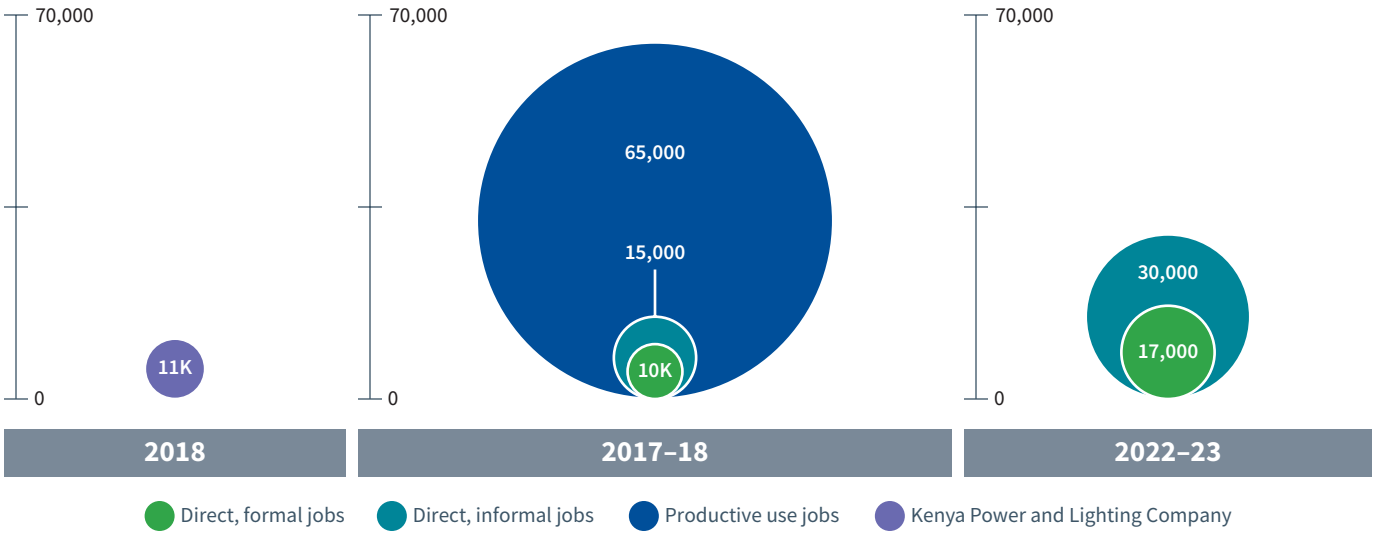
Kenya's policy environment has been conducive to creating a market environment friendly to the private sector. Not only does Kenya have one of the most developed power sectors in sub-Saharan Africa, but has also opened its market to independent power producers since the mid-1990s [4]. Since then, the country has developed a number of active, private, off-grid solar companies and has a high off-grid solar product penetration rate. Global Off-Grid Lighting Association estimated in 2017 that off-grid solar products, like pico-solar appliances and SHS, have reached more than half of their potential market. The sector is now entering a more mature phase of market development as it expands into more remote areas [5].

3. Employment Estimates

The strong presence of DRE technologies positions the sector as a potential job engine for Kenya. In 2017–18, according to the results of our survey, the sector provided 10,000 direct, formal jobs [6]. This scale of employment is similar to the Kenya Power and Lighting Company, which currently employs about 11,000 people [7]. See page 9 for definitions. The DRE sector also has a large impact on informal employment, particularly rural employment, through the creation of informal jobs along the value chain and productive use jobs among end users. In 2017–18, we estimated the DRE sector employed more than 15,000 informal workers and accounted for 65,000 productive use jobs.

The employment impact of the DRE sector is expected to grow if the Kenyan government follows the plan laid out by the KNES [1]. By 2022–23, the study estimates the sector will provide more than 17,000 direct, formal jobs and 30,000 informal jobs, an increase of 70% and 100% respectively. The real employment impact may be larger, as this conservative estimate does not consider job creation

FIGURE 1. DRE SECTOR EMPLOYMENT ESTIMATES AND PROJECTIONS



from standalone and grid-tied C&I solar systems or productive use applications such as solar water pumps. In Kenya, the DRE workforce is expanding at a rapid pace, with informal jobs growing faster than formal jobs. This finding corresponds to the national labor force trends: between 2009 and 2015, formal jobs in Kenya grew by 28% while informal jobs grew by 44% [8].

By breaking down the employment impact by technology type, the data show that pico-solar appliances and SHS sales currently account for the majority of sector employment, not only in terms of direct, formal jobs, but also informal and productive use jobs. However, employment from mini-grids is expected to grow faster than jobs related to pico-solar appliances or SHS. Below, we detail employment estimates and trends by company and technology types.

4. Sector Trends

Despite the wide employment impact of the DRE sector, there are important nuances that can be understood by disaggregating jobs according to company type. For instance, some company types offer longer-term jobs than others, require different skill sets, and have different levels of participation among women and youth. In the following sections we build a workforce profile for each company type to highlight key characteristics.

4.1 End-user Product Providers

We define end-user product providers as companies that sell pico-solar appliances, SHS, and other small, off-grid appliances

TABLE 1. DIRECT, FORMAL AND INFORMAL JOB TRENDS BY TECHNOLOGY TYPE

Job category	Direct, formal	Direct, formal	Direct, informal	Direct, informal	Productive use
Years	**2017–18**	**2022–23**	**2017–18**	**2022–23**	**2017–18**
Pico-solar appliance and SHS	7,500	12,000	15,000	24,000	64,000
Standalone and grid-tied C&I	1,800	N/A*	200	N/A*	N/A*
Solar water pump	95	N/A*	N/A*	N/A*	N/A*
Mini-grid	260	5,000	290	5,800	590
Approximate total	**10,000**	**17,000**	**15,000**	**30,000**	**65,000**

Numbers rounded to two significant figures.
** Survey or market insight data unavailable.*

directly to customers. In 2017–18, pico-solar appliances and SHS provided 7,500 direct, formal jobs, 15,000 informal jobs, and 64,000 productive use jobs. Together, the workforce for pico-solar appliances and SHS sold more than 900,000 products, the largest sales of any country in sub-Saharan Africa. These companies alone accounted for 78% of total DRE jobs created in 2017–18.

Over the next five years, it is expected that expansion of this market will continue to be the main driver of workforce growth. By 2022–23, the sales of pico-solar appliances and SHS should provide 12,000 direct, formal jobs and 24,000 informal jobs. Such growth will be sustained by system upgrades and replacements for existing customers. The Kenya Climate Innovation Centre pointed out that at least 50% of Kenyans have owned a solar product for lighting, mobile charging, or another basic application [9]. Furthermore, as a study in 2018 shows, consumers are now preferring larger appliances, especially those for income-generating purposes, over lighting and mobile charging devices [10]. This trend of system and appliance upgrades for existing customers will continue to fuel the growth of end-user product providers.

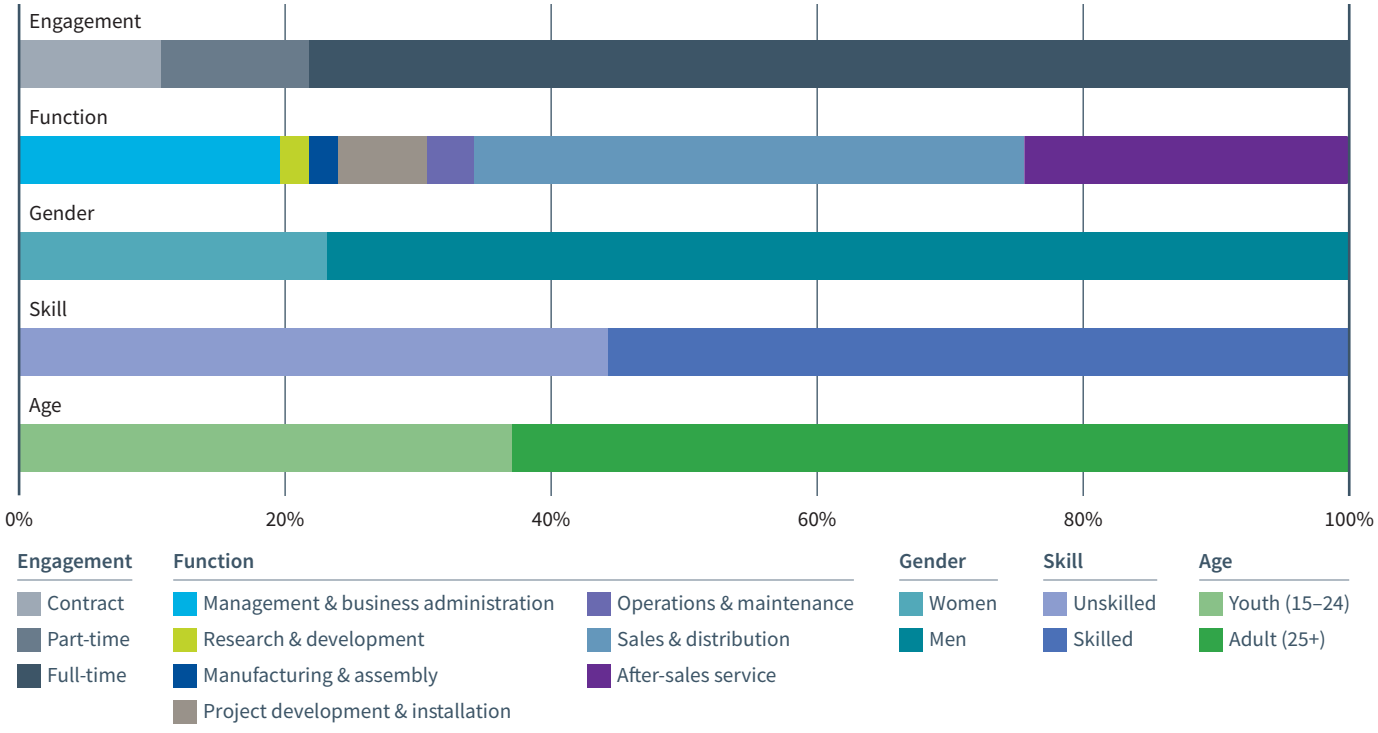
A large share of direct, formal jobs created by these companies are skilled activities, with sales and distribution accounting for 41% and another 24% in product servicing. In fact, about 87% of the direct, formal jobs reported by these companies are skilled, as compared to the global renewable energy industry, where less than half of the workforce is skilled [11]. Furthermore, 78% of these direct, formal jobs are full-time. They are also long-term jobs, lasting more than a year, with an average employee retention period of 32 months.

While women comprise only 23% of direct, formal jobs for end-user product providers in Kenya, these companies engage far more women through informal work, with 34% of informal workers serving the sector being women, often as sales agents. The sector also has high youth participation at 37% of the workforce.

4.2 Project Developers, Installers, and Mini-grid Operators

Project developers and installers are defined as companies that generally work with projects larger than household SHS. The size of these projects generally ranges from a few hundred watts to a few kilowatts. These companies develop and construct grid-tied or off-grid systems, but do not generate revenue from operating them.

FIGURE 2. END-USER PRODUCT PROVIDER WORKFORCE PROFILE



Because of the less standardized, component-based nature of project development and installation, the work carried out is labor intensive. We estimated that C&I project developers and installers in Kenya provided 1,800 direct, formal jobs and 200 informal jobs in 2017, employing about 120 people for every MW deployed. This is much larger than what was found in India, where only 81 people are employed per MW. With an average retention of 34 months, 72% of these direct, formal jobs are full-time and long-term. Unfortunately, there is currently not enough data to confidently forecast the future of standalone and grid-tied C&I systems. Therefore, future employment trends for these technologies are not discussed in the report.

Project developers and installers draw less heavily from sales and distribution talent as compared to end-user product providers. Instead, these companies are more dependent on construction workers who install projects on site and engineers who design and develop PV systems. The survey data shows that these companies also rely on management and business administration skills, which account for 27% of their workforce. This is closely followed by 26% in project development and installation activities such as site selection, feasibility study, system design, engineering, procurement, construction, and commissioning [12].

About 87% of the jobs created by project developers and installers are skilled. Women represent 19% of direct, formal employees, which is lower than the industry average of 23%. However, 38% of informal jobs in this market segment are taken up by women. Youth make up 45% of the workforce.

Mini-grid operators are private companies which operate and maintain mini-grids and are responsible for sales of electricity as an integral part of their business model. Mini-grid operators and project developers and installers are analyzed separately because their business models and revenue structures differ, as does their contracting and hiring behavior.

Mini-grid companies may emerge as one of the main contributors to DRE job growth. In 2017–18, mini-grid companies provided about 260 direct, formal jobs, 290 direct, informal jobs and 590 productive use jobs. In order to service the 135,000 connections found in KNES [1], the employment impact of mini-grid companies would surge dramatically by 2022–23, to about 5,000 direct, formal jobs and 5,800 direct, informal jobs, an increase of 2,000%. Most direct, formal jobs created by the mini-grid sector are full-time and long-term, with an average retention of 38 months. This is the longest retention across all types of DRE companies in Kenya.

FIGURE 3. PROJECT DEVELOPER AND INSTALLER WORKFORCE PROFILE

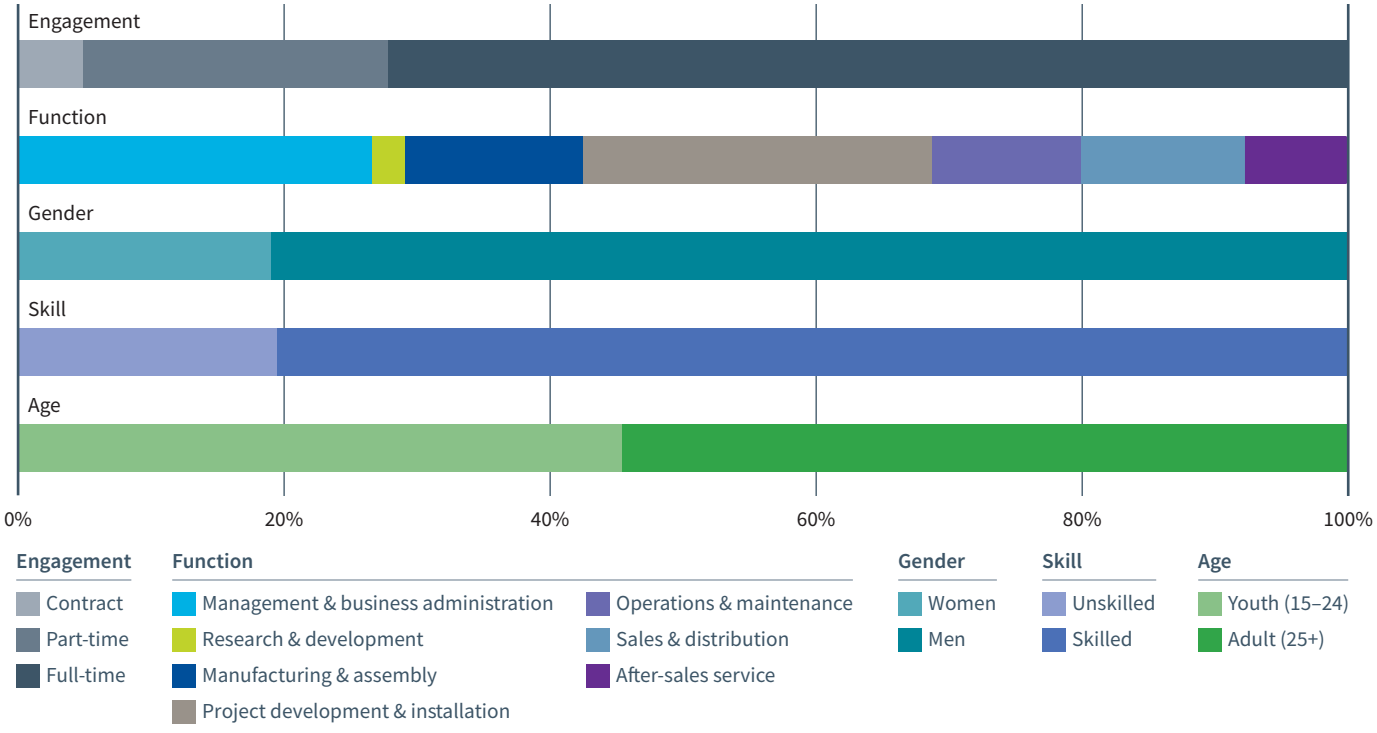


FIGURE 4. MINI-GRID OPERATOR WORKFORCE PROFILE

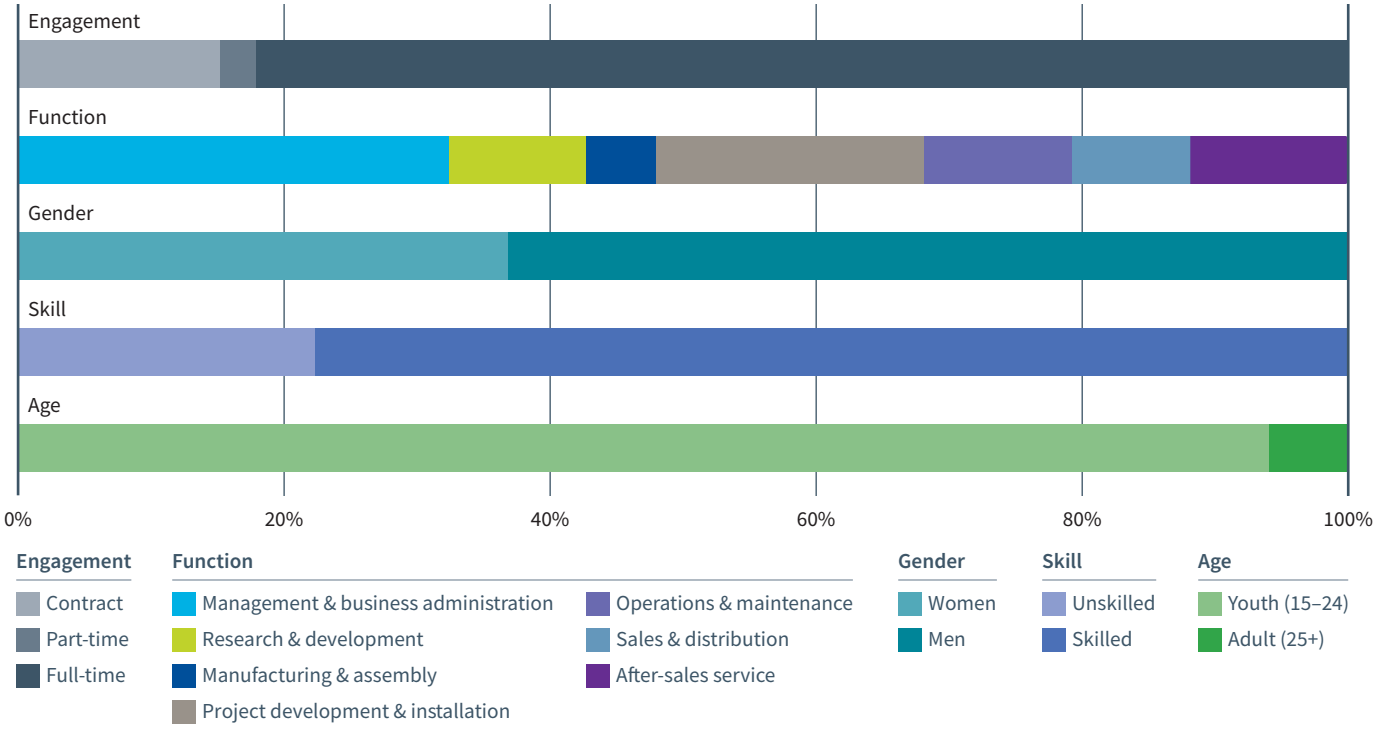
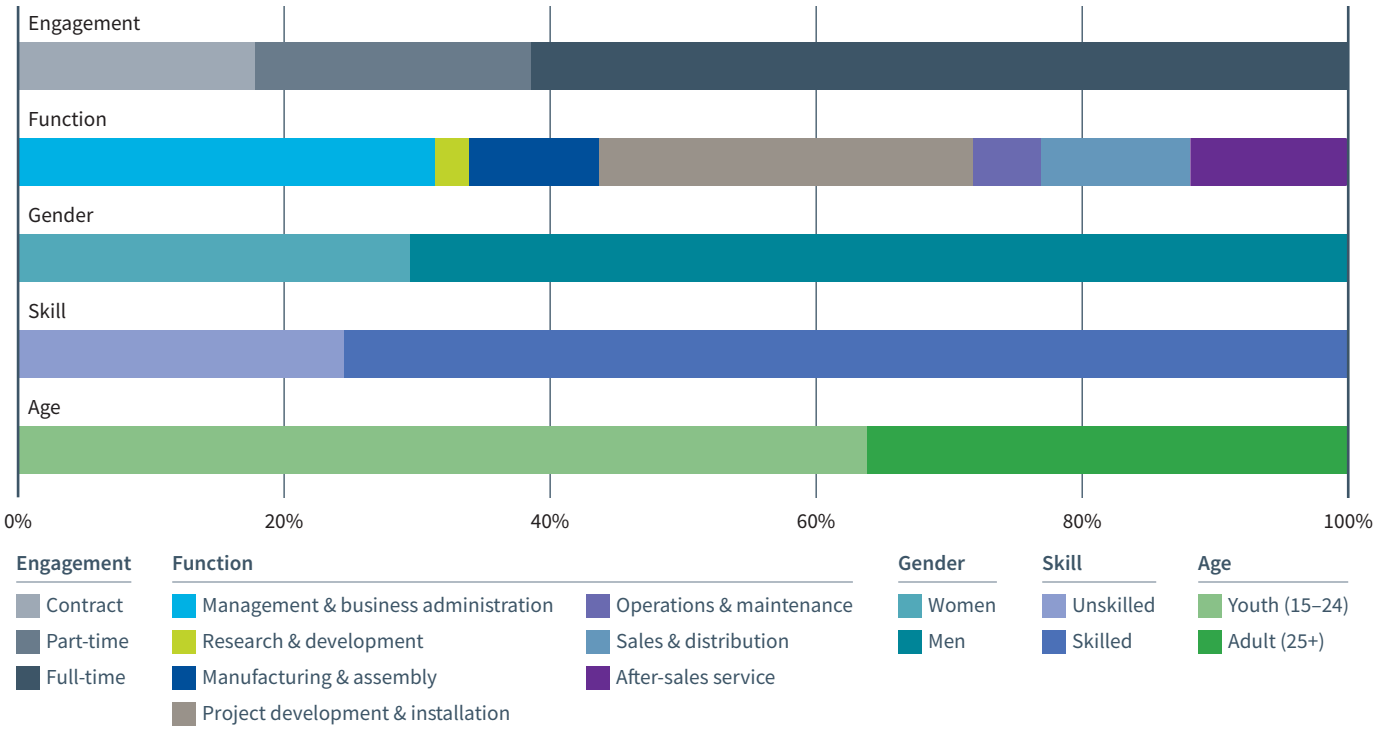


FIGURE 5. MANUFACTURING AND UPSTREAM SUPPLY CHAIN WORKFORCE PROFILE



Growth of the mini-grid sector may shift the workforce toward more demand for management, project development, and installation talent. Mini-grid operators have 32% of their workforce in management and business administration, followed by 20% in project development and installation. While most mini-grid companies still develop and install projects, many of those jobs are created as indirect jobs outsourced to upstream engineering, procurement, and construction companies. In terms of gender balance, women account for 19% of direct, formal jobs and 64% of informal jobs in mini-grid companies.

4.3 Manufacturing, Upstream Supply Chain Companies, and Service Providers

Finally, the DRE sector is supported by companies and organizations such as PV and inverter manufacturers, equipment importers and exporters, metering companies, training centers, and microfinance institutions, all of which create indirect jobs. Only three manufacturing and upstream supply chain companies in Kenya responded to our survey, so these results cannot be generalized. On average, 61% of the direct, formal employment jobs provided by these companies are full-time, with an the average retention of 30 months. This is the lowest of all the company types in Kenya.

Several survey respondents were service providers, who assist with research, advocate, or raise awareness of the sector. Women are employed in 41% of direct, formal jobs and 80% of informal jobs, which is the highest across all company types in Kenya. Additionally, women account for 79% of managerial positions. Within these organizations, 59% of the talent required is in management and business administration. All of the direct, formal jobs in this company type are skilled. Due to the lack of market estimates and our limited survey responses, future projections were not possible.

5. Skills Needs

About two-thirds of the direct, formal jobs in the Kenyan DRE sector are skilled. This is significantly higher than the global renewable energy sector, where less than 50% of the jobs are skilled [11]. One of the major job functions is sales and distribution. In Kenya, about 41% of the workforce is engaged in sales and distribution, a trend expected to continue as pico-solar appliances and SHS expand into new areas. By 2022–23, about 39% of the workforce should still be in sales and distribution.

FIGURE 6. SECTOR SERVICE PROVIDER WORKFORCE PROFILE

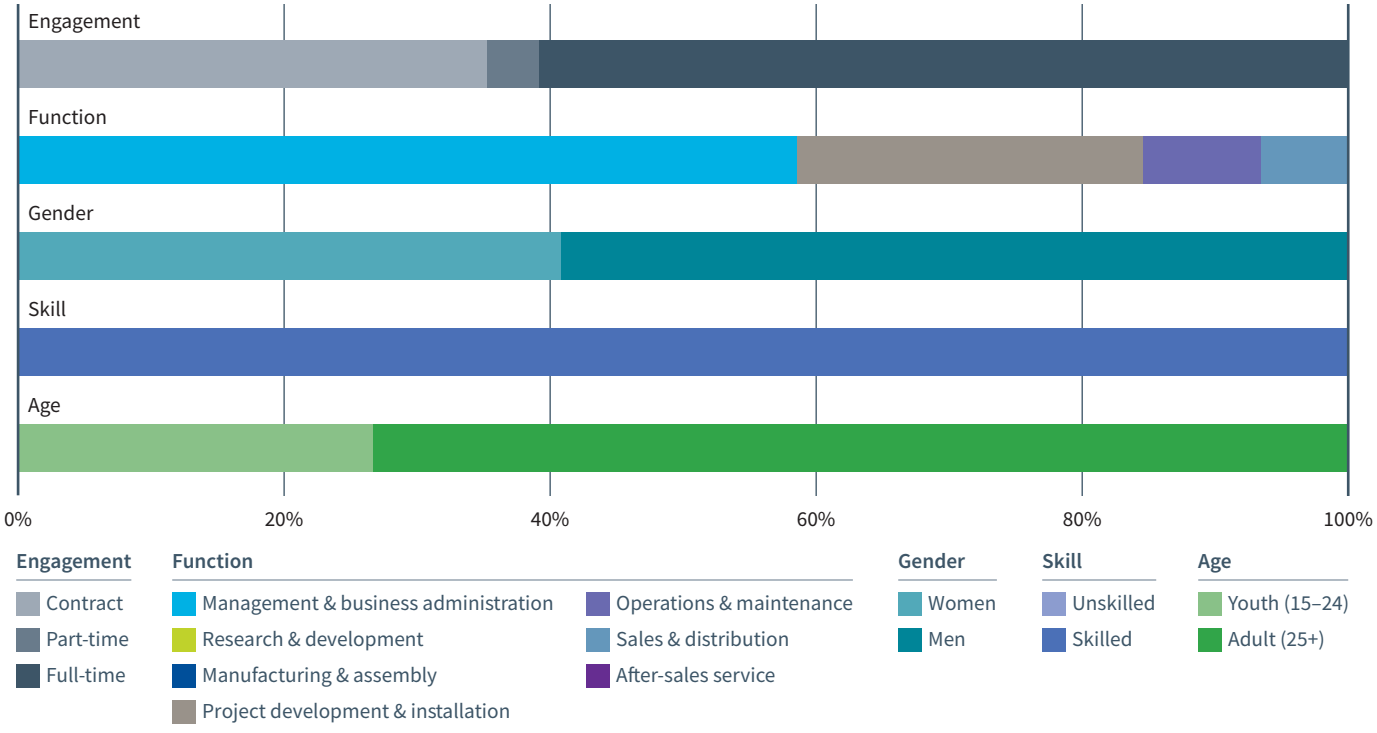
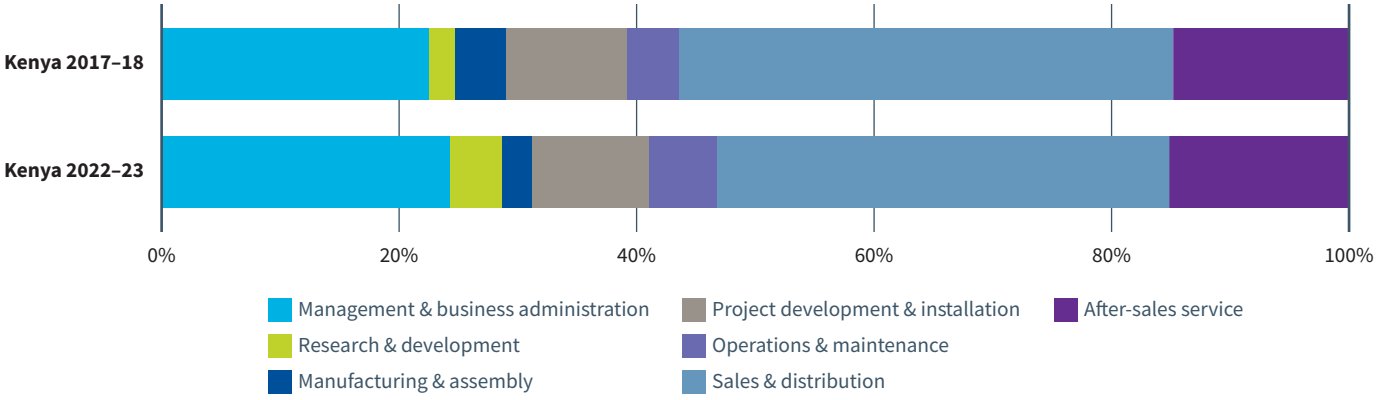


FIGURE 7. CHANGE IN SKILLS NEEDS BETWEEN 2017–18 AND 2022–23



Following sales and distribution, management and business administration make up 22% of the DRE jobs in Kenya. By 2022–23, this number is expected to almost double, increasing from about 2,000 to 4,000. However, managerial talent is also the most difficult to recruit, partly due to the small talent pool and because of competition from other sectors, especially the utility-scale energy sector.

6. Conclusions

The DRE sector is expanding at a rapid pace. Its direct, formal jobs are expected to increase by 70% over the next five years. In 2017–18, the sector provided about 10,000 direct, formal jobs, with 78% of these jobs coming from pico-solar appliances and SHS companies. By 2022–23, the workforce will provide more than 17,000 direct, formal jobs, and about 29% of these jobs will support the growing mini-grid sector. The projected five-year increase of formal jobs in the DRE sector is 70%, as compared to the national formal job five-year growth rate of 28% between 2009 and 2015 [8].

The sector has a significant, positive impact on informal and productive employment. In 2017–18, the sector provided about 15,000 informal jobs and 65,000 productive use jobs. By 2022–23, the total number of informal jobs will double, reaching more than 30,000. The five-year increase in DRE informal jobs is higher than the national informal job five-year growth rate of 44% between 2009 and 2015 [8].

Two key contributions to continuous DRE job growth are product replacements or upgrades for existing customers and the injection of public funding into building mini-grids. Existing customers' proven demand for larger appliances should support DRE market growth and therefore higher employment [10]. About 27% of 2017's pico-solar appliance and SHS market potential came from existing customers' product replacements or upgrades. Therefore, customer retention is key to realizing the DRE sector's job creation potential. In addition, KOSAP indicates that the Kenyan government strongly supports mini-grids. This should help scale the mini-grid companies and create jobs [3].

Sales and distribution make up 41% of DRE direct, formal jobs in Kenya, followed by 22% in management and business administration. The sector finds managerial talent very difficult to recruit. The challenges around recruiting and retaining managerial talent are compounded by competition for the limited talent pool within the economy.

Women's participation in the workforce across almost all company types is low, except for sector service providers, but all companies show a willingness to employ youth. In particular, project developers and installers have a poor gender balance.

Overall, the DRE sector in Kenya relies on a young, highly skilled, long-term workforce. This synopsis details the breakdown of employment estimates and characteristics by technology and company type, and can be used to increase awareness and to facilitate policy development. See the main report for detailed methods, limitations, and other recommendations based on the combined data.

DEFINITIONS

- **Direct, formal jobs**: Direct, formal jobs are those created through contractual engagement with an incorporated company in the DRE sector. For example, an IT professional or a project manager who is employed by a DRE company.
- **Informal sector:** According to the International Labour Organization, the informal sector comprises all work for unincorporated enterprises and for which no complete accounts are available that would permit a financial separation of the production activities of the enterprise from other activities of its owner(s). Informal jobs can even be extended to include non-remunerative work of contributing family members, and thus can be difficult to bound definitively [13].
- **Direct, informal jobs:** Informal jobs are created through contractual or non-contractual engagement with an incorporated company in the DRE sector. Informal employment in the sector takes on various forms—from long-term arrangements with companies (e.g. product retail) to commission-based sales activities. For example, a home business owner who works as a village sales representative for a SHS company [13].
- **Indirect jobs:** Indirect jobs are those created by backward-linked industries or companies that serve and supply the DRE sector. That is, those vendors and suppliers who serve the DRE sector upstream or provide services for the DRE sector's day-to-day operations either contractually or non-contractually. For example, indirect jobs are those created by an inverter manufacturer or an importer who supplies DRE companies. Literature on indirect jobs is cited where available.
- **Productive use jobs:** Productive use jobs are those created by the DRE end users themselves as a result of newly-acquired or enhanced electricity access. For the purpose of this study, productive use is defined as any income-generating application of a DRE product or service [14]. For example, the new jobs created by the purchase of a solar milling plant. Productive use jobs are estimated through insights from focus groups and literature, as most surveyed respondents did not readily have data on jobs created by their product or service offers at the customer level.
- **Full-time equivalent (FTE) job:** An FTE job is the equivalent of one employee working full time over the course of a year where full-time work is defined in accordance with the country context. Part-time and contract work is converted to FTE based on number of hours worked or length of contract. All estimates of direct, formal jobs are presented in FTE job terms. All other references to "job" outside of direct, formal employment do not assume full-time equivalency.
- **Skilled workers:** Skilled workers are those who hold leadership, management, professional, technical, or associate professional positions. Their responsibilities typically involve the performance of complex technical and practical tasks that require an extensive body of factual, technical, and procedural knowledge in a specialized field, as defined by the International Standard Classification of Occupation (ISCO-08) Skill Level [15]. Workers in Skill Level 3 or above are considered skilled workers.

References

[1] "Data Finder - World Employment and Social Outlook," *International Labour Organization.* [Online]. Available: https://www.ilo.org/wesodata/. [Accessed June 3, 2019].

[2] "Kenya National Electrification Strategy: Key Highlights," Kenya Ministry of Energy, 2018.

[3] "Kenya Off-Grid Solar Access Project for Underserved Counties," Lighting Africa, Dec. 2018.

[4] "Kenya Power Africa Fact Sheet," *USAID,* Nov-2018. [Online]. Available: https://www.usaid.gov/sites/default/files/documents/1860/Kenya-_November_2018_Country_Fact_Sheet.pdf. [Accessed June 21, 2019].

[5] "Off-Grid Solar Market Trends Report 2018," GOGLA, Lighting Global, ESMAP, Dalberg Advisors, Washington, D.C., Jan. 2018.

[6] "Powering Jobs: 2019 Energy Access Jobs Census," Power for All, July 2019.

[7] R. Obala, "Kenya Power to review vendors' contracts amid customer uproar," *The Standard,* May-2018. [Online]. Available: https://www.standardmedia.co.ke/article/2001279375/kenya-power-to-review-vendors-contracts-amid-customer-uproar. [Accessed June 4, 2019].

[8] "How Kenya is failing to create decent jobs," Africa Research Institute, June 2017.

[9] "Kenya Solar PV Market Assessment," Kenya Climate Innovation Centre.

[10] "Off-Grid Appliance Market Survey: Perceived Demand and Impact Potential of Household, Productive Use and Healthcare Technologies," Efficiency for Access Coalition, Sep. 2018.

[11] "Renewable Energy Benefits: Leveraging Local Capacity for Solar PV," International Renewable Energy Agency, Abu Dhabi, 2017.

[12] "Utility-Scale Solar Photovoltaic Power Plants: A Project Developer's Guide," International Finance Corporation, 2015.

[13] R. Hussmanns, "Statistical definition of informal employment: Guidelines endorsed by the Seventeenth International Conference of Labour Statisticians," presented at the 7th Meeting of the Expert Group on Informal Sector Statistics, New Delhi, 2003.

[14] L. Mayer-Tasch, M. Mukherjee, and K. Reiche, "Productive Use of Energy - PROUSE: Measuring Impacts of Electrification on Small and Micro-Enterprises in Sub-Saharan Africa," GIZ, 2013.

[15] "International Standard Classification of Occupations: Structure, group definitions and correspondence tables," International Labour Organization, Geneva, 2012.

Cover photo generously provided by Practical Action/Edoardo Santangelo.