SOLAR STATUS

GIVING POWER BACK TO YOU & YOUR HOME

Beginners guide to Solar in South Africa

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Introduction

Deciding to go solar can be quite a daunting experience, with so many different options on the market, it is easy to feel overwhelmed.

Below is a simple guide of what you can expect to find in a system, but at the end of the day, the most important factors to consider are the warranties, the service level of the manufacturer, and their longevity.

There are three types of solar systems: gid-tied, off-grid, and hybrid.

- **A grid-tied system** is directly connected to the grid. In places where there is a feed-in tariff, such as the Western Cape, the grid is used as a storage space instead of batteries. But due to the load shedding situation, it is not viable for residential use as when the grid is down, so is your system. It is more suited for large scale commercial installations who sell their power back to the grid.
- **An off-grid system** is the opposite of a grid-tied system as it is not connected to the grid and only requires batteries for storage. This system is normally used with a back-up generator for days of prolonged cloud cover, when the solar panels aren't able to produce enough power to charge the batteries. This is a more costly system, but it does give you the peace of mind that you are totally self sufficient
- **A hybrid system,** which is the most popular residential system in South Africa, is a mix between the above two systems. This is a more affordable option as it does not require the extra battery power and uses the grid as a backup generator for times of low irradiation, such as during the night.

There are 5 main categories of a PV Solar system

- Solar panels
- Racking System
- Inverter
- Batteries
- B.O.S

Solar panels

All energy, except Nuclear and Geothermal (from the earth's core) is a direct or indirect form of Solar energy. For example coal and oil that has been fossilised, or wind which is driven by solar energy in the atmosphere. Solar panels are fast becoming the preferred method of harnessing the sun's energy.

What to choose

With so many manufacturers, it would seem that there are just too many options to make a decision, but realistically, as long as you go for a tier 1 panel, their competencies are all pretty much the same, with the only main difference being cost vs warranties.

A tier 1 panel is basically a stamp of approval and must meet the following criteria:

- 25-year warranty, meaning your panels will produce the same energy as they do on day one with an industry standard of 5 to 8 tenths of a percent degradation per annum.
- They are of a similar design, either polycrystalline or monocrystalline and both have similar efficiencies.
- They are roughly 1m x 2m for ease of installation and carrying.
- They range from 300w upwards.
- The company has been manufacturing for more than 5 years with a strong R&D department.
- The Panels are made in-house via a fully-automated production line, eliminating human error.
- The company has a healthy balance sheet ensuring they will be around to honour their warranties.

Mounting Structure

The racking system or mounting system is used to secure your panels on either the roof or a ground mounted system. In the past, it wasn't worth installing solar unless your panels were north facing, but with modern day panels they can be installed facing east and west with only about 10% loss in efficiency.

On the plus side, the panels produce power earlier in the morning on the east side and later in the day on the west side which can be more beneficial for self-consumption, i.e. slightly less efficiency but for a longer period.

The ideal angle in South Africa is around 35 degrees but anything between 25 degrees and 45 degrees is acceptable with minimal loss in efficiencies.

Roof mounted

A mounting hook (specific to the type of roof, i.e. tiled or IBR) is connected to the trusses of the roof about 1m apart. Once these are fastened and secure, rails are then connected to the mounting hooks. The panels are then connected to the railing via four side clamps.

Ground mounted

In the case that your roof is not adequate for installation, due to insufficient space or the longevity of the roof is in question, a ground mounted system can be installed. This is similar to the roof mounted system, with the exception of a steel frame in place of the roof.

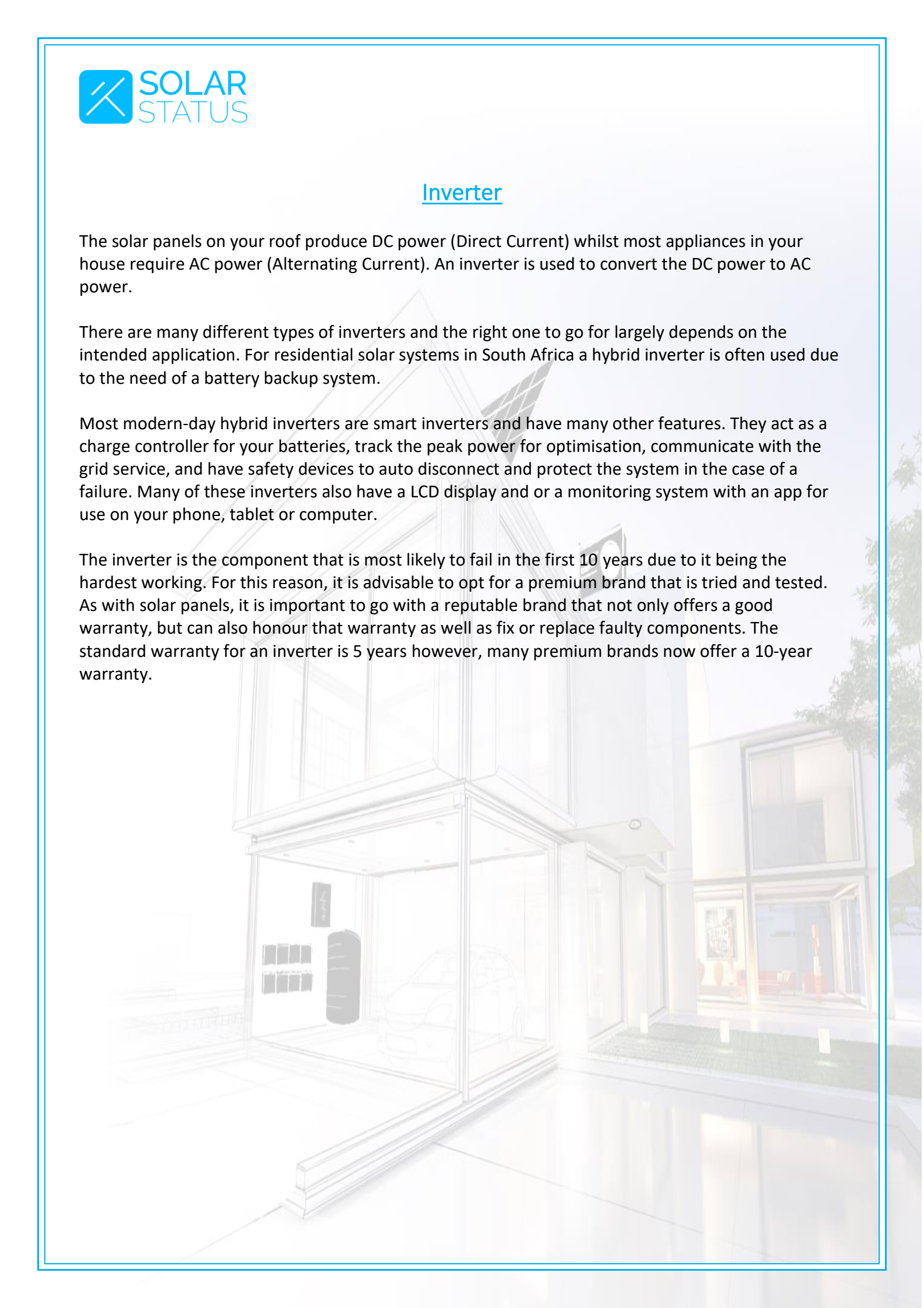
Inverter

The solar panels on your roof produce DC power (Direct Current) whilst most appliances in your house require AC power (Alternating Current). An inverter is used to convert the DC power to AC power.

There are many different types of inverters and the right one to go for largely depends on the intended application. For residential solar systems in South Africa a hybrid inverter is often used due to the need of a battery backup system.

Most modern-day hybrid inverters are smart inverters and have many other features. They act as a charge controller for your batteries, track the peak power for optimisation, communicate with the grid service, and have safety devices to auto disconnect and protect the system in the case of a failure. Many of these inverters also have a LCD display and or a monitoring system with an app for use on your phone, tablet or computer.

The inverter is the component that is most likely to fail in the first 10 years due to it being the hardest working. For this reason, it is advisable to opt for a premium brand that is tried and tested. As with solar panels, it is important to go with a reputable brand that not only offers a good warranty, but can also honour that warranty as well as fix or replace faulty components. The standard warranty for an inverter is 5 years however, many premium brands now offer a 10-year warranty.



Batteries

Batteries are a storage space for energy with many different types for different applications. The two most common batteries used in a solar PV system are Lead-acid batteries and Lithium-ion batteries.

Life Span
Lead-acid batteries have been around for over a hundred years and at first glance are more appealing due to their lower initial cost.

Although Lithium-ion batteries come at a higher upfront cost, one of the many benefits is that they have a much longer shelf life. The life span of most lithium-ion batteries is 10 to 20 years and come with a 10-year warranty. This is four to five times longer than the life span of a Lead-acid battery, which at best is 5 years, but realistically only 3 years with South Africa's load shedding situation.

Installation Space
When deciding between the two, one must consider where the batteries will be installed. Lead-acid batteries need to be installed in a well-ventilated area due to the toxic fumes they can produce, they also require almost double the storage space and are a lot heavier, making them difficult to move.

Depth of Discharge (DOD).
DOD is the amount of usable energy in a battery, or how much it can discharge before drastically shortening its lifespan i.e. decreasing the number of cycles. With Lead-acid batteries, it is advisable not to deplete the batteries lower than 60% (only 40% useable) whereas Lithium-ion batteries have a DOD of between 80% and 100%.

Battery Cycles
The number of cycles a battery can do is the amount of times a battery can charge and discharge over its life span. The average Lead-acid battery has between 1500 to 2500 cycles (this is very dependent on the DOD) whereas Lithium-ion batteries have between 3000 to 6000 cycles, depending on which one you go for.

Efficiency
Lithium-ion batteries have an efficiency of 95% + compared to 80-85% efficiency of the Lead-acid battery. This means is has less losses and faster charging, which is especially important in South Africa due to constant power failure.

Conclusion
At the end of the day, the battery you choose is dependent on budget, location, and application.

Lithium-ion batteries have a longer lifespan, are more efficient, and have a far superior depth of discharge. Lithium-ion batteries can also work out cheaper in the long run but

there are still certain applications that don't warrant the extra. Lead-acid may be more cost effective in a boat or caravan that does not get regular use.

Another option is to start with Lead-acid batteries to help lower the initial project cost and later upgrade to Lithium-ion batteries when it is time to replace the Lead-acid batteries.

Balance of System (B.O.S)

The B.O.S is everything else needed to complete the installation and must be kept in mind when pricing your system as it is a large percentage of the total cost.

The B.O.S includes:

- AC cabling to connect your DB board to the inverter.
- DC cabling to connect the inverter to the batteries and panels.
- Switches, isolators, surge protectors, and fuses to protect your system.
- Trunking and conduit for cable management and in order to comply with regulations.
- Certification to confirm that everything is compliant.

Monitoring

The monitoring system provides two main functions. It is used for configuring your system as well monitoring the daily usage; this includes how much the panels are producing, how much electricity is being used, and where the electricity is being drawn from. This helps ensure that everything is operating as it should.

Systems differ from inverter to inverter and can be in the form of either an LCD screen on the inverter or an app on your mobile device that is connected via Bluetooth or WiFi. Wi-Fi dongles can be directly connected to the inverter system allowing you to monitor and make changes remotely via relevant online portals.

Financing

Solar systems require a substantial upfront expense, which can often distract one from the 15+ years of free energy received in the end.

Financing allows one to break up the lumpsum into manageable repayments. With Solar PV fast becoming popular, banks and finance houses have realised the importance of jumping on board to assist.

Financing can either be in the form of a personal loan from your bank or an external finance house. We suggest that the best way would be to finance it through an existing bond/mortgage, as this has the lowest interest rate out of all your options.