

THE PRACTICAL SOLAR GUIDE

Chapter 2: Cut the Load Before You Buy Anything

Free companion tool: Efficiency Savings Estimator (Excel)

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2.1 The cheapest kilowatt-hour is the one you don't use

Every kilowatt-hour you use has to come from somewhere. Once you go solar, it comes from panels you paid for, or from a battery that cost even more. So before you size anything, it pays to shrink the number you're sizing for.

There are two ways to do that, and both matter:

- **Reduce:** use less energy for the same result. LED lights, a better-insulated water heater, a pool pump that runs fewer hours.
- **Shift:** use the same energy, but at a different time. Running the dishwasher at lunchtime instead of after dinner doesn't save a single kWh, but it moves that load from the battery to the panels.

Reducing makes your whole system smaller. Shifting makes your battery smaller, which is usually the most expensive part. The best results come from doing both.

RULE OF THUMB

Money spent cutting your load almost always goes further than money spent on extra panels and batteries to cover it. A few rand, dollars or euros on a timer or a water heater blanket can save you far more on hardware you no longer need.

2.2 Start with your biggest users

Go back to the *Summary* sheet from Chapter 1 and look at your five biggest users. In most homes, three or four appliances account for well over half of all electricity used. That's where to focus.

Small savings on small loads add up slowly. Unplugging a phone charger saves almost nothing. Changing how your water heater runs can save more than everything else in this chapter combined. Work down your list from the top, and for each big user ask two questions: *can I use less of this?* and *can I run it while the sun is up?*

2.3 Water heating: usually the biggest win

In homes with an electric water heater (also called a geyser, boiler or hot-water cylinder), it's often the single largest user, typically a third or more of the total. It's also one of the easiest loads to fix, because hot water stores well. You can heat it when the sun is up and use it in the evening.

Change	What it does	Typical cost
Timer	Heats water during the solar window instead of	Low

Change	What it does	Typical cost
	whenever it cools. Moves most of the load into daylight.	
Insulation blanket and pipe lagging	Cuts heat lost from the tank and the first metres of pipe, so it reheats less often.	Low
Lower the thermostat	Many are set hotter than needed. Around 60°C is a good setting; don't go much lower, as lukewarm stored water can allow bacteria to grow.	Free
Low-flow shower heads	Less hot water used per shower, with little difference in feel.	Low
Heat pump water heater	Moves heat from the air into the water. Uses roughly a third of the electricity of a standard element.	Medium to high
Solar water heater	Heats water directly from the sun, with an electric element as backup. Can cut water-heating electricity by half or more.	Medium to high

Start with the free and low-cost changes. A timer alone can turn your biggest night-time load into a daytime one.

THE BIGGEST SINGLE UPGRADE

If you're replacing an old water heater, choose a heat pump or solar water heater. It's one of the biggest changes you can make to the size of the solar system you need, and the saving lasts for the life of the system.

2.4 Cooking and gas

Electric stoves and ovens draw a lot of power in short bursts, usually in the evening when there's no sun. That combination is hard on batteries and inverters. Switching some cooking to gas takes those peaks off your electrical system entirely.

Common options:

- **Gas hob:** the most popular swap. Instant heat, works during outages, and removes one of the biggest evening peaks.
- **Gas water heating:** an instantaneous gas water heater removes water heating from your electricity bill completely. It suits homes where a timer or heat pump isn't practical.
- **Smaller electric appliances:** a microwave, air fryer, slow cooker or pressure cooker uses far less energy than heating a full oven for a small meal.

SAFETY FIRST

Gas appliances must be installed by a certified gas installer and comply with your local regulations. Make sure there's proper ventilation, keep gas bottles outside where required, and consider a carbon monoxide alarm. Check whether your insurer needs to be told.

2.5 Lighting

Lighting is rarely the biggest load, but it's almost entirely a night-time load, so every watt you save is a watt your battery doesn't have to supply. If you still have halogen downlights or old incandescent bulbs, switching to LED is one of the quickest paybacks there is.

Light type	Typical power	Equivalent LED	Saving
Halogen downlight	50 W	5 to 7 W	About 90%
Incandescent bulb	60 W	8 to 9 W	About 85%
Compact fluorescent (CFL)	14 W	8 to 9 W	About 40%
Fluorescent tube (1.2 m)	36 W	16 to 18 W	About 50%

Ten halogen downlights used for five hours a night use 2.5 kWh. The same ten as LEDs use about 0.3 kWh. Add motion sensors or timers to outdoor and security lights so they're not burning all night when they don't need to be.

2.6 Appliances and motors

Some appliances can't be switched off or moved, but they can be replaced with more efficient versions when the time comes, or simply run smarter.

- **Fridges and freezers:** these run 24 hours a day. Old models can use two or three times more than a modern one. Look for an *inverter* compressor and a good energy label. Keep seals clean and tight, and don't put them next to the oven or in direct sun.
- **Pool pumps:** often run far longer than needed, and usually by habit rather than need. Try reducing run time by an hour or two and check the water stays clear. A variable-speed pump can cut pool pump energy by half or more.
- **Air conditioners and heaters:** choose inverter-type air conditioners, set them a degree or two less extreme, and close doors to the room you're conditioning. Insulating the ceiling helps more than most people expect.
- **Tumble dryers:** among the most power-hungry appliances in the house. A washing line on sunny days costs nothing. If you need a dryer, a heat pump dryer uses roughly half the energy.
- **Standby loads:** TVs, decoders, consoles and chargers left on standby can quietly add up to half a kWh a day or more. A switched power strip or smart plug turns them fully off.

You don't need to replace working appliances today. But when one breaks or reaches the end of its life, make efficiency part of the buying decision. The cheapest fridge in the shop may be the most expensive one to run on solar.

2.7 Shift loads into daylight

Once you've reduced what you can, look at *when* things run. Any load that can wait a few hours is a candidate for moving into the solar window.

Easy to shift	Harder to shift	Can't really shift
Water heater (with a timer)	Washing machine (if you're out all day)	Evening lighting
Dishwasher	Ironing	Cooking dinner
Pool pump	Electric vehicle charging	Fridges and freezers
Washing machine and dryer (if someone is home)	Air conditioning (pre-cool the house)	Alarm and Wi-Fi

Many modern appliances have a delay-start button, so you can load them in the morning and set them to start at noon. For everything else, a simple timer or smart plug does the job. Shifting costs little or nothing, and it's the single most effective way to reduce the battery you'll need.

WHY THIS MATTERS EVEN MORE LATER

We can't control the weather, so in Chapter 3 we'll size the panels with some extra capacity to cope with cloudy days. The flip side is that on a clear day, your battery will often be full by around midday. From then until sunset, your panels can produce far more than you're using, and anything you don't use is simply wasted.

That's why shifting matters so much. Every load you move into the sunny hours runs on power that would otherwise go to waste.

2.8 Smart plugs, timers and energy monitors

You can't manage what you can't see. A few inexpensive gadgets make reducing and shifting much easier.

- **Mechanical or digital timers:** the simplest way to control a water heater, pool pump or anything else on a fixed schedule.
- **Smart plugs:** switch appliances from your phone or on a schedule, and many report how much energy the appliance is using.
- **Whole-home energy monitors:** clip onto your distribution board and show your total usage in real time on an app. Excellent for spotting what's on when it shouldn't be.

- **Smart water heater controllers:** purpose-built timers for water heaters, often with temperature readouts and usage tracking.

If you'll install solar soon, check what your future inverter can do first. Many inverters come with apps that show your usage, and some can switch loads automatically when there's surplus solar. That may make a separate monitor unnecessary.

2.9 The worked example, revisited

Let's go back to the family from Chapter 1. They used about 25 kWh a day, with only 39% of it in daylight. Here's what a few low-cost changes do:

Change	Daily use (kWh)	Moved into daylight (kWh)	Cost
Water heater: timer for the solar window, blanket, thermostat to 60°C	Saves 1.0	6.0	Low
Dishwasher on delay-start at midday	No change	1.8	Free
Pool pump: 6 hours down to 4	Saves 1.5	n/a (already daytime)	Free
Washing line instead of tumble dryer most days	Saves 0.95	n/a	Free

And the result:

	Before	After
Total use per day	25.3 kWh	21.8 kWh
Daytime use	9.9 kWh (39%)	15.2 kWh (70%)
Night-time use	15.3 kWh	6.6 kWh

Their total use dropped by about 14%, but the real win is at night. Their night-time load fell from 15.3 kWh to 6.6 kWh, so the battery they'd need has more than halved. That's likely to be the biggest saving on their entire solar project, and it cost them a timer, a blanket and some new habits.

If they later replace the water heater with a heat pump, their total would drop by roughly another 5 kWh a day. That's a decision worth making before the panels go on the roof, not after.

2.10 Small habits, big difference

None of these change your lifestyle much, but together they add up:

- **Switch off as you leave.** Turn off the air conditioner or heater when you leave a room you're not coming back to, and the light behind you.
- **Take shorter showers.** Every minute less is hot water your water heater doesn't have to replace.
- **Experiment with the pool pump timer.** Try cutting from eight hours to six. If the water stays clear, try four. Many pools need less in winter than in summer, so adjust with the seasons.
- **Boil only the water you need.** A full kettle for one cup uses several times the energy.
- **Run full loads.** Wait until the dishwasher and washing machine are full, and wash at lower temperatures where you can.
- **Use curtains and doors.** Close them to keep heat in during winter and out during summer, so heating and cooling run less.

Later in the book you may decide to size your system large enough that you don't need to think about any of this. But every habit you keep makes that system smaller and cheaper.

2.11 Chapter checklist

Before moving on, you should have:

- ☐ Identified which of your five biggest users you can reduce, and which you can shift
- ☐ Set up a timer, or planned one, for your water heater
- ☐ Checked your water heater thermostat and insulation
- ☐ Listed the lights you'll switch to LED
- ☐ Decided whether gas cooking or gas water heating makes sense for you
- ☐ Moved at least one load into daylight hours
- ☐ Tried at least two of the small habit changes
- ☐ Updated your Load Audit with your new hours and appliances

Run your updated Load Audit again. The new totals, and especially your new night-time figure, are the numbers you'll size your system from in the next three chapters.

NEXT

Chapter 3: Panels and Placement.