

THE PRACTICAL SOLAR GUIDE

Chapter 1: Know Your Usage

Free companion tool: Home Energy Load Audit (Excel)

Date: October 2026

Chapter 1: Know Your Usage

1.1 Start with what you use, not what you buy

The most expensive mistake in solar is sizing a system before you understand your own electricity use. Size too small and you're still paying your electricity supplier every month. Size too big and you've paid for panels and batteries that sit idle.

Most people start by asking an installer "how much for a 5 kW system?" That's the wrong place to start. Instead, ask yourself three questions: How much electricity do I use? When do I use it? What would I need during an outage? Answer those, and every later decision (panels, inverter, batteries) almost makes itself.

This chapter gives you the tools to answer these questions. You don't need to be technical. You need your electricity bill, a walk around your home with a notepad (or the free **Load Audit** spreadsheet that comes with this chapter), and a few weeks of meter readings.

1.2 Watts and kilowatt-hours: the only two units you need

There are two numbers that matter, and mixing them up causes the most confusion.

Power (watts, W, or kilowatts, kW) is how hard something is working right now. A kettle draws about 2,000 W (2 kW). An LED bulb draws about 8 W. Power tells you how big your inverter needs to be.

Energy (kilowatt-hours, kWh) is how much work was done over time. Run that 2 kW kettle for half an hour and you've used 1 kWh. Energy is what your supplier bills you for, and it helps you understand how many panels and how much battery you need.

Think of a water tank. Power is how wide the tap is open. Energy is how much water ends up in the bucket. A kettle is a wide-open tap for a few minutes. A fridge is a dripping tap that never stops, and over a day it can fill a bigger bucket than the kettle.

THE ONE FORMULA YOU NEED

$$\text{Energy (kWh)} = \text{Power (W)} \times \text{Hours used} \div 1,000$$

A 150 W TV used for 5 hours a day uses $150 \times 5 \div 1,000 = 0.75$ kWh per day. That's all the maths the audit needs, and the spreadsheet does it for you.

1.3 Reading your electricity bill

Your bill is the quickest way to get a starting number. Collect the last 12 months if you can. Usage swings a lot between summer and winter, and one month on its own can mislead you.

On each bill, look for:

- **Units used (kWh)** for the billing period. Ignore the money for now; the kWh number is what matters for sizing.
- **Number of days** in the billing period, so you can work out a daily average.
- **Tariff structure:** a flat rate, rising price blocks (the more you use, the more each unit costs), or time-of-use pricing (different rates at different times of day). Block and time-of-use tariffs change how much solar saves you, so note which one you're on.
- **Fixed charges:** daily or monthly fees you pay regardless of usage. Solar won't remove these unless you leave the grid entirely.

If you're on prepaid electricity, your purchase history works the same way. Most suppliers and vending apps show it, or you can add up your receipts.

Divide each month's kWh by the days in that period to get **kWh per day**. Write down the lowest month, the highest month, and the average. You'll use all three later: the average for panel sizing, the highest month to check your worst case.

A bill tells you *how much* you use, but not *when* or *on what*. On its own, it's a useful starting point but not a precise one. That's what the next steps are for.

1.4 Day versus night: the split that decides your system

Solar panels only produce while the sun is up. Anything you use during the day can run straight off the panels, which is the cheapest electricity you'll ever get. Anything you use after dark must come from a battery or the grid.

That makes the day/night split the most important number in this chapter:

- **Daytime use** is mainly a *panel* question. More daytime use means more value from every panel, with no battery needed.
- **Night-time use** is mainly a *battery* question. Batteries are usually the most expensive part of a system, so every kWh you use at night costs far more to cover with solar than one used at noon.
- **The two are linked.** Your panels must cover your daytime use *and* produce enough extra energy to charge your battery for the night. A large battery with too few panels will never fill up, so panels and battery have to be sized together.

Two homes using the same 15 kWh a day can need very different systems. A home office running computers and a pool pump in daylight might need a modest battery. A household that's empty all day and cooks, heats water and does laundry in the evening needs a much larger one, or needs to change its habits.

For this book, "day" means roughly the solar window, about 8 am to 4 pm, adjusted for your location and season. "Night" is everything else, basically any time your panels

produce little or no energy. The audit spreadsheet asks you to split each appliance's hours between the two, and it calculates the totals and percentages for you.

Keep this in mind for Chapter 2: shifting a load from night to day (running the dishwasher at lunchtime instead of after dinner, say) is often worth more than buying a more efficient appliance.

1.5 Base loads, peak loads and surge loads

Not all appliances behave the same way. Sorting them into three groups will make inverter and battery choices much clearer later.

Type	What it is	Typical examples	What it drives
Base load	Small, always on, day and night	Fridge, freezer, Wi-Fi router, alarm, standby devices	Battery size (it never stops)
Peak load	Large, used for short periods	Kettle, oven, hairdryer, electric water heater, iron	Inverter size (how much at once)
Surge load	Motors that briefly draw several times their running power when starting	Pool pump, borehole pump, air conditioner, fridge compressor, power tools	Inverter surge rating

Base loads are easy to underestimate because each one is small. A router (10 W), an alarm panel (15 W), a TV on standby (5 W) and a fridge (averaging about 60 W) don't sound like much. Together they run 24 hours a day and can add up to 2 to 3 kWh daily, all of it needing battery at night.

Peak loads matter because they stack. Kettle, oven and microwave running at the same time on a winter evening can ask for 6 kW or more in one moment. Your inverter has to handle that, or you have to avoid it.

Surge loads catch people out. A pump rated at 750 W can briefly demand two to three times that when it starts, sometimes more. An inverter sized only for running power may trip every time the pump kicks in. The audit sheet has a column to flag these.

1.6 Doing your appliance audit

The audit turns your home into a list of numbers. It takes about an hour, and it's the most useful hour you'll spend on this project. Open the free **Load Audit** spreadsheet and work through these steps. Even if it feels like a chore, it pays off: if you appoint an installer, a completed audit helps them size your system accurately and saves you money.

1. **Walk the house room by room.** Pick a room from the dropdown, then list everything that plugs in or is wired in. Don't forget the hidden ones: the water heater, the alarm, the gate motor, the borehole or pool pump, outdoor lights.

2. **Find each appliance's power in watts.** Look for the rating label on the back or underneath, or check the manual. If you can't find it, use the *Typical Wattages* sheet for a reasonable estimate. A plug-in energy meter (inexpensive at most hardware stores) gives you real numbers and is worth buying.
3. **Enter the quantity.** Ten identical downlights can go on one line with a quantity of 10.
4. **Estimate daytime and night-time hours of use per day.** Be honest, and average across the week. A washing machine used three times a week for an hour is about 0.4 hours a day.
5. **Mark essential loads.** Ask: "If the power went off, would I need this running?" Fridge, lights, Wi-Fi and alarm usually are. The oven and tumble dryer usually aren't. This column feeds your battery sizing in Chapter 5.
6. **Mark surge loads.** Anything with a motor or compressor: pumps, fridges, air conditioners, gate motors.

The spreadsheet calculates daily kWh for each line, splits it into day and night, and builds a **Summary** sheet showing your totals, your day/night percentage, your biggest users, and how much each room uses.

TWO TIPS FOR TRICKY APPLIANCES

Things that cycle on and off (fridges, freezers, water heaters, air conditioners) don't run at full power all the time. A fridge's compressor typically runs about a third of the time, so a fridge plugged in for 24 hours counts as roughly 8 hours of running. For a water heater, count only the time the element is actually heating, typically 2 to 4 hours a day for a family.

Variable appliances (washing machines, dishwashers, ovens) use full power only part of the cycle. The label figure gives you a safe, slightly high estimate. That's fine; a little cautious is better than undersized.

When you're done, compare the audit's daily total with the kWh-per-day from your bills. If they're within 15 to 20%, your audit is good. If the audit is much lower, something is missing (often a water heater, a pump, or underestimated hours). If it's much higher, you've probably overestimated hours on large appliances.

1.7 Logging your meter

The audit is an estimate. Your meter is the truth. Two readings a day for two to four weeks will show you your real day/night split, and it costs nothing.

1. **Find your meter** and work out which number is the kWh reading. On most digital meters it cycles through several displays; the kWh total is usually labelled "kWh" or "Total".
2. **Read it twice a day**, at the start and end of your solar window. Around 8 am and 4 pm works best, but pick times that fit your routine and stick to them. A phone reminder helps.

3. **Enter both readings** on the *Meter Log* sheet. It works out your daytime use (morning to afternoon) and night-time use (afternoon to the next morning), and charts them automatically.
4. **Prepaid meters count down instead of up.** Choose "Counts down" on the *Start Here* sheet, and record any units you load in the top-up columns so the sheet can account for them.
5. **Include a weekend.** Weekday and weekend patterns are often very different.

If your supplier offers a smart meter app or online usage portal with hourly data, use that instead. It's even better.

After a few weeks, the *Summary* sheet puts your measured averages next to your audit estimate. Where they disagree, trust the meter, and go back to the audit to find what's missing.

1.8 A worked example

Meet a typical household: a family of four in a suburban house with an electric water heater, a pool, and one parent working from home. Their full audit is on the *Example Audit* sheet. Here's what it shows.

They use about 25 kWh a day, roughly 760 kWh a month. Their bills average 23 kWh a day, so the audit is within 10%. Good enough to work with.

Two appliances use more than half of it:

Appliance	kWh per day	Share of total
Electric water heater	9.0	36%
Pool pump	4.5	18%
Oven	1.8	7%
Dishwasher	1.8	7%
Tumble dryer	1.3	5%
Everything else (15 items)	6.9	27%

Only 39% of their use happens in daylight. The other 15 kWh happens after dark, mostly the water heater, oven, dishwasher and dryer. If they installed solar today without changing anything, they'd need a large battery to cover their evenings.

Their essentials are small. Fridge, lights, Wi-Fi, alarm, laptop, gate motor and chargers add up to under 4 kWh a day, with only about 2.2 kWh of that at night. Running together, the essentials draw around 800 W. That's a very different backup requirement from "run the whole house."

This is the picture most households find: a few big users dominate, too much happens at night, and the things that truly matter in an outage are a small slice. Chapter 2 shows what this family can do about it before spending anything on panels. Just moving the water heater and dishwasher into daylight hours would lift their daytime share from 39% to about 70%.

1.9 Chapter checklist

Before moving on, you should have:

- ☐ Your daily kWh from 12 months of bills (average, lowest and highest month)
- ☐ A completed appliance audit, within about 20% of your bills
- ☐ Your day/night split, ideally confirmed by two to four weeks of meter readings
- ☐ Your five biggest users identified
- ☐ Your essential loads marked, with their night-time kWh
- ☐ Your surge and motor loads flagged

These numbers follow you through the rest of the book. Chapter 2 uses your biggest users and your night-time load to cut what you need before you buy anything. Chapters 3 to 5 turn what's left into panels, an inverter and a battery.

NEXT

Chapter 2: Cut the Load Before You Buy Anything.