



POWER FOR **ALL**

Schneider
Electric
Foundation

 **The ROCKEFELLER
FOUNDATION**

Powering Jobs Census 2019: **Focus on Nigeria**

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) solar 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 Nigeria, specifically exploring the Nigerian DRE employment landscape, skills trends, and future projections across the different DRE technologies. 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 Nigeria's unemployment challenges deepen. In Nigeria, young men and women between the ages of 15 to 24 comprise over 34% of the working-age population, but also 50% of the unemployed [1].

2. DRE Policy in Nigeria

Nigeria has made great strides, successfully electrifying 65% of its population as of 2018. Despite this, 80% of those who have electricity access still use alternative sources of energy due to frequent power outages. Low quality of energy access has taken a toll on Nigeria's economy. There are about 37 million micro, small, and medium enterprises (MSMEs) in Nigeria, which provide about 84% of the total jobs and contribute 48.5% of Nigeria's GDP [2]. Among them, close to one-third had less than 4 hours of electricity per day [3]. Annual economic loss due to inadequate power supply is estimated at US\$25 billion, which is more than 6% of Nigeria's GDP [4].

There is a large demand for a more resilient power supply which will likely result in the expansion of the DRE sector. The Nigerian government set an ambitious goal to improve their energy sector by 2030. Vision 30:30:30 aims to achieve a power generation goal of 30 GW with a renewable energy mix of 30% by 2030 [5]. The Rural Electrification Goal aims to provide reliable power to 75% and 90% of the population by 2020 and 2030, respectively [6], [7].

DRE technology is at the center of Nigeria's energy vision [8]. The Nigerian Rural Electrification Agency (REA) designed several programs to increase energy access through the use of DRE technologies. In 2018, the REA launched a five-year Nigeria Electrification Project (NEP) [9]. The project utilizes a \$350 million loan from the World Bank to finance private-sector mini-grid development. Under the NEP, 1,200 mini-grid projects will be developed to serve a population of 300,000 households and 30,000 local enterprises. With financial support and policy protection from the Nigeria Electricity Regulatory Commission, the mini-grid market is expected to scale to 10,000 mini-grids by 2023 [10]. The NEP estimated that this will power over 250,000 MSMEs and 1 million household through DRE technologies [10], [11].

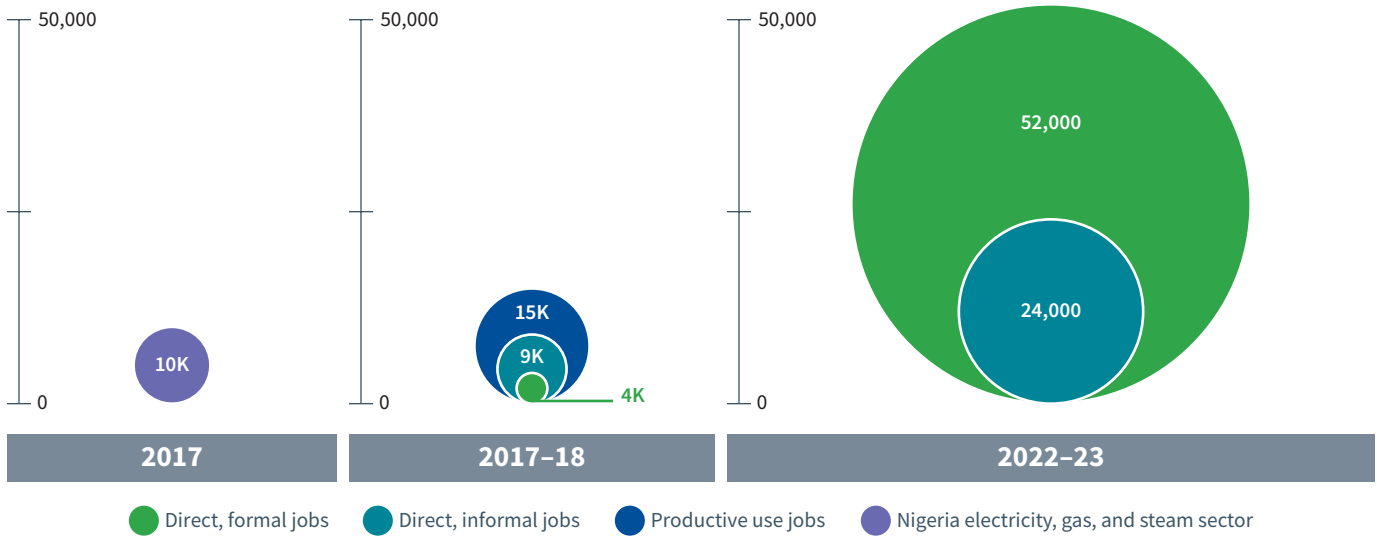
Given the strong policy focus on DRE, there is a major opportunity in Nigeria to impact employment. The unemployment rate in Nigeria in 2018 was 6% overall, with female unemployment at 6.4% and youth unemployment at 19.7% [1].

3. Employment Estimates

The DRE market is still nascent in Nigeria, despite a large and unmet appetite for power led by Nigeria's MSMEs. This is due, in part, to the country's current economic crisis [12]. High import duties on batteries also pose a challenge to the sector [13]. In 2017–18, the study estimated the DRE sector provided 4,000 direct, formal jobs. Nigeria's national gas, electricity, and air conditioning sector employed about 10,000 workers during in the same year [14]. The DRE sector's employment impact extends beyond direct, formal jobs into the informal sector by creating indirect jobs in the upstream value chain and productive use jobs among end users in rural areas. In 2017–18, the DRE sector employed about 9,000 informal workers. Furthermore, the newly acquired or enhanced electricity access may have enabled the creation of 15,000 productive use jobs.

By 2022–23, we project the DRE sector will provide more than 52,000 direct, formal jobs and about 24,000 informal jobs. A significant share of that growth will be secondary to the rapid expansion

FIGURE 1. DRE SECTOR EMPLOYMENT ESTIMATES AND PROJECTIONS



of the mini-grid sector, which is targeted to reach 405 MW by 2022, as projected by Sustainable Energy for All (SEforALL) Action Agenda [5]. However, industry experts are skeptical of these projections.

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 directly to customers. The Nigeria DRE market, the second largest in the world after India, presents great opportunity for end-user product providers. However, pico-solar appliances and SHS have a low market penetration rate: 4% in 2017, as compared to 51% in Kenya. As such, end-user product providers provided only 1,100 direct, formal jobs, 8,400 informal jobs and 15,000 productive use jobs. This is expected to double quickly as penetration increases, such that by 2022-23, these companies would provide about 2,000 direct, formal jobs and 14,000 informal jobs.

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	1,100	2,000	8,400	14,000	15,000
Standalone and grid-tied C&I	2,700	N/A*	390	N/A*	N/A*
Solar water pump	N/A*	N/A*	N/A*	N/A*	N/A*
Mini-grid	120	50,000	9	9,500	270
Approximate total	4,000	52,000	9,000	24,000	15,000

Numbers rounded to two significant figures.

* Survey or market insight data unavailable.

As shown by the survey data, about 33% of the direct, formal employees in these companies are engaged in management and business administration, while another 18% are dedicated to manufacturing and assembling. Additionally, 89% of these direct, formal jobs are full-time and long-term, lasting more than a year, with the average employee retention period being 33 months.

Nigerian companies have excellent female participation. On average, women account for 52% of the direct, formal jobs in these companies, higher than most other types of DRE companies, and greatly exceeding corresponding companies in Kenya or India. In fact, the global renewable energy sector is only 32% female [15]. End-user product providers also engage many women through informal work, with 44% of the informal workers serving the sector being women, often sales agents.

About 62% of the direct, formal jobs reported by these companies are skilled, as compared to the global renewable energy industry, where less than half of its workers are skilled [16]. The sector also has strong participation from youth, or people between 15–24 [17], accounting for 42% of the end-user product provider workforce.

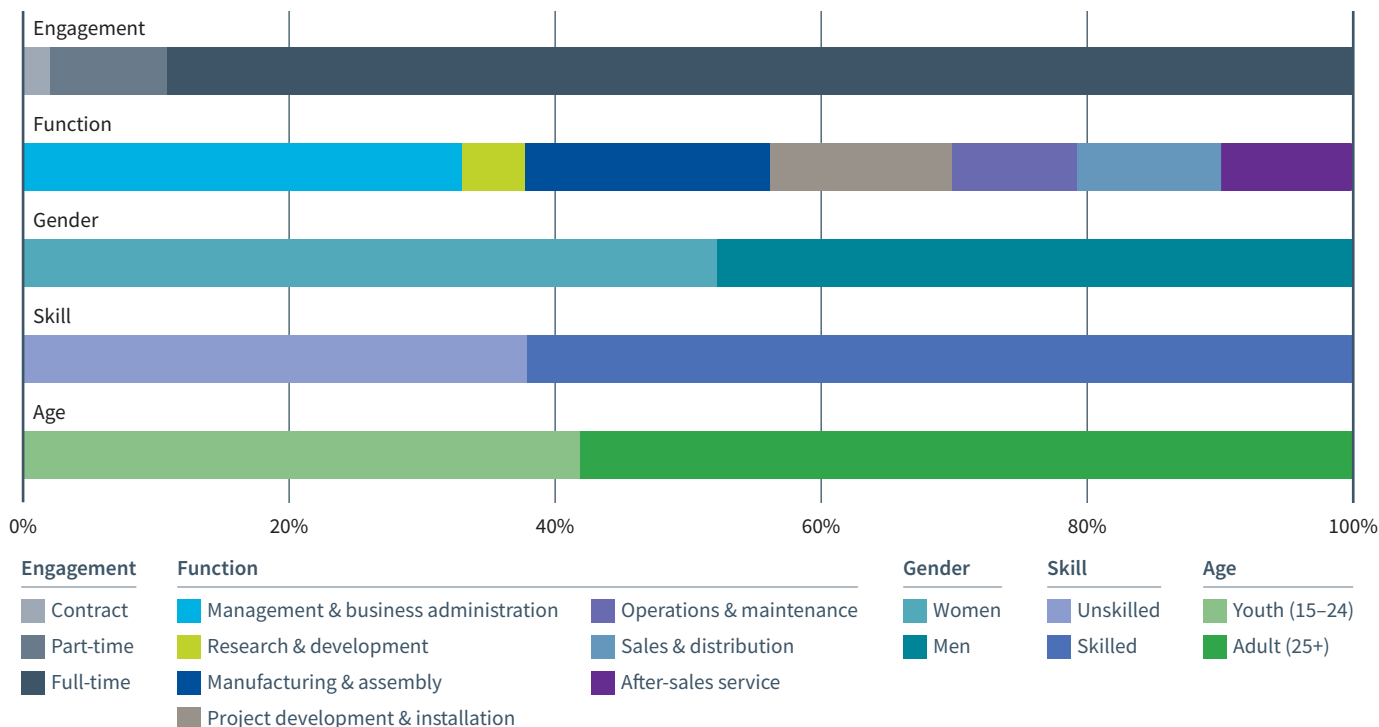
4.2 Project Developers, Installers, and Mini-grid Operators

Project developers and installers are defined as companies that work on projects ranging from a few hundred watts to a few kilowatts. These companies develop and construct standalone or grid-tied C&I systems, but do not generate revenue from operating them.

It has been estimated that a project developer and installer provides 133 direct, formal jobs per MW deployed. By applying this employment factor to C&I market estimates from Bloomberg New Energy Finance, more than 2,700 direct, formal jobs and 390 informal jobs were provided by project developers and installers in 2017–18. Survey data shows that 67% of these direct, formal jobs are full-time jobs, with an average retention of 43 months, the longest across all DRE company types surveyed. The study could not project employment impact in 2022–23 due to the lack of data.

Project developers and installers dedicate most of their workforce to project development and servicing products. About 23% of the jobs are in project development and 31% in after-sales service. These companies are more dependent on construction workers

FIGURE 2. END-USER PRODUCT PROVIDER WORKFORCE PROFILE



who install projects on site and engineers who design and develop PV systems. Furthermore, during the construction phase of C&I projects, the developers and installers draw heavily on support of engineering, procurement, construction, transportation, and logistics companies, with the support of local civil workers. Thus, the potential for indirect job creation is high.

Feedback from focus groups and interviews provided anecdotal insight into DRE jobs from the C&I sector. For example, managers of the Maiganga Solar Powered Milling Project described its construction in Nigeria during 2018. The project took around 15 weeks and required 47 people. Of those, seven were direct, formal employees, such as project managers and engineers overseeing the work, while 35 people were employed temporarily during plant construction as masons, metal workers, welders, and carpenters. After it was commissioned, the mill required three full-time plant operators and one technician, thus creating productive use jobs as well.

About 70% of those employed by project development and installation companies are skilled workers. Women make up 21% of direct, formal employees within project developers and installers, slightly lower than the industry average of 27%, while 25% are youth.

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.

Currently, mini-grid companies are still emerging in Nigeria, which is why they only provide about 120 direct, formal jobs, nine informal jobs and 270 productive use jobs across some 30 solar-based mini-grids [18]. However, mini-grid operators may shift the DRE sector's workforce skill demand in the future, as the Nigerian REA considers mini-grids the cornerstone for their electrification strategy. With the support of the World Bank, 1,200 mini-grid sites are already planned, with a potential of scaling up to 10,000 sites by 2030 [19]. SEforALL, in its Action Agenda projected that Nigeria may need to deploy 405 MW worth of mini-grids to achieve Vision 30:30:30 [5].

Finding a skilled workforce for the sector may represent a challenge. Our study estimates that operating 405 MW worth of mini-grids would take roughly 50,000 highly skilled employees every year, as more than 83% of mini-grid employees are skilled. Our study also projects 9,500 informal jobs would be required to satisfy 405 MW

FIGURE 3. PROJECT DEVELOPER AND INSTALLER WORKFORCE PROFILE

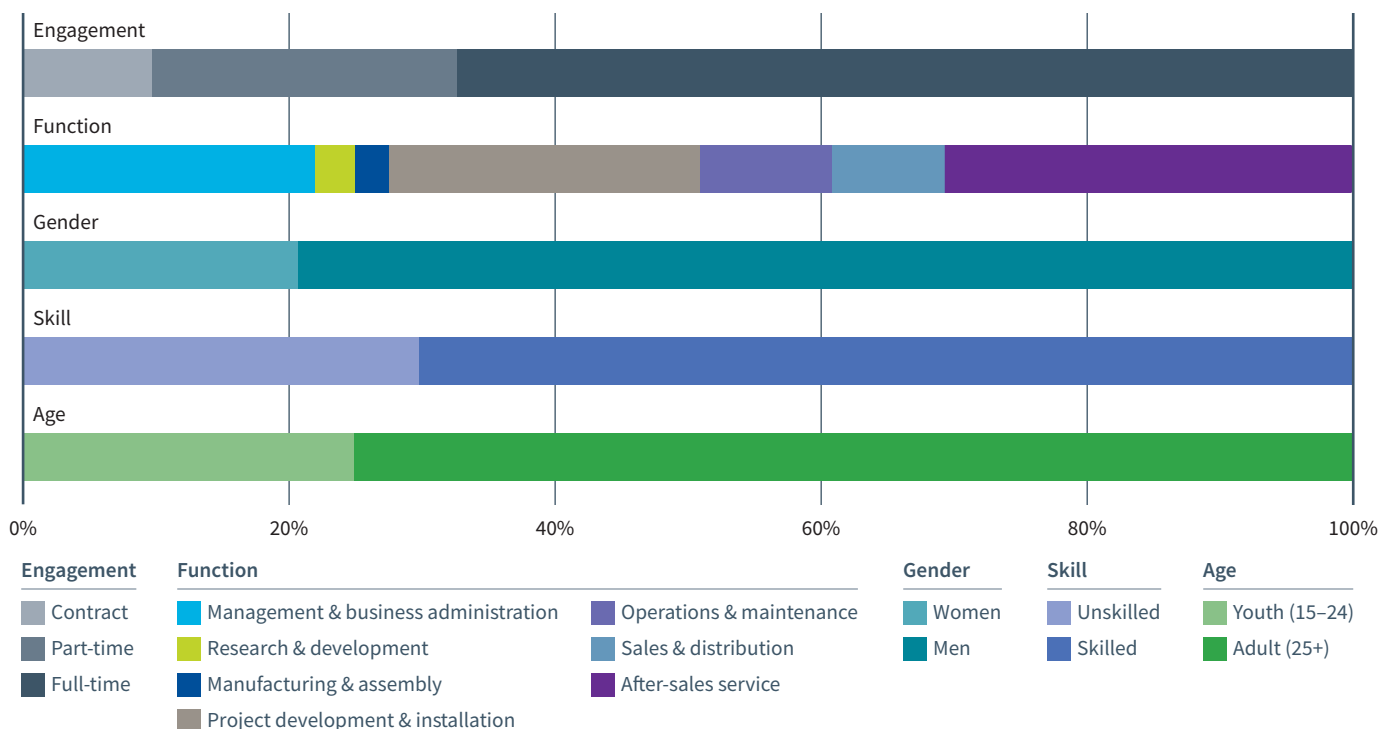


FIGURE 4. MINI-GRID OPERATOR WORKFORCE PROFILE

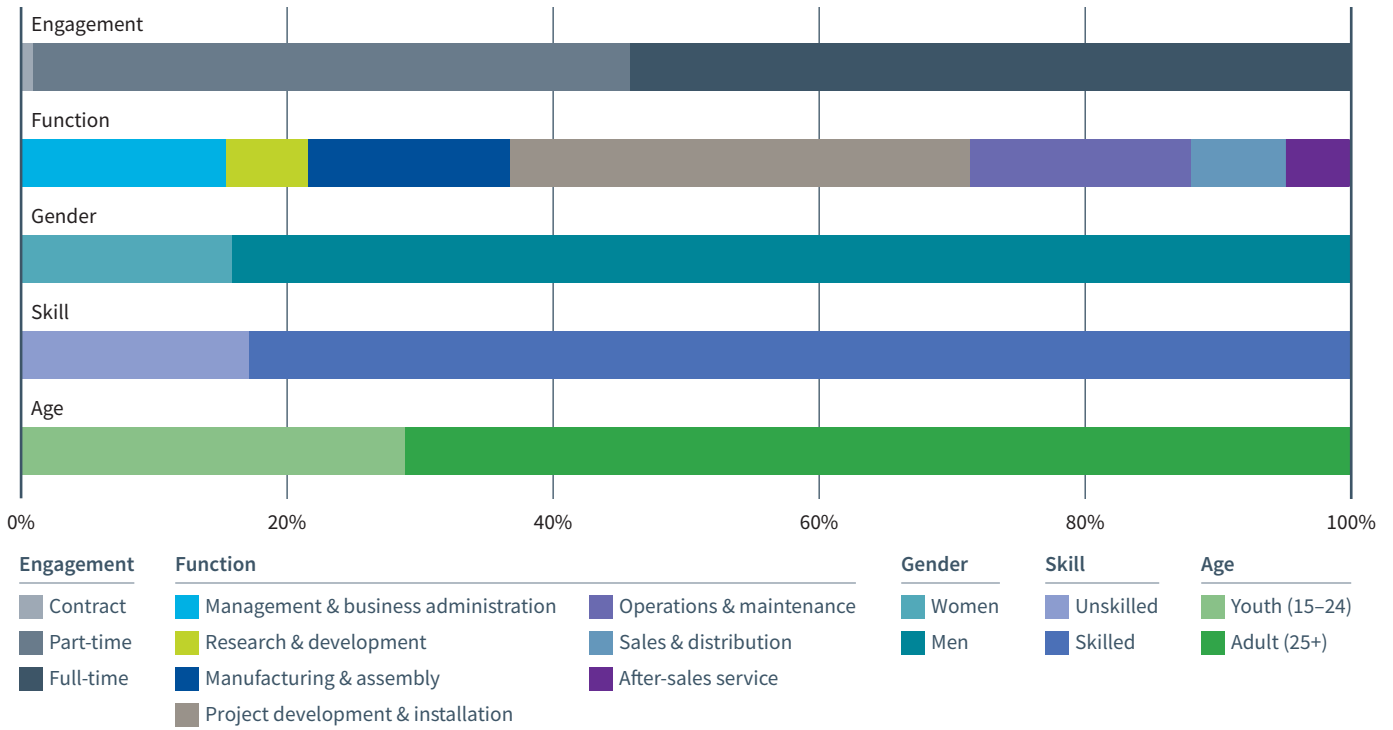
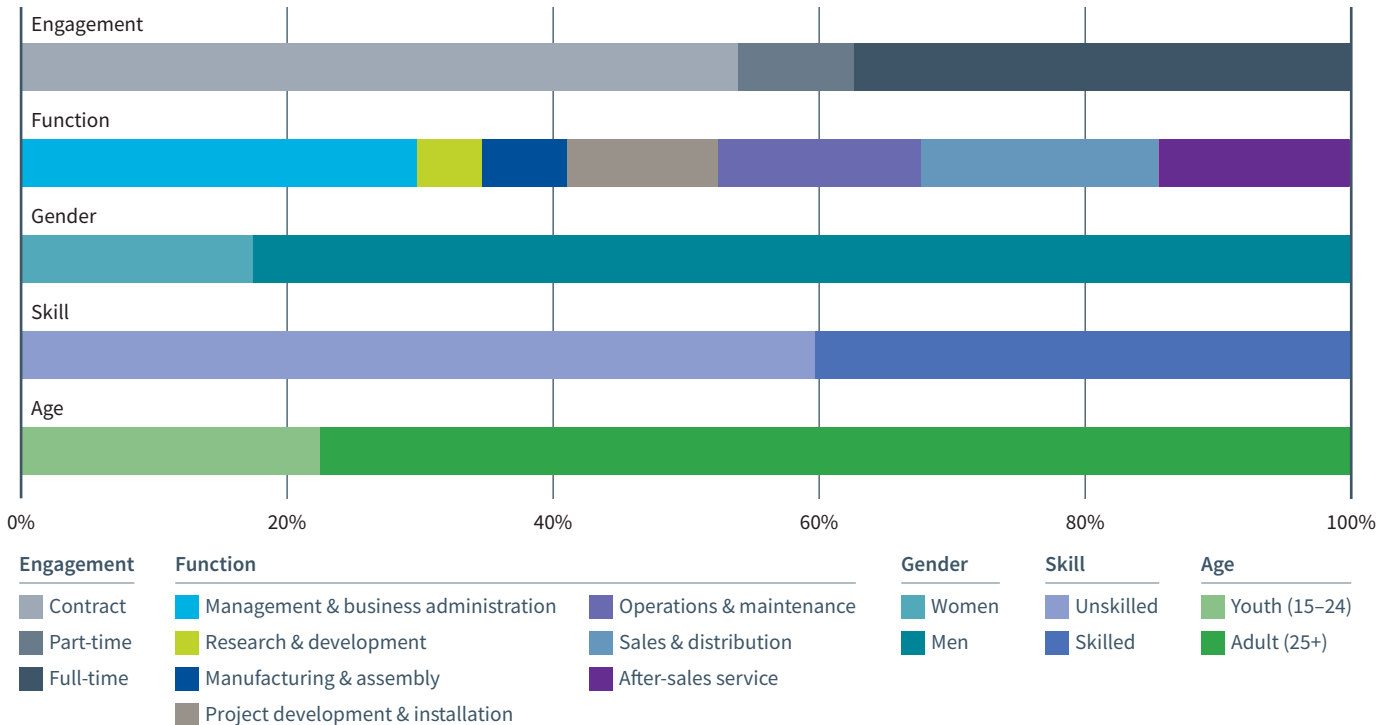


FIGURE 5. MANUFACTURING AND UPSTREAM SUPPLY CHAIN WORKFORCE PROFILE



worth of mini-grids. This highlights the fact that mini-grid companies provide significantly more formal than informal work opportunities. The jobs created by the mini-grid operators are mostly full-time, long-term jobs. Average retention in mini-grid companies is 39 months, longer than the industry average of 35 months. Unfortunately, women account for only 16% of the direct, formal jobs in the mini-grid sector, compared to 27% across the DRE sector. Youth compose 29%, which is close to the DRE sector's 28% average.

4.3 Manufacturing, Upstream Supply Chain Companies, and Service Providers

Finally, the DRE sector is supported by a group of companies and organizations such as PV manufacturers, inverter manufacturers, equipment importers and exporters, metering companies, training centers, and micro-finance institutions that create indirect jobs. Very few of these companies responded to our survey, so these results cannot be generalized. However, among the manufacturing and upstream supply chain companies who did respond, most do not have full manufacturing lines in Nigeria, only a few staff handling imports and sales. As such, about 30% of the jobs in these companies are in management and business administration and 18% in sales and distribution. Manufacturing and upstream supply

chain companies report that about 40% of their workforce is skilled, significantly lower than the DRE sector's average of 70%. Women are 18% of the workforce, while 23% are youth.

Gender is more balanced among the service providers who responded, many of which assist with research, advocacy, or raising awareness of the sector. Women make up 49% of the workforce in these organizations, while 28% are youth. The workforce is 91% skilled, with more than 43% of jobs in management and business administration alone. Due to the lack of market estimates, future projections were not possible.

5. Skills Needs

DRE penetration into remote areas is still nascent and most DRE companies are still serving urban customers, mainly replacing diesel generators. However, the sector is growing rapidly and already the survey results show that 70% of direct, formal jobs in the Nigerian DRE sector are skilled, compared to less than 50% in the global solar industry [16]. Currently, 23% of these jobs are in project development and installation alone, including site selection, feasibility study, system design, engineering, procurement, construction,

FIGURE 6. SECTOR SERVICE PROVIDER WORKFORCE PROFILE

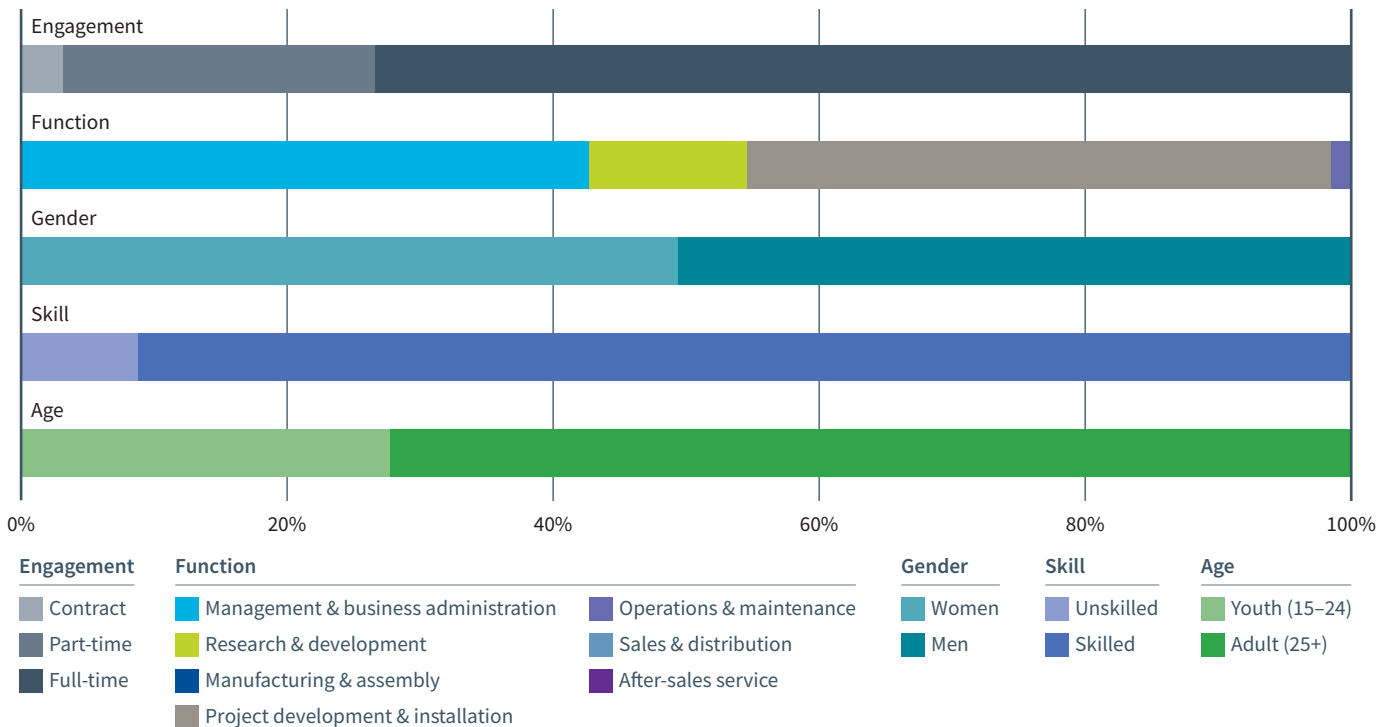
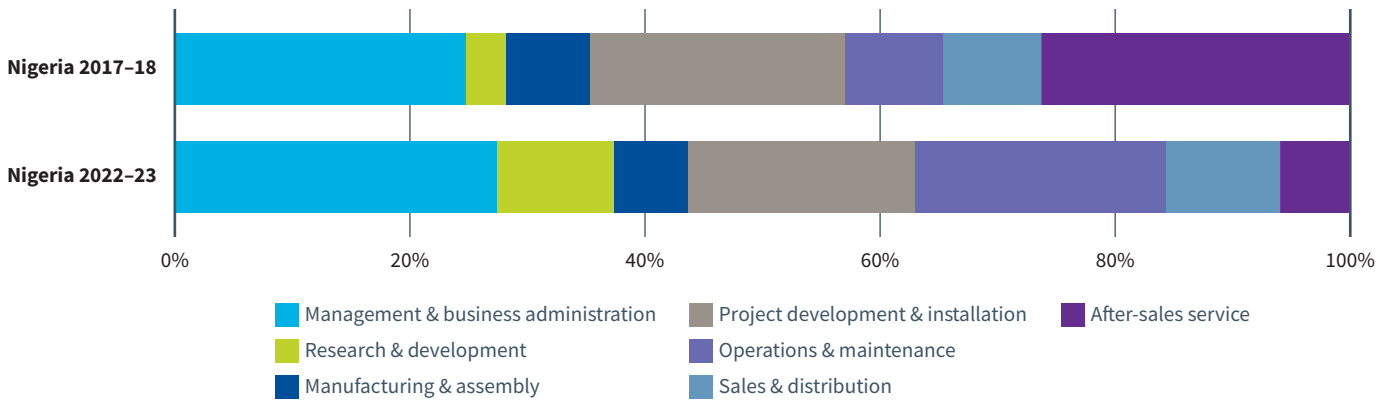


FIGURE 7. CHANGE IN SKILLS NEEDS BETWEEN 2017–18 AND 2022–23



and commissioning. However, by 2022–23, the demand may shift towards operations and maintenance (O&M), mainly due to the growth of mini-grids. Management and business administration skills continue to be in high demand, as 24% of jobs in 2017–18 are in this area, and it is projected that this will increase to 27% of jobs in 2022–23. That said, skilled managers are difficult to recruit, due to the small talent pool and competition from other sectors.

6. Conclusions

Nigeria’s DRE market is expanding at a rapid pace. The workforce may need to grow by more than tenfold to meet national targets. In 2017–18, the DRE sector provided about 4,000 jobs, most of which were through project developers and installers. With the ambitious electrification strategy the Nigerian REA published, mini-grids may grow to become a major employer. By 2022–23, if Nigeria is to meet the goals the government has laid out, the DRE workforce will need to provide more than 52,000 direct, formal jobs, 50,000 of which serving 405 MW worth of mini-grid systems.

In addition to direct, formal jobs, Nigeria’s DRE sector also has considerable impact on informal employment. In 2017–18, the sector provided about 9,000 informal jobs and 15,000 productive use jobs. The number of informal jobs should more than double to 24,000 by 2022–23, but will still be surpassed by the growth of direct, formal jobs.

Management and business administration skills are the most in demand in the DRE sector and will continue to be in the future. Currently about 24% of direct, formal jobs are in management and business administration, which will grow to 27% by 2022–23. Skills

needs will see a slight shift from project development and installation to O&M, depending on the growth of the mini-grid market.

Women’s participation in the DRE sector is low, at only 27% of the workforce. End-user product providers and DRE sector service providers have the highest levels of women’s participation, where women account for about half of the workforce. Mini-grid and project development companies hire very few women.

Overall, the DRE sector in Nigeria 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 [21].

-
-
- » **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 [21].
 - » **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 [22]. 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 [23]. 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] “Pushing Off-Grid Renewables for Micro, Small and Medium Enterprises (MSME) in Nigeria,” Climate Transformation and Energy Remediation Society, 2018.
- [3] “Nigeria: Energy needs assessment and value chain analysis,” All On, 2017.
- [4] “Power Sector Recovery Programme: 2017 – 2021.” Federal Government of Nigeria, Jan2018.
- [5] “Sustainable Energy for All Action Agenda (SE4ALL-AA),” Federal Republic of Nigeria, July 2016.
- [6] “Electric Power Sector Reform Act,” Nigeria Ministry of Power, 2005.
- [7] “Rural Electrification Goal,” *Nigeria Rural Electrification Agency*, Sep. 7, 2017. [Online]. Available: <http://rea.gov.ng/theagency/rural-electrification-goal/>. [Accessed Mar. 15, 2019].
- [8] “Rural Electrification Strategy and Implementation Plan,” Federal Government of Nigeria, July 2016.
- [9] “The Nigeria Electrification Project,” *Nigeria Rural Electrification Agency*, July 2018.
- [10] “Off Grid Electrification Strategy,” *Nigeria Rural Electrification Agency*, Aug. 22, 2017. [Online]. Available: <https://rea.gov.ng/themasterplan/>. [Accessed June 25, 2019].
- [11] S. C. Dubey, “Solar Mini Grids Put Nigeria on Path to Energy for All by 2030,” *Energy for All*, Jan. 25, 2018. [Online]. Available: <http://blogs.worldbank.org/energy/solar-mini-grids-put-nigeria-path-energy-all-2030>. [Accessed Mar. 15, 2019].
- [12] “Off-Grid Solar Market Trends Report 2018,” GOGLA, Lighting Global, ESMAP, Dalberg Advisors, Washington, D.C., Jan. 2018.
- [13] “Climatescope 2018,” *Climatescope 2018*. [Online]. Available: [//global-climatescope.org](http://global-climatescope.org). [Accessed June 25, 2019].
- [14] “Labour Force Statistics Vol. 2: Employment by Sector Report (Q3 2017),” Nigeria National Bureau of Statistics, Jan. 2018.
- [15] R. Ferroukhi, M. Renner, C. García-Baños, and B. Barua, “Renewable energy: A gender perspective,” International Renewable Energy Agency, Abu Dhabi, 2019.
- [16] “Renewable Energy Benefits: Leveraging Local Capacity for Solar PV,” International Renewable Energy Agency, Abu Dhabi, 2017.
- [17] “Youth Definition,” *United Nations Educational, Scientific and Cultural Organization*. [Online]. Available: <http://www.unesco.org/new/en/social-and-human-sciences/themes/youth/youth-definition/>. [Accessed Feb. 18, 2019].
- [18] “Mini-grid Investment Report: Scaling the Nigerian Market,” Nigerian Economic Summit Group and Rocky Mountain Institute, 2018.
- [19] “Project Appraisal Document on a Proposed Credit in the Amount of 243.4 Million (US\$350 Million Equivalent) to the Federal Republic of Nigeria for the Nigeria Electrification Project,” The World Bank, May 31, 2018.
- [20] “International Standard Classification of Occupations: Structure, group definitions and correspondence tables,” International Labour Organization, Geneva, 2012.
- [21] 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.
- [22] 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.
- [23] “International Standard Classification of Occupations: Structure, group definitions and correspondence tables,” International Labour Organization, Geneva, 2012.

Cover photo generously provided by Futurepump/IWMI & jeffreymwalcott.com.