# SOLAR SIZING GUIDE

*Mwongozo wa Ukubwa wa Mfumo wa Jua*

Everything you need to know before sizing your solar system

*Kila unachohitaji kujua kabla ya kupima mfumo wako wa jua*

ROSANATECH SOLUTIONS LTD
Professional Solar Engineering • Nairobi, Kenya

### How to use this guide / Jinsi ya kutumia mwongozo huu

**Step 1:** Read Pages 1–4 fully before touching the tool. / Soma mwongozo huu kwanza.

**Step 2:** Note your appliances and hours from Page 2. / Andika vifaa na masaa yako kutoka ukurasa 2.

**Step 3:** Answer the 5 questions on Page 3. / Jibu maswali 5 kwenye ukurasa 3.

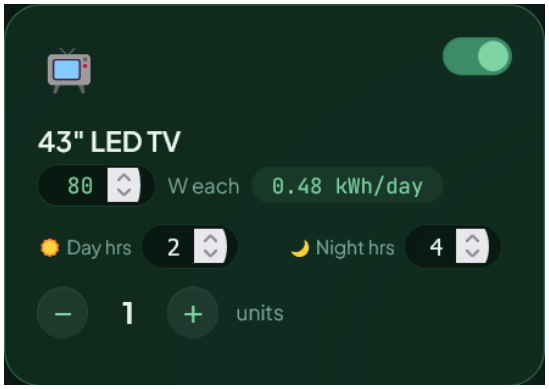
**Step 4:** Open Smart-Sizer and fill in your data confidently. / Fungua Smart-Sizer na jaza data yako.

# PAGE 2 — Your Appliances & Wattages | *Vifaa vyako na Nguvu*

## Understanding the Appliance Card / *Kuelewa kadi ya kifaa*

Below is the appliance card exactly as it appears in the Smart-Sizer tool. Each field is explained on the right.

*Hapa chini ni kadi ya kifaa kama inavyoonekana kwenye zana ya Smart-Sizer. Kila sehemu imeelezwa kulia.*




*Appliance card as it appears in the Smart-Sizer tool*

**① Toggle (On/Off Switch)**
Top-right circle. Green = appliance is ON and included in your calculation. Grey = excluded.

**② Watts (W) field**
The power rating of the appliance. Find it on the back label, packaging, or the table on Page 2. Example: "80" for a TV.

**③ kWh/day pill (auto-calculated)**
This updates automatically. Formula: Watts × Total hours ÷ 1000. The TV at 80W used 6 hours = 0.48 kWh/day.

**④ Day Hours**
Hours used between 6am–6pm. This load is powered directly by the solar panels.

**⑤ Night Hours**
Hours used between 6pm–6am. This load is powered by the battery. CRITICAL for battery sizing.

**⑥ Units (Quantity)**
How many of this appliance you have. Example: 8 LED bulbs → enter 8. The tool multiplies automatically.

**IMPORTANT: Inductive vs Resistive Loads / Muhimu: Aina mbili za vifaa**

Inductive appliances (marked ⚡ in the table below) have motors or compressors. They draw 2–3× their rated wattage at startup — this affects your inverter size. Always tell your engineer if you have pumps, compressors, or air conditioners.

*Vifaa vya injini (vilivyowekwa alama ⚡ kwenye jedwali) hutumia nguvu mara 2–3 zaidi wakati vikianza. Hii inaathiri ukubwa wa inverter yako.*

## Common Appliance Wattage Reference Table / *Jedwali la Nguvu za Vifaa vya Kawaida*

** kWh/day calculated at default hours shown. Your actual usage may vary. / kWh/siku imehesabiwa kwa masaa yaliyoonyeshwa. Matumizi yako yanaweza kutofautiana.*

| Appliance / Kifaa | Swahili | Typical Watts | Type / Aina | Day Hrs | Night Hrs | kWh/day* |
|---|---|---|---|---|---|---|
| LED Light Bulb (9W) | Balbu ya LED | **9W each** | Resistive / Kawaida | 2 | 6 | **0.07 kWh** |
| LED Light Bulb (18W) | Balbu Kubwa ya LED | **18W each** | Resistive / Kawaida | 2 | 5 | **0.13 kWh** |
| 43" LED Television | Runinga ya LED 43" | **80–100W** | Resistive / Kawaida | 2 | 4 | **0.48 kWh** |

| Appliance / Kifaa | Swahili | Typical Watts | Type / Aina | Day Hrs | Night Hrs | kWh/day* |
|---|---|---|---|---|---|---|
| 32" LED Television | Runinga ya LED 32" | **50–70W** | Resistive / Kawaida | 2 | 3 | **0.35 kWh** |
| Laptop Computer | Kompyuta ndogo | **45–75W** | Resistive / Kawaida | 6 | 2 | **0.52 kWh** |
| Desktop Computer | Kompyuta ya mezani | **120–180W** | Resistive / Kawaida | 8 | 0 | **1.20 kWh** |
| Smartphone Charger | Chaja ya simu | **10–20W** | Resistive / Kawaida | 2 | 2 | **0.08 kWh** |
| WiFi Router / Modem | Ruta ya intaneti | **10–20W** | Resistive / Kawaida | 12 | 8 | **0.30 kWh** |
| Normal Fridge (150L) | Friji ndogo | **100–150W** | Inductive / Injini | 8* | 8* | **1.44 kWh** |
| Large Fridge (300L) | Friji kubwa | **150–200W** | Inductive / Injini | 8* | 8* | **2.40 kWh** |
| Washing Machine | Mashine ya kufulia | **450–600W** | Inductive / Injini | 1 | 0 | **0.53 kWh** |
| Microwave Oven | Oveni ya umeme | **800–1200W** | Resistive / Kawaida | 0.5 | 0 | **0.50 kWh** |
| Electric Iron | Pasi ya umeme | **1000–2000W** | Resistive / Kawaida | 0.5 | 0 | **0.75 kWh** |
| Electric Kettle | Jug ya umeme | **1500–2200W** | Resistive / Kawaida | 0.5 | 0 | **0.88 kWh** |
| Ceiling Fan | Feni ya dari | **50–75W** | Inductive / Injini | 4 | 6 | **0.50 kWh** |
| Standing Fan | Feni ya kusimama | **40–60W** | Inductive / Injini | 4 | 4 | **0.40 kWh** |
| Air Conditioner 1HP | AC ya baridi 1HP | **750–950W** | Inductive / Injini | 8 | 0 | **7.20 kWh** |
| Water Pump (0.5HP) | Pampu ya maji ndogo | **370–450W** | Inductive / Injini | 1 | 0 | **0.41 kWh** |
| Borehole Pump (1HP) | Pampu ya kisima | **750–900W** | Inductive / Injini | 4 | 0 | **3.30 kWh** |
| Security Light (LED) | Taa ya usalama | **30–50W** | Resistive / Kawaida | 0 | 8 | **0.32 kWh** |
| CCTV System (4 cam) | Kamera za usalama | **30–60W** | Resistive / Kawaida | 12 | 12 | **1.08 kWh** |
| Water Dispenser | Dispensa ya maji | **80–120W** | Inductive / Injini | 8 | 0 | **0.80 kWh** |
| Printer | Printa | **30–60W standby** | Resistive / Kawaida | 4 | 0 | **0.18 kWh** |

| Appliance / Kifaa | Swahili | Typical Watts | Type / Aina | Day Hrs | Night Hrs | kWh/day* |
|---|---|---|---|---|---|---|
| Milk Cooler (farm) | Baridi ya maziwa | **350–500W** | Inductive / Injini | 12 | 12 | **4.80 kWh** |
| Electric Motor 1HP | Injini ya umeme 1HP | **750–900W** | Inductive / Injini | 6 | 0 | **4.95 kWh** |

# PAGE 3 — Your KPLC Bill & The 5 Questions | *Bili yako ya KPLC na Maswali 5*

## How to Read Your KPLC Bill / *Jinsi ya Kusoma Bili yako ya KPLC*

Your KPLC bill contains all the information the Smart-Sizer needs. Look for these three things:
*Bili yako ya KPLC ina taarifa zote unazohitaji. Tafuta mambo haya matatu:*

| ① Units Consumed (kWh) | ② Total Amount (KES) | ③ Billing Period |
|---|---|---|
| *Vipimo vilivyotumiwa* | *Jumla ya bili (shilingi)* | *Kipindi cha bili* |
| Usually shown as "Units" or "kWh". This is the most important number. Divide by 30 to get your daily kWh. | The total you pay monthly. Enter this into the Smart-Sizer "From My Bill" tab — it reverse-calculates your kWh automatically. | Make sure the bill is for a full month. If it is for 2 months, divide the amount by 2 before entering. |

## KPLC Tiered Tariff — Why Your Rate Changes / *Kiwango cha KPLC — Kwa nini bei inabadilika*

KPLC charges different rates depending on how much electricity you use. The more you use, the higher the rate per unit. This is why solar saves you more money the more electricity you consume.
*KPLC hukuchargia viwango tofauti kulingana na matumizi yako. Matumizi zaidi = bei ya juu zaidi kwa kila kipimo. Ndiyo maana jua huokoa pesa zaidi ukitumia umeme zaidi.*

| Units (kWh) | Vipimo | Rate / Kiwango | Who this is / Ni nani |
|---|---|---|---|
| 0 – 50 units | 0–50 vipimo | **KES 2.50/kWh** | Very low usage / Matumizi kidogo sana |
| 51 – 100 units | 51–100 vipimo | **KES 11.05/kWh** | Low usage / Matumizi ya chini |
| 101 – 150 units | 101–150 vipimo | **KES 14.79/kWh** | Average home / Nyumba ya wastani |
| 151 – 200 units | 151–200 vipimo | **KES 15.80/kWh** | Above average / Zaidi ya wastani |
| 201 – 300 units | 201–300 vipimo | **KES 17.10/kWh** | High usage / Matumizi ya juu |
| 301 – 500 units | 301–500 vipimo | **KES 20.16/kWh** | Very high / Matumizi makubwa |
| 500+ units | 500+ vipimo | **KES 21.32/kWh** | Commercial / Biashara |

*Note: Fixed charge of KES 200 + 16% VAT is added to all bills regardless of usage. / Kumbuka: Ada ya KES 200 + VAT 16% huongezwa kwa kila bili bila kujali matumizi.*

## The 5 Questions to Answer Before You Size / *Maswali 5 Ya Kujibu Kabla ya Kupima*

Answer these before opening the Smart-Sizer tool. Write your answers in the spaces provided.
*Jibu maswali haya kabla ya kufungua zana ya Smart-Sizer. Andika majibu yako kwenye nafasi zilizotolewa.*

| | | |
|---|---|---|
| 1 | What | **What is your daily energy need?** / *Una matumizi ya umeme kiasi gani kwa siku?*<br>Add up all your appliance kWh/day from the table. Or enter your KPLC bill into the tool — it calculates it for you.<br>*Jumlisha kWh/siku za vifaa vyako. Au weka bili yako ya KPLC kwenye zana.* |
| 2 | What | **What is your budget?** / *Bajeti yako ni nini?* |

A basic 3 kWp system starts at KES 250,000. Standard 5 kWp starts at KES 450,000. Premium 8 kWp starts at KES 750,000.
*Mfumo wa msingi huanza KES 250,000. Wa kawaida KES 450,000. Wa hali ya juu KES 750,000.*

**3 Hybrid**

**Hybrid or Off-Grid?** / *Mchanganyiko au bila gridi?*
Hybrid = stays connected to KPLC as backup. Off-Grid = completely independent. Most Nairobi clients choose hybrid.
*Mchanganyiko = KPLC inabaki kama hifadhi. Bila gridi = uhuru kamili. Wateja wengi wa Nairobi huchagua mchanganyiko.*

**4 How**

**How many backup hours do you need?** / *Unahitaji saa ngapi za hifadhi?*
Basic = 8–12 hours. Standard = 24 hours (full day). Premium = 48–72 hours (2–3 days). Choose based on your outage frequency.
*Msingi = saa 8–12. Kawaida = saa 24. Hali ya juu = saa 48–72. Chagua kulingana na mara nyingi za kukatiwa umeme.*

**5 What**

**What is your location?** / *Uko wapi?*
Location determines Peak Sun Hours (PSH). Nairobi = 5.5 hrs, Mombasa = 5.8 hrs, Garissa = 6.2 hrs, Kisumu = 5.2 hrs. More sun = fewer panels needed.
*Eneo linaathiri muda wa jua. Nairobi = saa 5.5, Mombasa = 5.8, Garissa = 6.2, Kisumu = 5.2. Jua zaidi = paneli chache.*

# PAGE 4 — Solar Terms & Next Steps | *Maneno ya Jua na Hatua Zinazofuata*

## Solar Glossary — Plain English + Swahili / *Kamusi ya Jua — Kiingereza na Kiswahili*

These are the terms you will encounter in the Smart-Sizer tool. No engineering degree required.

*Hizi ni maneno utakayokutana nayo kwenye zana ya Smart-Sizer. Hakuna shahada ya uhandisi inayohitajika.*

| Term / Neno | Plain English + Swahili |
|---|---|
| **kWh (Kilowatt-hour)**<br>*kiloWati saa* | The unit of electrical energy. 1 kWh = running a 1,000W device for 1 hour. This is what KPLC charges you for.<br>*Kitengo cha nishati ya umeme. KPLC hukuchargia kwa kWh.* |
| **Watts (W)**<br>*Wati* | The power rating of a device — how fast it uses energy. Found on every appliance label.<br>*Nguvu ya kifaa. Inaonyeshwa kwenye lebo ya kila kifaa.* |
| **PSH (Peak Sun Hours)**<br>*Masaa ya Jua* | The average daily hours of strong sunlight in your area. Nairobi: 5.5 hrs. More PSH = smaller solar array needed.<br>*Wastani wa masaa ya jua kali kwa siku. Nairobi: 5.5 saa.* |
| **Inverter**<br>*Inverter / Kubadilisha* | Converts DC power from solar panels into AC power your appliances use. Sized by your peak demand (watts).<br>*Hubadilisha umeme wa jua (DC) kuwa umeme wa nyumbani (AC).* |
| **Battery / DoD**<br>*Betri / Kina cha matumizi* | Stores energy for night use. DoD (Depth of Discharge) = how much you can safely use. $LiFePO_4$ batteries: DoD = 80–90%.<br>*Huhifadhi nishati kwa usiku. DoD = kiwango cha usalama cha kutumia betri.* |
| **MPPT**<br>*MPPT* | Maximum Power Point Tracking. The smart controller that extracts maximum power from solar panels at all times.<br>*Kidhibiti kinachochukua nguvu ya juu zaidi kutoka kwa paneli kila wakati.* |
| **Hybrid System**<br>*Mfumo wa mchanganyiko* | Solar + Battery + Grid connection. When sun and battery are insufficient, KPLC grid provides backup automatically.<br>*Jua + Betri + KPLC. KPLC inaingia kiotomatiki inapohitajika.* |
| **Off-Grid System**<br>*Mfumo bila gridi* | Solar + Battery only. Fully independent from KPLC. Requires more battery capacity for cloudy days.<br>*Jua + Betri tu. Uhuru kamili kutoka KPLC. Inahitaji betri nyingi zaidi.* |
| **LCOE**<br>*Gharama ya kWh* | Levelized Cost of Energy — the true cost per kWh your solar system produces over 25 years. Usually KES 4–8/kWh.<br>*Gharama ya kweli ya kila kWh kutoka jua kwa miaka 25. Kawaida KES 4–8/kWh.* |
| **Payback Period**<br>*Muda wa kurudisha mtaji* | Years until your solar savings equal your investment. Typically 5–8 years in Kenya.<br>*Miaka mpaka akiba yako ya umeme inalipa gharama ya mfumo. Kawaida miaka 5–8 Kenya.* |
| **Inductive Load**<br>*Mzigo wa injini* | Appliances with motors or compressors. They draw 2–3× their rated watts at startup. Examples: fridge, pump, AC, fan.<br>*Vifaa vyenye injini. Hutumia nguvu mara 2–3 zaidi wakati wa kuanza. Mifano: friji, pampu, AC.* |
| **Resistive Load**<br>*Mzigo wa kawaida* | Appliances with no motors. Power draw is constant. Examples: lights, TV, laptop, phone charger, iron.<br>*Vifaa bila injini. Hutumia nguvu mara kwa mara. Mifano: taa, runinga, laptop.* |

## What Happens Next / Hatua Zinazofuata

**1** **Open Smart-Sizer / Fungua Smart-Sizer**

Visit rosanatechsolutionsltd.co.ke/design.html on any device — phone, tablet, or laptop. / Tembelea tovuti kwenye simu, kompyuta kibao, au laptop yoyote.

**2** **Choose your customer type / Chagua aina yako**

Select Residential, SME, Agricultural, or Institutional. This loads relevant preset appliances. / Chagua aina yako. Zana itapakia vifaa vya kawaida.

**3** **Add your appliances / Ongeza vifaa vyako**

Toggle on the appliances you have. Adjust watts, day hours, and night hours using this guide. / Washa vifaa unavyovyo. Rekebisha wati, masaa ya mchana, na masaa ya usiku.

**4** **Calculate your system / Hesabu mfumo wako**

Click "Calculate System". Review Basic, Standard, and Premium packages with full financial projections. / Bonyeza "Hesabu Mfumo". Angalia pakiti zote tatu na makadirio ya kifedha.

**5** **Generate your proposal / Tengeneza pendekezo lako**

Enter your details and download a professional PDF proposal. Share via WhatsApp with our engineer. / Weka maelezo yako na pakua pendekezo la PDF. Shiriki kwa WhatsApp na mhandisi wetu.

**6** **Talk to Edgar / Zungumza na Edgar**

WhatsApp +254 705 059 964 for a free 30-minute consultation. No commitment required. / WhatsApp +254 705 059 964 kwa ushauri wa bure wa dakika 30. Hakuna ahadi inayohitajika.

## Ready to go solar? / Uko tayari kwenda jua?

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*Free consultation · No commitment · Professional engineering*