Steps to Plan a Reliable Solar Power System for Your Home or Business

Switching to solar power can feel like a big step, but breaking it down into clear stages makes the process manageable. Whether you want to lower your monthly electricity bill, gain backup power during outages, or simply run your property on cleaner energy, a well-planned system is essential. The key is to match the equipment to your actual needs, not to a one-size-fits-all package.

Start with your energy use

Before looking at solar panels or batteries, you need a clear picture of how much electricity you use and when you use it. This is called your load profile. For a home, that means listing every appliance that runs on electricity: lights, fridge, geyser, air conditioner, pool pump, computers, and kitchen appliances. For a small business, include office equipment, servers, lighting, and any machinery or refrigeration.

Note the power rating (in watts) and the typical daily run time for each item. Multiply watts by hours to get watt-hours per day. Add everything up to find your total daily energy consumption. This number tells you how large your solar array and battery bank need to be. It also reveals your peak demand - the moment in the day when you draw the most power at once. That peak drives the size of your inverter and the wiring capacity.

Understand your site and sun exposure

Solar panels need direct sunlight for most of the day to generate their rated output. Check your roof or ground area for shading from trees, neighbouring buildings, or chimneys. Even a small patch of shade on one panel can drop the output of the whole string if you are using older panel technology. Modern panels with bypass diodes help, but it is still better to avoid shading entirely.

Your location also affects how much sun you get across the year. In South Africa, most areas receive good irradiance, but the angle and orientation of your panels matter. North-facing roofs in the southern hemisphere get less direct sun than north-facing ones in the northern hemisphere. Ideally, panels tilt toward the north at an angle close to your latitude. If your roof faces east or west, you will still generate power, but you may need more panels to hit your target daily production.

Choose the right system type

There are three main configurations for a solar power system: grid-tied, off-grid, and hybrid. A grid-tied system connects to the municipal electricity grid. It uses the grid as a virtual battery: you send excess power to the grid and draw from it when the sun is down. This setup is simpler and cheaper, but it shuts down during a grid outage for safety reasons.

An off-grid system runs entirely on solar and batteries. It must be sized to cover your worst-case winter days with limited sun. That means a larger battery bank and often a backup generator. Off-grid is practical for remote properties, but it costs more and requires careful load management.

A hybrid system combines the best of both: it stays connected to the grid but also includes battery storage. During the day, solar powers your loads and charges the batteries. At night or during a power cut, the batteries supply the essential circuits. This is the most popular choice for homes and small businesses today because it offers energy independence without losing the security of the grid.

Size the solar array and inverter

Once you know your daily energy consumption, you can calculate the solar array size. Divide your daily watt-hours by the peak sun hours your location receives. For most of South Africa, that figure is between 4.5 and 5.5 hours per day. The result tells you the total wattage of solar panels you need. For example, if you use 10 kWh per day and get 5 peak sun hours, you need roughly 2,000 watts of panels.

The inverter must be able to handle the peak load you identified earlier. If you run a welder, a borehole pump, or a large air conditioner at the same time as other loads, the inverter needs to deliver that surge current. Many inverters can handle short overloads, but you should size the continuous rating at least 20% above your expected peak. A good installer will also check the voltage and current ratings to match the panel string configuration.

Select battery storage wisely

Batteries store the energy you do not use during the day for use at night or during outages. The two common chemistries today are lithium-ion and lead-acid. Lithium batteries cost more upfront but last longer, charge faster, and can be discharged deeper without damage. Lead-acid batteries are cheaper but heavier, require ventilation, and typically need replacement sooner.

When sizing your battery bank, consider how many hours of backup you want. A common approach is to store enough energy to cover your essential loads for one full evening and the next morning, with some reserve for cloudy days. Avoid the temptation to oversize the battery for rare events. Instead, plan for typical usage and accept that during extended outages you

may need to conserve power. A battery management system is essential with lithium packs to protect the cells and communicate with the inverter.

Plan for safety and compliance

A solar installation involves high-voltage DC, AC mains wiring, and heavy batteries. It must comply with local electrical regulations. In South Africa, that means following the SANS 10142 code and, for grid-connected systems, meeting the utility provider's requirements. A registered electrical contractor should handle the final connections and sign off the installation.

Protection devices include DC isolators near the panels, surge arrestors, and a main disconnect for the battery bank. Proper earthing is critical to prevent shock hazards. Your installer should also fit a changeover switch if you plan to run the system independently of the grid during outages.

Most reputable suppliers, including LAN Systems, can help you with the design and specification of a system that meets your load profile and local regulations. Their team understands the technical details of inverters, battery sizing, and panel matching, so you get a solution that works reliably for years.

Think about future expansion

Your energy needs may grow over time. You might add an electric vehicle, a workshop, or more office equipment. Design your system with room to expand. Leave spare breaker slots in the distribution board, choose an inverter that can accept additional solar input later, and buy a battery system that allows stacking extra modules. Planning ahead saves you from having to replace major components in a few years.

Also consider monitoring. Most modern inverters come with a display and a mobile app that shows real-time generation, consumption, and battery status. Good monitoring helps you spot problems early and adjust your usage habits to get the most from the system.

Get the installation right

Even the best equipment performs poorly if it is installed carelessly. Roof mounts must be weather-sealed to prevent leaks. Cables should be run in conduit to protect against UV and rodents. Battery enclosures need ventilation, especially for lead-acid types. The inverter should be mounted in a cool, dry place out of direct sun.

Do not rush the commissioning phase. After installation, test every function: grid charging, solar charging, battery discharge, and changeover during a simulated outage. Confirm that the

app or display reports accurate data. A thorough commissioning step catches wiring errors and configuration mistakes before they cause trouble.

Solar power is a long-term investment. With careful planning - starting from your actual usage, through equipment selection, to professional installation - you can build a system that cuts your electricity bills and provides reliable backup power. The effort you put into the planning stage pays off every day the system runs.