

12 Things to consider before getting solar

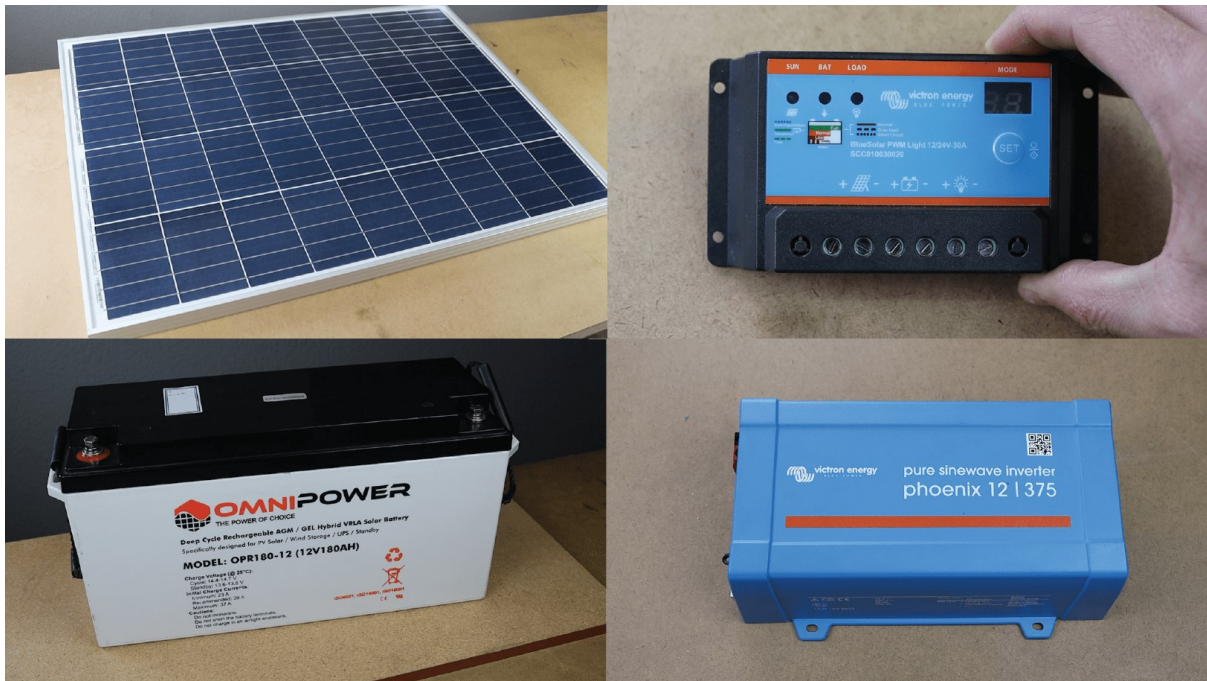
Understand the basics of how a solar energy system works.

A brief introduction:

When the sun shines on solar panels they produce DC power. Solar Panels do not work with the heat from the sun, but rather the light. A 300w solar panel can produce 300w of energy per hour when the sun shines on the panel. Panels should face north in the southern hemisphere and should be angled correctly to maximise the hours the sun shines on the panels. In Johannesburg we get about 4 to 6 hours of strong sunshine (peak sun hours) per day, compensating for weaker sunlight in mornings and late afternoons and the occasional clouds passing by.

In an off-grid/back-up system, the DC power is sent to a charge controller and from there to a battery bank for storage. The charge controller manages the charging of the batteries. An inverter then pulls power from the battery bank and supplies power to the loads (household appliances) when the sun doesn't shine. It converts 48V DC power to 220V AC power that home appliances use.

In an on-grid system, the power from the panels go straight to the on-grid inverter and provides energy for the loads to use. No solar charger or battery bank is needed. In an on-grid system there are no batteries and solar energy is not stored for later use.



Which type of solar system do you need?

Different systems deliver different results. It is important to decide what you would like to achieve by switching to solar. Do you want power during load-shedding? Do you want to save on your energy bill? Do you want to live a more sustainable life? The most common systems are:

- **Off-Grid System.** This means no connection to Eskom. This is the most expensive system because you need a large battery bank to run your appliances in the evenings and/or on

cloudy days. With an off-grid system, load shedding is a thing of the past because you are not connected to the grid (Eskom). You might need a backup generator (or increase the battery bank size) if there are a few days of cloudy weather. Getting off the grid is the dream for most people, but it is expensive. A full off-grid system can cost from R200 000 to R300 000 for the average homeowner. You will also need to focus on being energy efficient meaning giving up luxuries like underfloor heating, heaters etc.

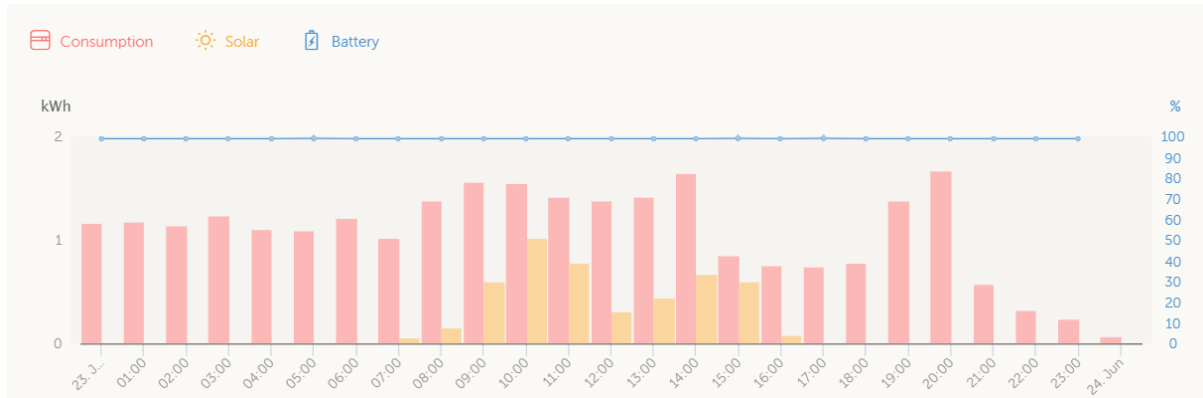
- **On-Grid System.** This means you are still connected to Eskom. For an on-grid system, you don't need batteries. The power the panels generate is used immediately by appliances. This reduces your energy bill but does not necessarily eliminate all energy costs. In countries where you can feed back into the grid, the excess power generated during the day can cover your evening consumption leaving you with a R0 bill. Feeding back into the grid is not allowed in most of South Africa. This means you will only save money during the day. This option works best for offices where consumption occurs during the day. Consumption in most households are early morning and late at night when the sun doesn't shine. The on-grid system won't have a significant impact in these situations. Average Cost R30 000 – R100 000 (More for large offices / large buildings)
- **Hybrid System.** This system is a combination of an on-grid and off-grid. You are still connected to the grid, but with a smaller battery bank to get you through load shedding & you will save money during the day. The system can be set up to keep batteries at 100% and then run your daily loads from the panels. It can also be set up for self-consumption where for example 30% of the batteries are used every evening, day loads run off the panels and the remaining 70% is kept for load shedding. This is the most popular system for South Africans in the suburbs. The main goal is getting through load shedding but you are also saving money during the day. Average Price R120 000 to R250 000.
- **Backup System.** This system does not need solar panels. The batteries are charged, but the grid, when grid power is available (from a wall outlet/DB Board), is used when the grid fails (load shedding). You can select which appliances you want to run during load shedding and the installer will size the battery bank accordingly to last from 6 to 8 hours, when the power will go back on the battery charge from the grid. This is your most cost-effective backup solution. You do not save money with this solution. But load shedding is a thing of the past. You can also add panels to charge the batteries to this system and to charge batteries with a combination of solar and grid power. Cost will be from about R15 000 to R100 000

It is better to get energy-efficient first!

Appliances that draw a lot of power do not work well on solar systems. Your first step is to get as near to energy efficient as possible. This includes changing your electric geyser to a solar geyser/gas geyser. Next, replace your stove and oven with a gas stove and oven. If you use equipment like power tools & welding machines, it is best to run these on a generator and not on your solar system. Replace all your lights with LED lights. Also decide how you will use heaters in your home. Heaters can consume 2000w an hour and are not advised on an off-grid installation. In a hybrid system, some plugs can be wired for these high consuming appliances. These will still run off the grid and your other appliances off solar power. Now your installer can design a smaller solar system for the remaining appliances. This is the most cost-effective way of doing things. Get energy-efficient first, and then install a smaller system for your remaining appliances.

How much energy do you use?

The best way to establish this is to install an energy meter for a week or two in your home. You will then see exactly what your total consumption and peak usage is. You will also get a breakdown between daytime and evening consumption. Your installer can very accurately design a system based on this information. This is the most accurate way to size a solar system. Alternatively, you can provide your installer with utility bills and an appliance list indicating how long you want to use each appliance every day and they can design a system according to that. This information is very important when sizing a solar system and will determine the number of panels needed for the size of the inverter and size of the battery bank.



Solar Panels & Shading.

Is your roof facing north? A north-facing roof is the best for solar panels here in South Africa. Panels can also be placed west or east, but more panels might be needed to make up for the loss of direct sunlight. It is not advisable to put panels facing south in the southern hemisphere. If you do not have enough space on your roof a ground mount installation can be considered. It is important to mount your panels securely using a high-quality roof mounting system. There are different systems for different roof types the most common being tile and IBR (corrugated iron roof).

Also note, any shade on panels will influence power generation quite dramatically. A little bit of shade can reduce the efficiency of a panel by at least 30%. Shading from trees, chimneys and other buildings need to be considered when designing a system. When panels are installed at the correct angle, they self-clean when it rains, but in dusty areas & dry seasons it is advised to keep them clean to increase energy production.

How experienced is your installer?

A solar system is a big investment. Make sure your installer has at least 3 years' experience and a few quality installations as a credential. There are too many inexperienced installers that have unsafe installations that are not up to code. Ask for references and photos from previous installations to see if the work is neat and tidy. There are many dubious operators out there and it is better to pay a little more and get the job done properly. You can also check if they belong to solar associations like SAPVIA.

Hardware guarantees?

Ensure that you get a good guarantee on all your solar components. A good guarantee for solar inverters and chargers is 5 years. Under 5 years you are moving into cheaply made products that will not deliver over the long term. Lead Acid batteries usually have a 2-year warranty and Lithium-Ion Batteries a 7 to 10-year warranty. Most grade A solar panels have a 25 to 30-year warranty. If an installer offers noticeably short warranties, there is a reason and the product may be inferior.

Battery Cycles.

Not all batteries are made the same. They have different life spans, and this is indicated as cycles on the spec sheets. A cycle is when a battery goes from full to empty to full. This is considered 1 cycle. When comparing batteries don't just look at Amp Hours. A 100 Ah with 1000 cycles is not the same as a 100Ah battery with 2500 cycles. When comparing battery prices calculate the cost per cycle and do the comparison. Do not merely look at the price of the battery. The cycles need to be considered.

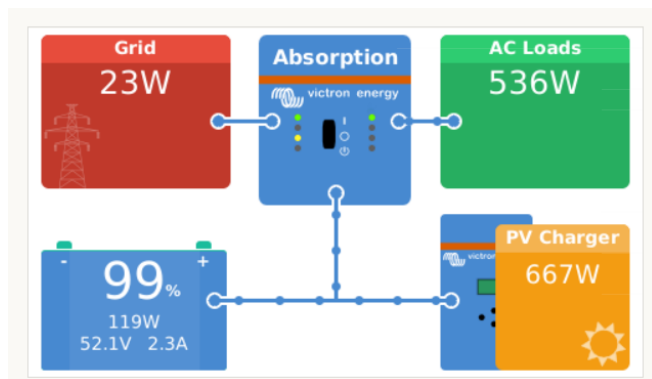
Also ask the installer about the depth of discharge settings that they will use, lead-acid batteries shouldn't be discharged more than 50% and Lithium-Ion batteries more than 80% or else this will dramatically shorten the lifespan of the batteries.

Compare apples with apples!

You cannot compare a 5kva Mecer inverter directly with a 5kva Victron inverter. Do not only compare the size of the components. You have to research the brands to see what you are buying. A good example is cars. You get a 2 litre Tata and a 2 litre Toyota. Both have the same capacity but there is a difference in price, quality, reliability, technology, warranty and more. Research the brands that the installer suggests. How long have these brands been around? Google some reviews of the products. Ask other installers what they think of brand X, or why they prefer a certain brand? In solar just like in most industries, you get what you pay for. Don't let an unreliable solar system become the new Eskom in your life.

Monitoring.

You wouldn't buy a car without a fuel gauge, speedometer and warning lights. Why purchase a R200 000 solar system without monitoring? It is important to be able to monitor your system to ensure it performs optimal. A good monitoring system also picks up system problems early enough before any hardware suffers damages. Mobile monitoring of the system is a great way to ensure you get the most



from your solar system. Your installer can also access the monitoring information and check-in remotely to ensure your system is performing optimally. A monitoring system also helps you manage your batteries better. You can clearly see how much power is left just like on your mobile phone. You can switch off higher consumers when there is little power left etc. Cheaper solar systems do not always provide good monitoring and you won't be able to manage your consumption effectively during load shedding etc.

What you can and can't run on a solar system.

Some high consumers will overload your solar system and shorten the lifetime and capacity of your batteries. Therefore, we don't put geysers and stoves on solar systems. If you have many power tools that use a lot of electricity it is better to turn these appliances off a generator. If you have an 800w inverter you cannot put a 1000w kettle on the system. It will overload the inverter (and might even damage it). It will also draw too many amps from batteries, more than the recommended rate and possibly damage your batteries. Fridge, Freezer, Lights, TV, laptops etc are fine. If you have appliances you are unsure of, your installer can advise you. You should be more careful with higher consumers like heaters. It would be better to opt for a gas heater. Or set up your hybrid system to run high consumers off the grid and use solar for your essential appliances.

Safety.

Safety extras include: Fuses, breakers, surge arrestors, proper grounding, emergency stop, correct cable gauges, Certificate of Compliance etc. This is usually where inexperienced installers don't know which safety measure to put in place and unreliable installers cut corners to make the system as cheap as possible. But this puts your family's lives at risk. If an installation is done incorrectly it can be extremely dangerous. It is worth paying a bit more for the peace of mind that your installation is up to code and has been signed-off by a master electrician. You need a COC for your insurance company and to be compliant. Solar regulation is improving, but at the moment almost anyone can claim to be a solar installer. This is leading to many sub-par and dangerous installations. We would advise an installer that is part of the solar associations SAPVIA and SAAEA.

<https://www.sapvia.co.za/>

<https://www.saaea.org/>

I hope this document helps you to understand solar better. It can be a very intimidating decision for a homeowner. Find an installer with a good track record that you can trust. The Cedar Solar team has 10 years' experience in the solar industry, and we can guide you through the process of designing and installing a system that meets your needs.