KEREA
Kenya Renewable Energy Association

# FIELD SURVEY OF THE SOLAR SUB-SECTOR IN KENYA

# REPORT OF FINDINGS

October 2014

Report Prepared by Kenya Renewable Energy Association (KEREA) Secretariat

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# 1 INTRODUCTION

The field survey of the solar sub-sector in Kenya was undertaken over a period of 7 weeks between 9th October 2013 and 27th November 2013.

The survey was based on solar vendors and technicians identified through visits to 62 towns. Solar vendors included vendors of solar photovoltaic modules, batteries, charge controllers, inverters, solar lanterns and solar water heaters. Technicians included providers of support services including design and installation, to vendors as well as directly to consumers. In total, 379 vendors and 268 technicians were covered by the field survey.

The field research was undertaken by a team of three researchers, administering survey questionnaires in the various towns through face to face interaction with vendors and technicians. The results presented in this report are based on interviews with 647 vendors and technicians in 62 towns.

Administrative and logistical support for the activity was provided by the Kenya Renewable Energy Association secretariat.

The survey questionnaire is included for reference as Appendix 1.

# 2 ACKNOWLEDGEMENTS

The Kenya Renewable Energy Association extends its appreciation to the bfz gGmbH, for supporting the field research activity under a project agreement for organizational development and improvement of services offered by the association. The project was financed by the BMZ – German Federal Ministry for Economic Cooperation and Development via SEQUA gGmbH – Partner of German Business.

We would also like to thank the vendors and technicians who participated in the research, as well as the research team, for their time and contribution, with which the activity was a success.

We would like to welcome stakeholders in providing feedback and other inputs into the report to ensure the best possible outcome is derived for the benefit of the solar sub-sector in Kenya.

These and any other queries can be addressed by post or email to:

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# 3 CONTEXT

The Kenya Renewable Energy Association aims to continuously improve the products and services available to renewable energy stakeholders, and its members. In order to ensure this objective is attained, collecting up to date information on the sector is necessary. This information includes the status of the business operations and business environment, the roles of active participants in the sector, and development of a communication database.

This field research was particularly focused on the solar sub-sector, for a number of reasons.

Firstly, KEREA has been undertaking priority activities in the solar sub-sector since 2012. The activities are being implemented in response to the Energy (Solar Photovoltaic Systems) Regulations, which came into effect in September 2012 and require technicians and vendors to be licenced. These activities have included facilitating development of a solar PV training curriculum, training of trainers, equipping of select technical training institutions and development of a facilitation service for training and licencing. The research is particularly useful in enabling KEREA's activities in disseminating information on the regulations and compliance pathway to technicians and vendors.

Secondly, the Energy (Solar Water Heating Systems) Regulations, came into effect in April 2012. The regulations require installation of heaters in buildings utilizing over 100 litres per day, and adherence of vendors and technicians to minimum design, installation and maintenance standards. KEREA is therefore also prioritizing activities in solar water heating area and working towards partnerships aimed at implementing similar activities to those undertaken for the solar PV sub-sector.

Thirdly, KEREA is undertaking a project to develop and implement a voluntary accreditation framework for vendors of off-grid lighting products in Kenya. This project incorporates testing of products and/or system components, and disseminating information to consumers on products meeting minimum testing requirements. It is envisioned that the research will be of great benefit in the implementation of this project by providing a baseline, and database.

It is therefore envisioned that this complementary strategy will successfully improve the delivery of products and services within the solar sector.

# 4 SUMMARY OF GENERAL FINDINGS

## 4.1 Annual Solar Systems Installations by Technicians

The number of solar systems installed annually was based on the total number of installations by the 268 technicians interviewed. Technicians were found to install a total of 2,902 solar systems per year, across 48 towns.

Technicians in Nairobi carried out the highest number of installations at 1,561 installations per year, representing 54% of all installations. Other technicians carrying out high numbers of installations were in Kericho, Kitui and Mwingi, installing 108, 102 and 95 systems respectively.

The towns in which technicians had the lowest number of installations were Mururi and Nkubu (4 installations each), Makueni and Ololunga (3 installations each), and Kapsabet (2 installations).

The annual installations of solar systems by technicians are summarized in Appendix 2.

## 4.2 Annual Solar Systems Sales and Installations by Vendors

The number of solar systems sold and installed annually was based on the total number of sales and installations by the vendors interviewed. Of the 379 vendors interviewed, 222 vendors across 42 towns were found to carry out sales and installations, totalling to 10,756 solar systems per year.

Vendors in Nairobi carried out the highest number of sales and installations at 9,295 sales and installations per year, representing 86% of all sales and installations. Other vendors carrying out high numbers of sales and installations were in Kisii, Kitui and Nyahururu, selling and installing 278, 130 and 92 systems respectively.

The towns in which vendors had the lowest number of sales and installations were Laare, Makutano and Thika (5 sales and installations each), Kibwezi and Kutus (3 sales and installations each), and Kimbimbi (1 sale and installation).

The annual sales and installations of solar systems by vendors are summarized in Appendix 3.

## 4.3 Annual Sales of Solar Components

The annual sales of solar of solar equipment and components are as summarized in Table 1.

*Table 1Number of System Components or Equipment Sold by Vendors (Annually)*

| Equipment/Component | Number of Units Sold (Annually) |
|---|---|
| Modules | 48,984 |
| Batteries | 28,308 |
| Charge Controllers | 11,712 |
| Inverters | 23,604 |
| Solar Lanterns | 32,316 |

## 4.4 Annual Solar PV Capacity Installed

In order to estimate the total annual solar PV capacity installed, the average size of modules and the total number of modules sold by vendors in the market were used. These were 53Wp[1] and 48,984 modules per year, respectively.

It was therefore estimated that the total annual solar PV capacity installed was 2.6MWp.

# 5 FIELD SURVEY RESULTS

## 5.1 Technicians

### 5.1.1 Number of Technicians by Location

268 technicians were interviewed during the field survey. The distribution of technicians by locations (62 towns) is included in Appendix 4 of the report.

Over 50% of technicians were located in 8 major towns. These were in order of size: Nairobi (12%), Machakos (7%), Kakamega, Eldoret and Kericho (6% each), Kitale (5%), Kisumu and Narok (4% each).

The remaining 50% of technicians were located across 42 towns, while 12 towns did not have solar technicians available.

### 5.1.2 Number of Installations by Technicians

Of the 268 technicians interviewed, 194 provided information on the number of solar installations they conducted, representing 51% of technicians. The 194 technicians were located in 48 of the 62 towns covered by the survey, representing 77% of the towns.

The distribution of the number of installations undertaken by the technicians per year is as summarized in Table 2.

*Table 2Number of Installations Undertaken by Technicians (Annually)*

| Number of Installations Per Year (Range) | Number of Technicians | % of Technicians |
|---|---|---|
| 0-10 | 140 | 72 |
| 11-20 | 35 | 18 |
| 30 | 12 | 6 |
| 40 | 0 | 0 |
| 50 | 0 | 0 |
| 60 | 0 | 0 |

[1] The average module size sold by each vendor was determined separately, and the average of these was calculated for 288 vendors.

| Number of Installations Per Year (Range) | Number of Technicians | % of Technicians |
|---|---|---|
| 70 | 0 | 0 |
| 80 | 1 | 1 |
| 90 | 0 | 0 |
| 100 | 0 | 0 |
| >100 | 6 | 3 |

It can be seen that the vast majority of technicians install up to 10 solar systems per year.

## 5.2 Vendors

### 5.2.1 Number of Vendors by Location

379 vendors were interviewed during the field survey. The distribution of vendors by location (62 towns) is included in Appendix 2 of the report.

It was seen that the distribution of vendors was better than that of technicians. Over 57% of vendors were distributed across 13 major towns. The highest distribution of vendors was in the following locations, in order of size: Nairobi (14%), Kisii (5%), Mombasa, Machakos, Meru and Nyahururu (4% each) amounting to 36% of the national total.

The remaining 64% of vendors were located across 42 towns, while 14 towns do not have solar vendors available.

### 5.2.2 Number of Sales and Installations by Vendors

Of the 379 vendors interviewed, 222 vendors conducted both sales and installations of solar systems, representing 59% of interviewees. The 222 vendors were located in 42 of the 62 towns covered by the survey, representing 68% of the towns.

The distribution of the number of installations undertaken by the vendors per year is as summarized in Table 3.

*Table 3 Number of Installations Undertaken by Vendors (Annually)*

| Number of Installations Per Year (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 0-10 | 152 | 68 |
| 11-20 | 17 | 8 |
| 30 | 17 | 8 |
| 40 | 11 | 5 |
| 50 | 9 | 4 |
| 60 | 6 | 3 |
| 70 | 2 | 1 |
| 80 | 1 | 0 |
| 90 | 0 | 0 |
| >100 | 6 | 3 |

### 5.2.3 Size of Solar-Related Business

The field survey established that in the majority of cases, solar-related business activities were undertaken alongside others. The size of the solar-related business activities undertaken by vendors, relative to other business activities was established as a percentage of the overall business size.

Of the 379 vendors interviewed, 290 vendors provided information on the percentage solar accounted for in their overall business activities, representing 77% of interviewees. The 290 vendors were located in 46 of the 62 towns covered by the survey, representing 74% of the towns.

The distribution of the vendors by the size of the solar-related business activities is as summarized in Table 4.

*Table 4Percentage of Solar-Related Business Activities for Vendors*

| Relative Size of Solar-Related Business (%) (Range) | % of Vendors |
|---|---|
| 0-10 | 35 |
| 11-20 | 9 |
| 30 | 29 |
| 40 | 15 |
| 50 | 4 |
| 60 | 2 |
| 70 | 4 |
| 80 | 5 |
| 90 | 2 |
| 100 | 3 |

### 5.2.4 Number of Solar Photovoltaic Modules Sold

Of the 379 vendors interviewed, 288 vendors provided information on the number of solar photovoltaic modules they sold, representing 76% of interviewees. The 288 vendors were located in 49 of the 62 towns covered by the survey, representing 79% of the towns.

The distribution of the vendors by the number of solar photovoltaic modules sold is summarized in Table 5.

*Table 5Numer of Solar Photovoltaic Modules Sold by Vendors (Monthly)*

| Number of Modules Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 0-10 | 235 | 82 |
| 11-20 | 20 | 7 |
| 30 | 19 | 7 |
| 40 | 4 | 1 |
| 50 | 2 | 1 |

| Number of Modules Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 60 | 2 | 1 |
| 70 | 2 | 1 |
| 80 | 0 | 0 |
| 90 | 0 | 0 |
| 100 | 1 | 0 |
| >100 | 3 | 1 |

It can be seen that the vast majority of vendors sell up to 10 solar photovoltaic modules per month. In total, 4,082 solar photovoltaic modules are sold by vendors per month, totaling to 48,984 modules annually.

### 5.2.5 Size of Solar Photovoltaic Modules Sold

Of the 379 vendors interviewed, 288 provided information on the sizes of solar photovoltaic modules they sold, representing 76% of interviewees. The 288 vendors were located in 51 of the 62 towns covered by the survey, representing 82% of the towns.

In the case of the most common solar module sizes sold by vendors, it was found that the highest percentage of vendors (40%) sold 20Wp modules. This leading group was followed closely by those (36%) selling 40Wp modules and 31% selling 50Wp modules.

The distribution of the solar photovoltaic modules by size is as summarized in Table 6.

*Table 6Size of Solar Photovoltaic Modules Sold by Vendors*

| Size of Module (Wp) | % of Vendors |
|---|---|
| 3 | 1 |
| 10 | 4 |
| 14 | 1 |
| 15 | 17 |
| 20 | 40 |
| 24 | 1 |
| 25 | 1 |
| 30 | 28 |
| 35 | 1 |
| 36 | 1 |
| 40 | 36 |
| 47 | 1 |
| 50 | 31 |
| 60 | 17 |
| 65 | 9 |
| 75 | 1 |
| 80 | 22 |
| 100 | 10 |
| 120 | 15 |

| Size of Module (Wp) | % of Vendors |
|---|---|
| 125 | 1 |
| 130 | 1 |
| 150 | 3 |
| 160 | 1 |
| 175 | 1 |
| 180 | 2 |
| 185 | 1 |
| 200 | 4 |
| 240 | 1 |

### 5.2.6 Number of Batteries Sold

Of the 379 vendors interviewed, 224 vendors provided information on the number of batteries they sold, representing 59% of interviewees. The 224 vendors were located in 44 of the 62 towns covered by the survey, representing 71% of the towns.

The distribution of the vendors by the number of batteries sold is summarized in Table 7.

*Table 7Number of Batteries Sold by Vendors (Monthly)*

| Number of Batteries Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 0-10 | 177 | 79 |
| 11-20 | 25 | 11 |
| 30 | 9 | 4 |
| 40 | 2 | 1 |
| 50 | 7 | 3 |
| 60 | 1 | 0 |
| 70 | 0 | 0 |
| 80 | 2 | 1 |
| 90 | 0 | 0 |
| 100 | 0 | 0 |
| >100 | 1 | 1 |

It can be seen that the vast majority of vendors sell up to 10 batteries per month. In total, 2,359 batteries are sold by vendors per month, totaling to 28,308 batteries annually.

### 5.2.7 Size of Batteries Sold

Of the 379 vendors interviewed, 259 vendors provided information on the sizes of batteries they sold, representing 68% of interviewees. The 259 vendors were located in 48 of the 62 towns covered by the survey, representing 77% of the towns.

The distribution of the batteries by size is as summarized in Table 8.

*Table 8Size of Batteries Sold by Vendors*

| Size of Battery (Ah) | % of Vendors |
|---|---|
| 10 | 1 |
| 15 | 1 |
| 20 | 1 |
| 24 | 1 |
| 40 | 8 |
| 50 | 67 |
| 60 | 7 |
| 65 | 6 |
| 67 | 1 |
| 70 | 32 |
| 75 | 44 |
| 80 | 2 |
| 90 | 14 |
| 100 | 31 |
| 110 | 1 |
| 120 | 1 |
| 150 | 1 |
| 170 | 1 |
| 200 | 9 |
| 210 | 1 |

### 5.2.8 Number of Charge Controllers Sold

Of the 379 vendors interviewed, 211 vendors provided information on the number of charge controllers they sold, representing 55% of interviewees. The 211 vendors were located in 44 of the 62 towns covered by the survey, representing 71% of the towns.

The distribution of the vendors by the number of charge controllers sold is summarized in Table 9.

*Table 9Number of Charge Controllers Sold by Vendors (Monthly)*

| Number of Charge Controllers Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 0-10 | 198 | 94 |
| 11-20 | 6 | 3 |
| 30 | 2 | 1 |
| 40 | 1 | 0 |
| 50 | 2 | 1 |
| 60 | 1 | 0 |
| 70 | 0 | 0 |
| 80 | 0 | 0 |
| 90 | 0 | 0 |

| Number of Charge Controllers Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 100 | 1 | 0 |
| >100 | 0 | 0 |

It can be seen that the vast majority of vendors sell up to 10 charge controllers per month. In total, 976 charge controllers are sold by vendors per month, totaling to 11,712 charge controllers annually.

### 5.2.9 Size of Charge Controllers Sold

Of the 379 vendors interviewed, 224 vendors provided information on the sizes of charge controllers they sold, representing 59% of interviewees. The 224 vendors were located in 46 of the 62 towns covered by the survey, representing 74% of the towns.

The distribution of the charge controllers by size is as summarized in Table 10.

*Table 10Size of Charge Controllers Sold by Vendors*

| Size of Charge Controller (A) | % of Vendors |
|---|---|
| 3 | 32 |
| 5 | 35 |
| 6 | 51 |
| 6.6 | 1 |
| 8 | 2 |
| 10 | 39 |
| 11 | 2 |
| 15 | 11 |
| 20 | 11 |
| 30 | 4 |
| 35 | 1 |
| 50 | 1 |

### 5.2.10 Number of Inverters Sold

Of the 379 vendors interviewed, 266 vendors provided information on the number of inverters they sold, representing 70% of interviewees. The 266 vendors were located in 44 of the 62 towns covered by the survey, representing 71% of the towns.

The distribution of the vendors by the number of inverters is summarized in Table 11.

*Table 11Number of Inverters Sold by Vendors (Monthly)*

| Number of Inverters Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 0-10 | 220 | 83 |
| 11-20 | 32 | 12 |
| 30 | 8 | 3 |

| Number of Inverters Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 40 | 4 | 2 |
| 50 | 0 | 0 |
| 60 | 0 | 0 |
| 70 | 0 | 0 |
| 80 | 0 | 0 |
| 90 | 0 | 0 |
| 100 | 1 | 0 |
| >100 | 0 | 0 |

It can be seen that the vast majority of vendors sell up to 10 inverters per month. In total, 1,967 inverters are sold by vendors per month, totaling to 23,604 inverters annually.

### 5.2.11 Size of Inverters Sold

Of the 379 vendors interviewed, 272 vendors provided information on the sizes of inverters they sold, representing 72% of interviewees. The 272 vendors were located in 44 of the 62 towns covered by the survey, representing 71% of the towns.

The distribution of the vendors by the size of the inverters is as summarized in Table 12.

*Table 12Size of Inverters Sold by Vendors*

| Size of Inverter (W) | % of Vendors |
|---|---|
| 35 | 1 |
| 50 | 1 |
| 100 | 31 |
| 150 | 11 |
| 250 | 2 |
| 300 | 61 |
| 350 | 4 |
| 360 | 1 |
| 400 | 2 |
| 500 | 3 |
| 600 | 16 |
| 800 | 2 |
| 1,000 | 1 |
| 1,600 | 1 |
| 3,000 | 3 |

### 5.2.12 Number of Solar Lanterns Sold

Of the 379 vendors interviewed, 157 vendors provided information on the number of solar lanterns they sold, representing 41% of interviewees. The 157 vendors were located in 38 of the 62 towns covered by the survey, representing 61% of the towns.

The distribution of the vendors by the number of solar lanterns is summarized in Table 13.

*Table 13Number of Solar Lanterns Sold by Vendors (Monthly)*

| Number of Solar Lanterns Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 0-10 | 121 | 77 |
| 11-20 | 21 | 13 |
| 30 | 4 | 3 |
| 40 | 2 | 1 |
| 50 | 2 | 1 |
| 60 | 1 | 1 |
| 70 | 0 | 0 |
| 80 | 0 | 0 |
| 90 | 0 | 0 |
| 100 | 1 | 1 |
| >100 | 5 | 3 |

It can be seen that the vast majority of vendors sell up to 10 solar lanterns per month. In total, 2,693 lanterns are sold by vendors per month, totaling to 32,316 lanterns annually.

### 5.2.13 Size of Solar Lanterns Sold

Of the 379 vendors interviewed, 157 vendors provided information on the sizes of solar lanterns they sold, representing 41% of interviewees. The 157 vendors were located in 38 of the 62 towns covered by the survey, representing 61% of the towns.

The distribution of the vendors by the size of the solar lanterns is summarized in Table 14.

*Table 14Size of Solar Lanterns Sold by Vendors*

| Size of Solar Lantern (W) | % of Vendors |
|---|---|
| 1 | 20 |
| 1.3 | 3 |
| 1.5 | 6 |
| 2 | 17 |
| 2.3 | 1 |
| 2.5 | 3 |
| 3 | 72 |
| 3.5 | 4 |
| 4 | 3 |
| 5 | 14 |
| 6 | 1 |
| 7.5 | 4 |
| 15 | 1 |
| 20 | 4 |
| 25 | 1 |

### 5.2.14 Number of Solar Water Heaters Sold

Of the 379 vendors interviewed, 19 vendors provided information on the number of solar water heaters they sold, representing 5% of interviewees. The 19 vendors were located in 10 of the 62 towns covered by the survey, representing 16% of the towns.

There was 1 vendor in Nyahururu, Thika, Chuka, Embu, Gilgil, Homabay, Kitui, Malindi and Mwingi; and 10 vendors in Nairobi selling solar water home systems. .

The distribution of the vendors by the number of solar water heaters is summarized in Table 15.

*Table 15Number of Solar Water Heaters Sold by Vendors (Monthly)*

| Number of Solar Water Heaters Sold Per Month (Range) | Number of Vendors | % of Vendors |
|---|---|---|
| 0-10 | 13 | 68 |
| 11-20 | 4 | 21 |
| 30 | 1 | 5 |
| 40 | 0 | 0 |
| 50 | 0 | 0 |
| 60 | 0 | 0 |
| 70 | 0 | 0 |
| 80 | 0 | 0 |
| 90 | 0 | 0 |
| 100 | 0 | 0 |
| >100 | 1 | 5 |

It can be seen that the vast majority of vendors sell up to 10 solar water heaters per month. In total, 152 solar water heaters are sold by vendors per month, totaling to 1,824 solar water heaters annually.

### 5.2.15 Size of Solar Water Heaters Sold

Of the 379 vendors interviewed, 21 vendors provided information on the sizes of solar water heaters they sold, representing 6% of interviewees. The 21 vendors were located in 11 of the 62 towns covered by the survey, representing 18% of the towns.

The distribution of the vendors by the size of solar water heaters is as summarized in Table 16.

*Table 16Size of Solar Water Heaters Sold by Vendors*

| Size of Solar Water Heater (L) | % of Vendors |
|---|---|
| 50 | 5 |
| 75 | 10 |
| 120 | 5 |

| | |
|---|---|
| 150 | 10 |
| 160 | 5 |
| 200 | 38 |
| 300 | 33 |

## APPENDIX 1 – Survey Questionnaire

| | | |
|---|---|---|
| 1. | Name of Company (or Technician) | |
| 2. | Name Company Contact Person | |
| 3. | Town | |
| 4. | Telephone contacts | |
| 5. | Physical address | |
| 6. | Postal address | |
| 7. | E-mail address | |
| 8. | How many solar PV systems do you install per year? *(Solar Technicians & Vendors)* | |
| 9. | What % of your business does solar represent? *(Solar Vendors only)* | |
| | Please indicate in the table below which of the following solar products you sell, the average number you sell per month and your main supplier *(Solar Vendors only)* | |

| **Product** | **Sold** | | **# sold per month** | **Most common size/type** | **Product Supplier (s)** |
|---|---|---|---|---|---|
| | **Yes** | **No** | | | |
| Solar PV module/module | ☐ | ☐ | | | |
| Batteries | ☐ | ☐ | | | |
| Charge controller | ☐ | ☐ | | | |
| Inverter | ☐ | ☐ | | | |
| Solar Lantern | ☐ | ☐ | | | |
| Solar water heater | ☐ | ☐ | | | |

| | | |
|---|---|---|
| 9. | Are you aware of the Solar PV regulations? | Yes☐ No☐ |
| 10. | What are the 3 main challenges facing your solar business? | |

## APPENDIX 2– Solar System Installations by Technicians per Year

| | Town | Installations by Technicians per Year |
|---|---|---|
| 1 | Nairobi | 1561 |
| 2 | Kericho | 108 |
| 3 | Kitui | 102 |
| 4 | Mwingi | 95 |
| 5 | Nakuru | 86 |
| 6 | Narok | 79 |
| 7 | Eldoret | 72 |
| 8 | Nyahururu | 63 |
| 9 | Kitale | 62 |
| 10 | Meru | 56 |
| 11 | Nanyuki | 52 |
| 12 | Makutano | 41 |
| 13 | Maua | 37 |
| 14 | Gilgil | 34 |
| 15 | Kisumu | 30 |
| 16 | Kilgoris | 28 |
| 17 | Siaya | 28 |
| 18 | Narumoro | 26 |
| 19 | Kenyanya | 25 |
| 20 | Nyeri | 23 |
| 21 | Bungoma | 22 |
| 22 | Homabay | 22 |
| 23 | Kakamega | 20 |
| 24 | Machakos | 20 |
| 25 | Garissa | 17 |
| 26 | Malindi | 17 |
| 27 | Kagio | 15 |
| 28 | Isiolo | 14 |
| 29 | Bomet | 13 |
| 30 | Mombasa | 12 |
| 31 | Al Kalou | 10 |
| 32 | Busia | 10 |
| 33 | Inyao Market | 10 |
| 34 | Kangeta | 10 |
| 35 | Kisii | 10 |
| 36 | Rongai | 10 |
| 37 | Embu | 8 |
| 38 | Kajiado | 8 |
| 39 | Molo | 8 |

| | Town | Installations by Technicians per Year |
|---|---|---|
| 40 | Mwea | 6 |
| 41 | Voi | 6 |
| 42 | Kimbimbi | 5 |
| 43 | Runyenjes | 5 |
| 44 | Mururi | 4 |
| 45 | Nkubu | 4 |
| 46 | Makueni | 3 |
| 47 | Ololunga | 3 |
| 48 | Kapsabet | 2 |
| | | **2902** |

## APPENDIX 3- Solar System Sales and Installations by Vendors per Year

| | Town | Sales and Installations by Vendors per Year |
|---|---|---|
| 1 | Nairobi | 9295 |
| 2 | Kisii | 278 |
| 3 | Kitui | 130 |
| 4 | Nyahururu | 92 |
| 5 | Meru | 71 |
| 6 | Machakos | 70 |
| 7 | Gilgil | 60 |
| 8 | Isiolo | 54 |
| 9 | Nanyuki | 54 |
| 10 | Kajiado | 48 |
| 11 | Maua | 45 |
| 12 | Mombasa | 44 |
| 13 | Kenyanya | 43 |
| 14 | Mwingi | 42 |
| 15 | Nyeri | 41 |
| 16 | Embu | 38 |
| 17 | Garissa | 36 |
| 18 | Chuka | 33 |
| 19 | Al Kalou | 25 |
| 20 | Kisumu | 23 |
| 21 | Narok | 23 |
| 22 | Narumoro | 23 |
| 23 | Kagio | 21 |
| 24 | Mwea | 20 |
| 25 | Timau | 19 |
| 26 | Kitale | 16 |
| 27 | Nakuru | 14 |
| 28 | Kerugoya | 12 |
| 29 | Siaya | 12 |
| 30 | Bomet | 10 |
| 31 | Kapsabet | 10 |
| 32 | Nkubu | 8 |
| 33 | Homabay | 6 |
| 34 | Karatina | 6 |
| 35 | Rumuruti | 6 |
| 36 | Voi | 6 |
| 37 | Laare | 5 |
| 38 | Makutano | 5 |
| 39 | Thika | 5 |

| | Town | Sales and Installations by Vendors per Year |
|---|---|---|
| 40 | Kibwezi | 3 |
| 41 | Kutus | 3 |
| 42 | Kimbimbi | 1 |
| | | **10756** |

## APPENDIX 4- Technicians and Vendors by Location

| | | Vendors | Vendors Installing | Technicians | Technicians Installing |
|---|---|---|---|---|---|
| 1 | Al kalou | 5 | 5 | 2 | 2 |
| 2 | Bomet | 5 | 1 | 3 | 2 |
| 3 | Bungoma | 0 | 0 | 3 | 2 |
| 4 | Busia | 1 | 0 | 2 | 1 |
| 5 | Chuka | 5 | 5 | 0 | 0 |
| 6 | Eldoret | 2 | 0 | 16 | 10 |
| 7 | Embu | 8 | 7 | 2 | 2 |
| 8 | Ekalakala Market | 2 | 0 | 0 | 0 |
| 9 | Garissa | 11 | 5 | 5 | 4 |
| 10 | Gilgil | 9 | 9 | 6 | 6 |
| 11 | Homabay | 11 | 1 | 6 | 3 |
| 12 | Inyao Market | 0 | 0 | 1 | 1 |
| 13 | Isiolo | 8 | 8 | 3 | 3 |
| 14 | Kagio | 3 | 3 | 1 | 1 |
| 15 | Kajiado | 11 | 4 | 2 | 2 |
| 16 | Kakamega | 2 | 0 | 17 | 2 |
| 17 | Kangeta | 0 | 0 | 2 | 2 |
| 18 | Kapsabet | 2 | 2 | 1 | 1 |
| 19 | Karatina | 2 | 2 | 0 | 0 |
| 20 | Kenyanya | 2 | 2 | 1 | 1 |
| 21 | Kericho | 12 | 0 | 15 | 10 |
| 22 | Kerugoya | 5 | 4 | 0 | 0 |
| 23 | Kibwezi | 4 | 1 | 0 | 0 |
| 24 | Kilgoris | 1 | 0 | 5 | 4 |
| 25 | Kilifi | 5 | 0 | 0 | 0 |
| 26 | Kimbimbi | 1 | 1 | 1 | 1 |
| 27 | Kisumu | 4 | 2 | 12 | 9 |
| 28 | Kisii | 20 | 15 | 1 | 1 |
| 29 | Kitale | 3 | 2 | 13 | 5 |
| 30 | Kitui | 9 | 4 | 6 | 6 |
| 31 | Kutus | 1 | 1 | 1 | 0 |
| 32 | Laare | 2 | 2 | 0 | 0 |
| 33 | Lodwar | 0 | 0 | 1 | 0 |
| 34 | Machakos | 14 | 3 | 19 | 3 |
| 35 | Makueni | 1 | 0 | 1 | 1 |
| 36 | Makutano | 3 | 2 | 4 | 4 |
| 37 | Malindi | 5 | 0 | 2 | 2 |
| 38 | Matuu | 2 | 0 | 0 | 0 |

| | | Vendors | Vendors Installing | Technicians | Technicians Installing |
|---|---|---|---|---|---|
| 39 | Maua | 8 | 8 | 6 | 6 |
| 40 | Meru | 17 | 16 | 9 | 8 |
| 41 | Molo | 0 | 0 | 1 | 1 |
| 42 | Mombasa | 17 | 3 | 5 | 1 |
| 43 | Mururi | 0 | 0 | 1 | 1 |
| 44 | Mwea | 3 | 3 | 1 | 1 |
| 45 | Mwingi | 6 | 4 | 7 | 5 |
| 46 | Nairobi | 53 | 39 | 32 | 32 |
| 47 | Nakuru | 9 | 5 | 3 | 3 |
| 48 | Nanyuki | 11 | 11 | 8 | 8 |
| 49 | Narok | 6 | 3 | 11 | 10 |
| 50 | Narumoro | 4 | 4 | 5 | 5 |
| 51 | Nkubu | 3 | 2 | 1 | 1 |
| 52 | Nyahururu | 14 | 13 | 9 | 9 |
| 53 | Nyeri | 11 | 9 | 4 | 4 |
| 54 | Ololunga | 0 | 0 | 1 | 1 |
| 55 | Rongai | 0 | 0 | 1 | 1 |
| 56 | Rumuruti | 2 | 2 | 0 | 0 |
| 57 | Runyenjes | 0 | 0 | 1 | 1 |
| 58 | Siaya | 2 | 2 | 5 | 4 |
| 59 | Thika | 13 | 1 | 0 | 0 |
| 60 | Timau | 5 | 5 | 0 | 0 |
| 61 | Voi | 4 | 1 | 3 | 1 |
| 62 | Wote | 8 | 0 | 0 | 0 |

## APPENDIX 5– Equipment and Components by Vendor Location

| | | Modules | Batteries | Charge Controllers | Inverters | Solar Lanterns | Solar Water Heaters |
|---|---|---|---|---|---|---|---|
| 1 | Al kalou | 4 | 5 | 5 | 5 | 3 | 0 |
| 2 | Bomet | 4 | 4 | 2 | 3 | 0 | 0 |
| 3 | Bungoma | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Busia | 1 | 1 | 1 | 1 | 0 | 0 |
| 5 | Chuka | 5 | 2 | 5 | 5 | 4 | 1 |
| 6 | Eldoret | 2 | 2 | 1 | 0 | 0 | 0 |
| 7 | Embu | 8 | 8 | 8 | 8 | 8 | 1 |
| 8 | Ekalakala Market | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | Garissa | 8 | 9 | 8 | 9 | 5 | 0 |
| 10 | Gilgil | 7 | 9 | 9 | 9 | 8 | 1 |
| 11 | Homabay | 9 | 8 | 7 | 9 | 4 | 1 |
| 12 | Inyao Market | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | Isiolo | 7 | 6 | 4 | 8 | 3 | 0 |
| 14 | Kagio | 2 | 3 | 3 | 3 | 2 | 0 |
| 15 | Kajiado | 6 | 4 | 4 | 5 | 4 | 0 |
| 16 | Kakamega | 1 | 1 | 0 | 0 | 0 | 0 |
| 17 | Kangeta | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | Kapsabet | 2 | 2 | 1 | 0 | 0 | 0 |
| 19 | Karatina | 2 | 1 | 1 | 2 | 2 | 0 |
| 20 | Kenyanya | 2 | 1 | 0 | 1 | 0 | 0 |
| 21 | Kericho | 10 | 9 | 9 | 8 | 7 | 0 |
| 22 | Kerugoya | 5 | 2 | 5 | 5 | 4 | 0 |
| 23 | Kibwezi | 3 | 2 | 3 | 3 | 2 | 0 |
| 24 | Kilgoris | 1 | 0 | 0 | 0 | 0 | 0 |
| 25 | Kilifi | 4 | 3 | 3 | 3 | 3 | 0 |
| 26 | Kimbimbi | 1 | 1 | 1 | 1 | 1 | 0 |
| 27 | Kisumu | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | Kisii | 16 | 6 | 4 | 10 | 0 | 0 |
| 29 | Kitale | 2 | 2 | 1 | 1 | 0 | 0 |
| 30 | Kitui | 7 | 6 | 5 | 7 | 5 | 1 |
| 31 | Kutus | 1 | 1 | 1 | 1 | 1 | 0 |
| 32 | Laare | 2 | 2 | 1 | 2 | 1 | 0 |
| 33 | Lodwar | 0 | 0 | 0 | 0 | 0 | 0 |
| 34 | Machakos | 14 | 8 | 9 | 8 | 7 | 0 |

| | | Modules | Batteries | Charge Controllers | Inverters | Solar Lanterns | Solar Water Heaters |
|---|---|---|---|---|---|---|---|
| 35 | Makueni | 1 | 0 | 0 | 0 | 0 | 0 |
| 36 | Makutano | 1 | 2 | 2 | 2 | 2 | 0 |
| 37 | Malindi | 5 | 3 | 3 | 4 | 1 | 1 |
| 38 | Matuu | 1 | 1 | 1 | 0 | 1 | 0 |
| 39 | Maua | 7 | 8 | 7 | 8 | 8 | 0 |
| 40 | Meru | 10 | 14 | 17 | 17 | 10 | 0 |
| 41 | Molo | 0 | 0 | 0 | 0 | 0 | 0 |
| 42 | Mombasa | 12 | 11 | 10 | 7 | 4 | 2 |
| 43 | Mururi | 0 | 0 | 0 | 0 | 0 | 0 |
| 44 | Mwea | 2 | 2 | 3 | 3 | 2 | 0 |
| 45 | Mwingi | 5 | 5 | 4 | 4 | 3 | 1 |
| 46 | Nairobi | 38 | 34 | 24 | 33 | 16 | 10 |
| 47 | Nakuru | 8 | 7 | 6 | 9 | 4 | 0 |
| 48 | Nanyuki | 9 | 11 | 7 | 11 | 6 | 0 |
| 49 | Narok | 3 | 4 | 2 | 2 | 0 | 0 |
| 50 | Narumoro | 3 | 4 | 2 | 4 | 1 | 0 |
| 51 | Nkubu | 3 | 3 | 2 | 3 | 0 | 0 |
| 52 | Nyahururu | 12 | 14 | 9 | 13 | 6 | 1 |
| 53 | Nyeri | 7 | 7 | 7 | 11 | 7 | 0 |
| 54 | Ololunga | 0 | 0 | 0 | 0 | 0 | 0 |
| 55 | Rongai | 0 | 0 | 0 | 0 | 0 | 0 |
| 56 | Rumuruti | 1 | 1 | 1 | 1 | 1 | 0 |
| 57 | Runyenjes | 0 | 0 | 0 | 0 | 0 | 0 |
| 58 | Siaya | 2 | 1 | 0 | 0 | 0 | 0 |
| 59 | Thika | 9 | 9 | 5 | 8 | 5 | 1 |
| 60 | Timau | 5 | 5 | 5 | 5 | 2 | 0 |
| 61 | Voi | 2 | 2 | 2 | 3 | 1 | 0 |
| 62 | Wote | 6 | 4 | 4 | 7 | 3 | 0 |