Data Article

Data on the daily electricity load profile and solar photovoltaic (PV) system components for residential buildings in Lagos, Nigeria

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ABSTRACT

This article contains the average daily electric load profile (for 24 h of the day) for the five categories of residential buildings (duplex, single family bungalow, traditional court yard, flat/apartment dwelling and ‘face-me-l-face-you’) in three Local Government Areas (LGAs) of the state of Lagos, Nigeria. In each of the LGAs, 10 buildings per residential building type were surveyed for the collection of data with the aid of a questionnaire. In each surveyed household, a household member completed the energy audit section of the questionnaire with the assistance of the questionnaire administrator while the section of the questionnaire designed as a time-of-use diary was left with the household for completion. For each building surveyed, the data retrieved from the completed time-of-use diary was used in Microsoft Excel for computing the hourly electricity load profile for the seven days of the week. In order to obtain the hourly energy load (in watts) for each building, the power rating of

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the appliances used during each of the 24 h of the day was summed and the result in watts was converted to kWh by dividing by 1000. Each dwelling’s daily load profile was obtained as an average of the load profile for the seven days of the week. The article as well provides data on the solar photovoltaic systems’ components designed to supply electricity to the building and the levelized cost of electricity (LCOE) of the systems for the base case scenario and different sensitivity cases obtained from simulations using HOMER Pro. The load profile data provided in this article can be reused by other researchers in the design of solar photovoltaic systems for residential buildings.

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Specifications Table

| Subject                        | Energy                      |
|--------------------------------|-----------------------------|
| Specific subject area          | Renewable Energy, Sustainability and the Environment |
| Type of data                   | Table                       |
| How data were acquired         | Survey (with the aid of a questionnaire) |
|                                | Software (HOMER Pro)        |
| Data format                    | Raw                         |
| Parameters for data collection | In collecting the data, the principle of free, prior and informed consent was respected. Prior to questionnaire administration and data collection, the objective of the research was well-explained to the respondents and their consent for participating in the research sought. Data collection was limited to those respondents who gave their consent to participate in the research. |
| Description of data collection | Data was obtained through household surveys with the aid of a questionnaire and modelling using the HOMER Pro software |
| Data source location           | Lagos (Latitude 6°27′14″N and Longitude: 3°23′40″ E), Nigeria |
| Data accessibility             | Data is with this article (in the Appendix) |
| Related research article       | The potential of solar photovoltaic systems for residential homes in Lagos city of Nigeria. Journal of Environmental Management (https://doi.org/10.1016/j.jenvman.2019.04.039). |

Value of the data

- The data provides an estimate of residential electricity loads for different categories of buildings in Nigeria which could also be adopted for different developing countries.
- The load profile data could be used by other researchers interested in designing off-grid renewable energy systems for residential buildings.
- The data on the LCOE of systems designed for the different building categories could be used as a benchmark for further research in renewable energy applications in residential buildings.

1. Data description

This article includes data on the daily electric load profiles and corresponding solar PV components for the different categories of residential buildings in Lagos, Nigeria. Table A1 (Appendix A) presents the minimum and maximum hourly electric loads for each category of building per LGA. Tables B2 and B3 (Appendix B) presents the effects of the variation of min-
imium battery state of charge and capacity shortage on PV system components and LCOE for the systems designed for the maximum (Table B2) and minimum (Table B3) electric loads for the different categories of building per LGA. Tables C4 and C5 (Appendix C) Portrays the effect of the variation of discount rate, inflation rate, PV lifetime and battery state of charge on the LCOE of the PV systems for the maximum (Table C4) and minimum load (Table C5) of buildings.

2. Experimental design, materials, and methods

Residential buildings from three Local Government Areas (LGAs): Kosofe, Oshodi and Alimosho in Lagos Metropolitan Area, Lagos State of Nigeria were surveyed. The survey was conducted using a structured questionnaire and entailed purposive sampling. Lagos is divided into five Administrative Divisions (Lagos, Epe, Badagry, Ikorodu and Ikeja) which are further divided into 20 Local Government Areas (LGAs) and 37 Local Council Development Areas (LCDAs). In each of the LGAs, 10 buildings per residential building type Nigeria (duplex, single family bungalow, traditional court yard, flat/apartment dwelling and ‘face-me-I-face-you’) as identified by Jiboye [1] were surveyed. In each surveyed household, a household member completed the energy audit section of the questionnaire with the assistance of the questionnaire administrator while the section of the questionnaire designed as a time-of-use diary was left with the household for completion. For each building surveyed, the data retrieved from the completed time-of-use diary was used in Microsoft Excel for computing the hourly electricity load profile for the seven days of the week. In order to obtain the hourly energy load (in watts) for each building, the power rating of the appliances used during each of the 24 h of the day was summed and the resulting value converted to kWh by dividing by 1000. Each dwelling’s daily load profile was obtained as an average of the load profile for the seven days of the week.

For each building type per LGA, load profiles representing the maximum and minimum building load were used in the HOMER Pro software for modelling the PV systems. The software modelled the system configuration’s behaviour for each hour of the year so as to determine the life cycle cost and the technical feasibility of the system. This involves optimization of the system through the simulation of several system configurations with the aim of identifying the system that meets the technical constraints at the lowest life cycle cost. The calculation for the base case scenario was conducted as per the following parameters: 2% and 5% inflation rate and discount rate respectively, a 25-year PV-system lifetime, maximum annual capacity shortage of 0% and 40% minimum battery state of charge (SOC).

Sensitivity analysis was conducted with HOMER Pro based on five variables: inflation and discount rates, lifetime of PV system, maximum annual capacity shortage and minimum battery state of charge. The sensitivity analysis was conducted in order to investigate the effect of the variables on the LCOE of the systems. Table 1 presents the sensitivity parameters used in the analysis.

Table 1

| Sensitivity variable                       | Base case | Sensitivity case(s) |
|-------------------------------------------|-----------|---------------------|
| PV-system lifetime                        | 25 years  | 30 years and 20 years |
| Minimum battery SOC                       | 40%       | 30%                 |
| Inflation rate                            | 2%        | 5%                  |
| Maximum annual capacity shortage          | 0%        | 15%, 10% and 5%     |
| Discount rate                             | 5%        | 10%                 |

K.E. Enongene, F.H. Abanda and I.J.J. Otene et al./Data in Brief 30 (2020) 105531
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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi: 10.1016/j.dib.2020.105531.

Appendix A

Table A1.
| LGA      | Hour of the day (hourly load data in kWh) – MINIMUM LOADS |
|----------|----------------------------------------------------------|
|          | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 |
| Building type: Single Family Bungalow |
| Alimosho | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Oshodi   | 0.160 0.160 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Kosofe   | 0.020 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Building type: Flat Apartment |
| Alimosho | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Oshodi   | 0.144 0.143 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Kosofe   | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Building type: ‘Face -me –I -Face –you’ |
| Alimosho | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Oshodi   | 0.221 0.209 0.209 0.209 0.209 0.209 0.132 0.132 0.132 0.154 0.154 0.150 0.021 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Kosofe   | 0.000 0.000 0.012 0.012 0.012 0.012 0.000 0.029 0.029 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Building type: Duplex |
| Alimosho | 1.918 0.560 0.649 0.649 0.649 0.552 2.102 2.626 2.147 1.666 0.240 0.071 0.000 0.001 0.006 0.082 0.435 0.507 0.455 0.698 1.269 1.440 1.466 1.325 |
| Oshodi   | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Kosofe   | 0.033 0.023 0.023 0.023 0.023 0.316 0.273 0.001 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Building type: Traditional Court |
| Alimosho | 0.000 0.029 0.029 0.029 0.029 0.029 0.029 0.107 0.148 0.096 0.136 0.119 0.135 0.148 0.107 0.017 0.032 0.079 0.066 0.135 0.081 0.041 0.029 0.000 |
| Oshodi   | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.226 0.000 0.251 0.226 0.251 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Kosofe   | 0.011 0.023 0.034 0.046 0.046 0.046 0.023 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |

(continued on next page)
| LGA     | Hour of the day (hourly load data in kWh) – MAXIMUM LOADS |
|---------|----------------------------------------------------------|
|         | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 |
| Building type: Single Family Bungalow |
| Kosofe  | 0.230 0.230 0.230 0.216 0.216 0.000 0.000 0.000 0.337 0.030 0.024 0.024 0.024 0.024 0.024 0.024 0.024 0.024 0.024 0.024 0.024 0.786 0.794 0.781 0.779 |
| Oshodi  | 0.514 0.502 0.502 0.502 0.416 0.416 1.221 1.266 1.514 1.347 0.957 0.546 0.327 0.137 0.997 1.138 1.875 2.409 3.765 2.921 2.130 2.118 1.558 0.741 |
| Alimosho| 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 2.052 0.049 0.049 0.049 0.049 0.049 0.049 |
| Building type: Flat Apartment |
| Kosofe  | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 1.247 1.574 0.429 0.402 0.000 |
| Oshodi  | 0.310 0.310 0.310 0.310 0.310 0.310 0.300 0.300 0.114 0.114 0.000 0.000 0.000 0.000 0.200 0.200 0.000 0.000 0.000 0.000 2.661 3.655 0.711 0.955 1.069 0.748 0.310 |
| Alimosho| 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 7.567 7.938 3.472 3.459 3.344 |
| Building type: ‘Face -me –I- Face -you’ |
| Kosofe  | 0.100 0.011 0.011 0.011 0.011 0.011 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 1.050 0.023 0.884 0.485 0.485 0.249 0.225 |
| Oshodi  | 0.220 0.220 0.220 0.209 0.129 0.129 0.033 0.033 32.890 0.033 0.044 0.044 0.044 0.034 0.034 0.034 0.034 0.034 0.034 0.034 0.034 0.034 0.150 0.344 0.344 0.344 0.327 0.310 |
| Alimosho| 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Building type: Duplex |
| Kosofe  | 0.203 0.159 0.159 0.069 0.046 0.046 0.741 0.699 0.604 0.000 0.000 0.000 0.119 0.119 0.119 0.049 0.049 0.000 0.000 0.481 1.151 0.994 0.791 0.283 |
| Oshodi  | 0.581 0.539 0.474 0.350 0.243 0.243 0.436 1.333 3.960 3.925 3.028 3.085 3.085 3.085 3.085 0.740 0.738 0.740 1.697 1.811 1.062 0.759 0.648 |
| Alimosho| 1.342 0.043 0.043 0.043 0.043 0.043 3.875 4.086 1.210 0.650 0.393 0.400 0.019 0.019 0.292 0.292 0.931 0.811 1.899 4.041 5.383 4.995 4.138 1.702 |
| Building type: Traditional Court |
| Kosofe  | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.014 0.277 0.302 0.113 0.051 0.000 |
| Oshodi  | 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 1.580 1.580 0.180 0.880 1.580 1.580 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 |
| Alimosho| 0.263 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.441 0.591 0.591 0.806 1.594 1.709 1.807 1.954 2.011 1.943 1.874 1.616 0.838 |
### Appendix B

Tables B2 and B3.

#### Table B2

Effect of minimum battery state of charge and capacity shortage on PV system components and LCOE (maximum loads)

| LGA         | Sensitivity value (%) | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE  |
|-------------|-----------------------|----------------|-------------------------|-----------------------------|-------|
| **Building Type: Single family bungalow** |                       |                |                         |                             |       |
| Sensitivity variable: Maximum annual capacity shortage |                       |                |                         |                             |       |
| Kosofe      | 0                     | 3              | 30                      | 4194                        | 0.508 |
|             | 5                     | 2              | 24                      | 2796                        | 0.399 |
|             | 10                    | 2              | 14                      | 2796                        | 0.385 |
|             | 15                    | 2              | 12                      | 2796                        | 0.38  |
| Oshodi      | 0                     | 3              | 30                      | 4194                        | 0.452 |
|             | 5                     | 13             | 86                      | 18,174                      | 0.312 |
|             | 10                    | 11             | 78                      | 15,378                      | 0.297 |
|             | 15                    | 10             | 66                      | 13,980                      | 0.288 |
| Alimosho    | 0                     | 15             | 108                     | 20,972                      | 0.513 |
|             | 5                     | 9              | 80                      | 12,583                      | 0.426 |
|             | 10                    | 8              | 68                      | 11,185                      | 0.412 |
|             | 15                    | 7              | 64                      | 9787                        | 0.403 |
| Sensitivity variable: Minimum battery state of charge |                       |                |                         |                             |       |
| Kosofe      | 30%                   | 3              | 26                      | 4194                        | 0.463 |
| Oshodi      | 30%                   | 22             | 115                     | 30,756                      | 0.416 |
| Alimosho    | 30%                   | 12             | 112                     | 16,778                      | 0.482 |
| **Building Type: Duplex** |                       |                |                         |                             |       |
| Sensitivity variable: Maximum annual capacity shortage |                       |                |                         |                             |       |
| Kosofe      | 0                     | 0.8            | 9                       | 1118                        | 0.552 |
|             | 5                     | 0.6            | 5                       | 839                         | 0.41  |
|             | 10                    | 0.6            | 4                       | 839                         | 0.401 |
|             | 15                    | 0.6            | 3                       | 839                         | 0.401 |
| Oshodi      | 0                     | 3              | 12                      | 4194                        | 0.459 |
|             | 5                     | 2              | 7                       | 2796                        | 0.304 |
|             | 10                    | 2              | 5                       | 2796                        | 0.28  |
|             | 15                    | 2              | 4                       | 2796                        | 0.21  |
| Alimosho    | 0                     | 22             | 80                      | 30,795                      | 0.502 |
|             | 5                     | 10             | 62                      | 13,981                      | 0.353 |
|             | 10                    | 8              | 62                      | 11,185                      | 0.335 |
|             | 15                    | 8              | 44                      | 16,778                      | 0.33  |
| Sensitivity variable: Minimum battery state of charge |                       |                |                         |                             |       |
| Kosofe      | 30%                   | 0.8            | 8                       | 1392                        | 0.511 |
| Oshodi      | 30%                   | 3              | 11                      | 4194                        | 0.441 |
| Alimosho    | 30%                   | 20             | 78                      | 27,963                      | 0.474 |
| **Building Type: ‘Face me ‘I face ‘you’** |                       |                |                         |                             |       |
| Sensitivity variable: Maximum annual capacity shortage |                       |                |                         |                             |       |
| Kosofe      | 0                     | 1.6            | 16                      | 2237                        | 0.538 |
|             | 5                     | 1.2            | 10                      | 1678                        | 0.44  |
|             | 10                    | 1              | 9                       | 1398                        | 0.425 |
|             | 15                    | 1              | 7                       | 1398                        | 0.421 |
| Oshodi      | 0                     | 6              | 36                      | 8388                        | 0.571 |
|             | 5                     | 3              | 24                      | 4194                        | 0.404 |
|             | 10                    | 3              | 18                      | 4194                        | 0.4   |
|             | 15                    | 3              | 14                      | 4194                        | 0.4   |

(continued on next page)
Table B2 (continued)

| LGA       | Sensitivity value (%) | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE |
|-----------|-----------------------|----------------|-------------------------|---------------------------|------|
| Alimosho  | 0                     | 78             | 176                     | 109,055                   | 0.429|
| 5         |                       | 34             | 164                     | 47,537                    | 0.279|
| 10        |                       | 28             | 148                     | 39,148                    | 0.265|
| 15        |                       | 28             | 98                      | 39,148                    | 0.26 |
| Sensitivity variable: Minimum battery state of charge |
| Kosofe    | 30%                   | 1.6            | 4                       | 2237                      | 0.497|
| Oshodi    | 30%                   | 4              | 40                      | 5592                      | 0.52 |
| Alimosho  | 30%                   | 70             | 176                     | 97,870                    | 0.399|

**Building Type: Traditional court**

| LGA       | Sensitivity value (%) | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE |
|-----------|-----------------------|----------------|-------------------------|---------------------------|------|
| Kosofe    | 0                     | 0.6            | 4                       | 839                       | 0.54 |
| 5         |                       | 0.4            | 3                       | 559                       | 0.452|
| 10        |                       | 0.3            | 3                       | 419                       | 0.424|
| 15        |                       | 0.3            | 3                       | 419                       | 0.424|
| Oshodi    | 0                     | 6              | 30                      | 8388                      | 0.453|
| 5         |                       | 4              | 12                      | 5592                      | 0.261|
| 10        |                       | 3              | 12                      | 4194                      | 0.243|
| 15        |                       | 3              | 8                       | 4194                      | 0.237|
| Alimosho  | 0                     | 16             | 68                      | 22,370                    | 0.45 |
| 5         |                       | 8              | 56                      | 11,185                    | 0.32 |
| 10        |                       | 7              | 44                      | 9787                      | 0.304|
| 15        |                       | 6              | 44                      | 8389                      | 0.294|
| Sensitivity variable: Maximum annual capacity shortage |
| Kosofe    | 30%                   | 0.5            | 4                       | 699                       | 0.504|
| Oshodi    | 30%                   | 5              | 30                      | 6990                      | 0.416|
| Alimosho  | 30%                   | 14             | 64                      | 19,574                    | 0.408|

**Building Type: Flat Apartment**

| LGA       | Sensitivity value (%) | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE |
|-----------|-----------------------|----------------|-------------------------|---------------------------|------|
| Kosofe    | 0                     | 3              | 18                      | 4194                      | 0.547|
| 5         |                       | 2              | 14                      | 2796                      | 0.461|
| 10        |                       | 2              | 10                      | 2796                      | 0.459|
| 15        |                       | 2              | 10                      | 2796                      | 0.459|
| Oshodi    | 0                     | 16             | 88                      | 22,368                    | 0.501|
| 5         |                       | 8              | 74                      | 11,184                    | 0.387|
| 10        |                       | 7              | 66                      | 9786                      | 0.376|
| 15        |                       | 6              | 76                      | 8388                      | 0.376|
| Alimosho  | 0                     | 42             | 76                      | 58,772                    | 0.743|
| 5         |                       | 16             | 76                      | 22,370                    | 0.475|
| 10        |                       | 12             | 74                      | 16,778                    | 0.436|
| 15        |                       | 10             | 72                      | 13,981                    | 0.421|
| Sensitivity variable: Minimum battery state of charge |
| Kosofe    | 30%                   | 2              | 24                      | 2796                      | 0.529|
| Oshodi    | 30%                   | 144            | 86                      | 19,572                    | 0.466|
| Alimosho  | 30%                   | 36             | 74                      | 50,333                    | 0.678|
Table B3
Effect of minimum battery state of charge and capacity shortage on PV system components and LCOE (minimum loads).

| LGA      | Sensitivity value (%) | Building Type: Duplex | Sensitivity variable: Maximum annual capacity shortage | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE  |
|----------|-----------------------|------------------------|-------------------------------------------------------|----------------|-------------------------|------------------------------|-------|
| Kosofe   | 0                     | 0.8                    | 9                                                     | 118            |                         | 0.552                        |       |
|          | 5                     | 0.6                    | 5                                                     | 839            |                         | 0.41                         |       |
|          | 10                    | 0.6                    | 4                                                     | 839            |                         | 0.401                        |       |
|          | 15                    | 0.6                    | 3                                                     | 839            |                         | 0.401                        |       |
| Oshodi   | 0                     | 3                      | 12                                                    | 4194           |                         | 0.459                        |       |
|          | 5                     | 2                      | 7                                                     | 2796           |                         | 0.304                        |       |
|          | 10                    | 2                      | 5                                                     | 2796           |                         | 0.28                         |       |
|          | 15                    | 2                      | 4                                                     | 2796           |                         | 0.21                         |       |
| Alimosho | 0                     | 22                     | 80                                                    | 30,795         |                         | 0.502                        |       |
|          | 5                     | 10                     | 62                                                    | 13,981         |                         | 0.353                        |       |
|          | 10                    | 8                      | 62                                                    | 11,185         |                         | 0.335                        |       |
|          | 15                    | 8                      | 44                                                    | 16,778         |                         | 0.33                         |       |

| LGA      | Sensitivity value (%) | Building Type: ‘Face- me -I –face- you’ | Sensitivity variable: Maximum annual capacity shortage | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE  |
|----------|-----------------------|------------------------------------------|-------------------------------------------------------|----------------|-------------------------|------------------------------|-------|
| Kosofe   | 0                     | 0.2                                     | 2                                                     | 280            |                         | 0.531                        |       |
|          | 5                     | 0.2                                     | 1                                                     | 280            |                         | 0.391                        |       |
|          | 10                    | 0.2                                     | 1                                                     | 280            |                         | 0.391                        |       |
|          | 15                    | 0.1                                     | 1                                                     | 140            |                         | 0.322                        |       |
| Oshodi   | 0                     | 2.5                                     | 22                                                    | 3495           |                         | 0.498                        |       |
|          | 5                     | 1.5                                     | 18                                                    | 3495           |                         | 0.384                        |       |
|          | 10                    | 1.5                                     | 12                                                    | 2097           |                         | 0.361                        |       |
|          | 15                    | 1.5                                     | 9                                                     | 2097           |                         | 0.357                        |       |
| Alimosho | 0                     | 7                                      | 42                                                    | 9787           |                         | 0.422                        |       |
|          | 5                     | 5                                      | 18                                                    | 6991           |                         | 0.253                        |       |
|          | 10                    | 4                                      | 16                                                    | 5593           |                         | 0.223                        |       |
|          | 15                    | 4                                      | 12                                                    | 5593           |                         | 0.219                        |       |

| LGA      | Sensitivity value (%) | Building Type: Traditional Court | Sensitivity variable: Maximum annual capacity shortage | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE  |
|----------|-----------------------|---------------------------------|-------------------------------------------------------|----------------|-------------------------|------------------------------|-------|
| Kosofe   | 0                     | 0.3                                 | 2                                                     | 419            |                         | 0.575                        |       |
|          | 5                     | 0.2                                 | 2                                                     | 280            |                         | 0.477                        |       |
|          | 10                    | 0.2                                 | 1                                                     | 280            |                         | 0.463                        |       |
|          | 15                    | 0.2                                 | 1                                                     | 280            |                         | 0.463                        |       |
| Oshodi   | 0                     | 0.6                                 | 4                                                     | 839            |                         | 0.43                         |       |
|          | 5                     | 0.5                                 | 2                                                     | 699            |                         | 0.284                        |       |
|          | 10                    | 0.5                                 | 1                                                     | 699            |                         | 0.24                         |       |
|          | 15                    | 0.4                                 | 1                                                     | 559            |                         | 0.23                         |       |
| Alimosho | 0                     | 1                                   | 8                                                     | 1398           |                         | 0.417                        |       |
|          | 5                     | 0.8                                 | 4                                                     | 1119           |                         | 0.264                        |       |
|          | 10                    | 0.8                                 | 2                                                     | 1119           |                         | 0.233                        |       |
|          | 15                    | 0.6                                 | 3                                                     | 839            |                         | 0.214                        |       |

| LGA      | Sensitivity value (%) | Building Type: Traditional Court | Sensitivity variable: Minimum battery state of charge | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE  |
|----------|-----------------------|---------------------------------|-------------------------------------------------------|----------------|-------------------------|------------------------------|-------|
| Kosofe   | 0                     | 0.3                                     | 2                                                     | 419            |                         | 0.554                        |       |
|          | 5                     | 0.3                                     | 2                                                     | 419            |                         | 0.554                        |       |
|          | 10                    | 0.7                                     | 3                                                     | 979            |                         | 0.402                        |       |
| October 30, 2020 | 30%                          | 1                                     | 7                                                     | 1398           |                         | 0.386                        |       |

(continued on next page)
### Table B3 (continued)

| LGA    | Sensitivity value (%) | PV array (kWh) | 1 kWh Lead acid battery | PV power output (kWh/year) | LCOE  |
|--------|-----------------------|----------------|-------------------------|----------------------------|-------|
| Kosofe | 0                     | 0.7            | 3                       | 979                        | 0.449 |
|        | 5                     | 0.4            | 3                       | 559                        | 0.35  |
|        | 10                    | 0.3            | 3                       | 419                        | 0.336 |
|        | 15                    | 0.3            | 2                       | 419                        | 0.328 |
| Oshodi | 0                     | 0.7            | 6                       | 979                        | 0.533 |
|        | 5                     | 0.4            | 5                       | 559                        | 0.412 |
|        | 10                    | 0.4            | 3                       | 559                        | 0.391 |
|        | 15                    | 0.4            | 3                       | 559                        | 0.383 |
| Alimosho | 0                   | 5              | 22                      | 6991                       | 0.488 |
|         | 5                     | 3              | 14                      | 4194                       | 0.323 |
|         | 10                    | 2              | 20                      | 2796                       | 0.31  |
|         | 15                    | 2              | 12                      | 2796                       | 0.281 |

Sensitivity variable: Maximum annual capacity shortage

| LGA    | Sensitivity variable: Minimum battery state of charge | LCOE (5% DR & 2% IR, 25 years PV, 40% SOC) | LCOE (10% DR) | LCOE (5% IR) | LCOE (20 yrs PV lifetime) | LCOE (30 yrs PV lifetime) | LCOE (30% SOC) |
|--------|------------------------------------------------------|----------------------------------------|---------------|--------------|----------------------------|----------------------------|-----------------|
| Kosofe | 30%                                                  | 0.7                                    | 0.706         | 0.388        | 0.542                      | 0.478                      | 0.457           |
| Oshodi | 30%                                                  | 0.7                                    | 0.578         | 0.307        | 0.44                       | 0.381                      | 0.371           |
| Alimosho | 30%                             | 0.7                                    | 0.411         | 0.654       | 0.463                      | 0.376                      | 0.353           |

### Appendix C

**Tables C4 and C5.**

### Table C4

Effects of sensitivity variables on LCOE of PV systems Maximum Loads.

| LGA       | LCOE (5% DR & 2% IR, 25 years PV, 40% SOC) | LCOE (10% DR) | LCOE (5% IR) | LCOE (20 yrs PV lifetime) | LCOE (30 yrs PV lifetime) | LCOE (30% SOC) |
|-----------|--------------------------------------------|---------------|--------------|--------------------------|--------------------------|-----------------|
| Duplex    |                                            |               |              |                          |                          |                 |
| Kosofe    | 0.497                                      | 0.706         | 0.388        | 0.542                    | 0.478                    | 0.457           |
| Oshodi    | 0.398                                      | 0.578         | 0.307        | 0.44                     | 0.381                    | 0.371           |
| Alimosho  | 0.411                                      | 0.765         | 0.411        | 0.463                    | 0.376                    | 0.353           |
| Single Family Bungalow |                          |               |              |                          |                          |                 |
| Kosofe    | 0.508                                      | 0.702         | 0.407        | 0.541                    | 0.495                    | 0.463           |
| Oshodi    | 0.452                                      | 0.648         | 0.349        | 0.495                    | 0.434                    | 0.416           |
| Alimosho  | 0.513                                      | 0.718         | 0.406        | 0.553                    | 0.497                    | 0.495           |
| ‘Face – me- I’ -‘face –you’ |                          |               |              |                          |                          |                 |
| Kosofe    | 0.538                                      | 0.742         | 0.427        | 0.572                    | 0.523                    | 0.497           |
| Oshodi    | 0.571                                      | 0.799         | 0.448        | 0.616                    | 0.551                    | 0.52            |
| Alimosho  | 0.429                                      | 0.645         | 0.322        | 0.486                    | 0.406                    | 0.399           |
| Traditional Court |                          |               |              |                          |                          |                 |
| Kosofe    | 0.54                                       | 0.758         | 0.428        | 0.582                    | 0.523                    | 0.504           |
| Oshodi    | 0.453                                      | 0.651         | 0.344        | 0.497                    | 0.432                    | 0.416           |
| Alimosho  | 0.45                                       | 0.653         | 0.346        | 0.497                    | 0.43                     | 0.408           |
| Flat Appartment |                          |               |              |                          |                          |                 |
| Kosofe    | 0.547                                      | 0.763         | 0.435        | 0.591                    | 0.529                    | 0.529           |
| Oshodi    | 0.501                                      | 0.717         | 0.391        | 0.547                    | 0.482                    | 0.466           |
| Alimosho  | 0.743                                      | $1.07         | 0.583        | 0.83                     | 0.707                    | 0.678           |

*Note: $ = USD.*
## Table C5
Effects of sensitivity variables on LCOE of PV systems (Minimum Loads).

| LGA                  | LCOE (5%DR & 2%IR, 25 years PV, 40% SOC) | LCOE (10% DR) | LCOE (5% IR) | LCOE (20 yrs PV lifetime) | LCOE (30 yrs PV lifetime) | LCOE (30% SOC) |
|----------------------|-----------------------------------------|---------------|--------------|--------------------------|----------------------------|------------------|
| Duplex               |                                         |               |              |                          |                            |                  |
| Kosofe               | 0.552                                   | 0.757         | 0.434        | 0.584                    | 0.535                      | 0.511            |
| Oshodi               | 0.459                                   | 0.416         | 0.354        | 0.506                    | 0.44                        | 0.441            |
| Alimosho             | 0.502                                   | 0.736         | 0.384        | 0.558                    | 0.479                      | 0.474            |
| Single Family Bungalow|                                        |               |              |                          |                            |                  |
| Kosofe               | 0.529                                   | 0.755         | 0.414        | 0.578                    | 0.509                      | 0.493            |
| Oshodi               | 0.439                                   | 0.639         | 0.339        | 0.486                    | 0.42                        | 0.413            |
| Alimosho             | 0.432                                   | 0.634         | 0.332        | 0.477                    | 0.413                      | 0.406            |
| ‘Face- me –I -face –you’|                                        |               |              |                          |                            |                  |
| Kosofe               | 0.531                                   | 0.733         | 0.425        | 0.565                    | 0.517                      | 0.472            |
| Oshodi               | 0.498                                   | 0.693         | 0.397        | 0.534                    | 0.484                      | 0.47              |
| Alimosho             | 0.422                                   | 0.6           | 0.33         | 0.458                    | 0.407                      | 0.395            |
| Traditional Court    |                                         |               |              |                          |                            |                  |
| Kosofe               | 0.575                                   | 0.811         | 0.453        | 0.599                    | 0.525                      | 0.554            |
| Oshodi               | 0.43                                    | 0.607         | 0.331        | 0.464                    | 0.413                      | 0.402            |
| Alimosho             | 0.417                                   | 0.584         | 0.316        | 0.449                    | 0.399                      | 0.386            |
| Flat Appartment      |                                         |               |              |                          |                            |                  |
| Kosofe               | 0.449                                   | 0.651         | 0.347        | 0.494                    | 0.431                      | 0.347            |
| Oshodi               | 0.533                                   | 0.743         | 0.419        | 0.517                    | 0.517                      | 0.481            |
| Alimosho             | 0.488                                   | 0.649         | 0.346        | 0.494                    | 0.429                      | 0.401            |

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[2] K.E. Enongene, F.H. Abanda, I.J.J. Otene, S.I. Obi, C. Okafor, The potential of solar photovoltaic systems for residential homes in Lagos city of Nigeria, J. Environ. Manag. 244 (2019) 247–256, doi:10.1016/j.jenvman.2019.04.039.