

PV and Renewables Frequently Asked Questions

Contents

Basic PV Concepts	1
Key terms and definitions	3
Connecting to the electricity grid	5
PV System Use and Performance.....	6
Costs and Insurance	7
Installation and Ownership	8

Basic PV Concepts

What is a solar PV system?

Solar photovoltaic (PV) systems, or solar power systems, are renewable energy systems that convert sunlight into electricity. The electricity they generate can be stored in batteries, used directly, or fed back into the electricity grid. Solar PV works well for a wide range of residential, industrial, commercial and agricultural uses and is considered clean as no fossil fuel is used in generating the electricity.

How does a sole PV system generate electricity?

PV technology produces electricity directly from the interaction of sunlight with certain semiconductor materials, such as silicon, in the PV module. The electrons freed during this interaction then flow as direct current (DC) electricity from the module. This electricity can be used as direct current or changed via an inverter to alternating current (AC) electricity which is the form that grid electricity is available to you in your home or business.

What are the main parts of a PV system?

A solar PV system includes different components that should be selected according to the system type, site location and uses. The major components for solar PV systems are:

- PV module – converts sunlight into Direct Current (DC) electricity.
- Battery (optional) – stores energy from the PV modules to supply electricity when there is additional demand or when there is no sun.
- Solar charge controller (required for battery systems only) – regulates the voltage and current coming from the PV panels going to the battery, which prevents battery overcharging, and prolongs the battery life.
- Inverter – converts DC output of PV panels into AC current for use by normal household or office appliances, or to be fed back into the electrical grid.
- AC & DC switch gear – connects and disconnects the PV system from the appliance or equipment using electricity (called the “load”).

- Load – all the electrical appliances and equipment that are connected to a solar PV system such as lights, radio, TV, computer, refrigerator, etc.

Does a solar PV system heat water?

Solar PV is not commonly used to heat water. There are various types of solar energy technologies with the same input (solar radiation), but differ in forms of energy output (electricity or heat).

Solar PV systems use PV panels to convert sunlight into electricity, which is used for various electrical appliances in the building. No water is involved with the functional operation of solar PV.

Solar water heaters or solar geysers use solar thermal energy to heat water directly by means of a set of pipes or collectors placed on the roof of your home. No electricity is generated, although an electrical element can be used as a backup when solar thermal energy is insufficient.

Some water heating systems do use solar PV panels to generate electricity from the sun to heat water via an electrical element. The water can then be used throughout your home for all your hot water needs. This technology is not widely used but is becoming increasingly popular.

How can I tell a water-heating solar panel from a solar electric PV module?

PV panels or modules are the thinner ones, typically 2,5 to 5 cm thick with typically an array of 7,5 to 10 cm blue solar cells behind the cover glass. Solar water heating panels are generally much thicker, and may be connected to a water tank above it (the tank can also be inside the roof).

Can I generate heat for my home with a PV system?

Technically it's possible, with a large enough PV system, but it's generally not cost-effective. PV systems are usually designed to provide electricity to run your lights, appliances and other electric devices in your home.

Do panels store energy from the sun?

No, the electricity generated by your system is used directly by the appliances and equipment operating on your property when it is produced. Batteries are needed to store electricity.

Do I need batteries with the system?

PV systems run whenever the sun is shining. Batteries are only required if you want electricity when there are power outages from the grid, or if you want to be independent of the grid at night or when the sun is not shining. Batteries are still expensive, have a limited life (5-10 years being typical) and require maintenance. Battery backup is most commonly used in remote areas where there is no electric service (off-the-grid).

What happens with my solar PV system during load-shedding or other utility power outages?

No electricity access during load-shedding:

It is unsafe to generate and supply your own solar PV power without being connected to an additional more stable power source (such as the utility grid or battery backup). As a result, a grid-connected solar PV installation will not provide electricity during load-shedding or other power outages. When the utility grid goes down, the solar PV inverter will automatically disconnect from the grid as a safety feature. This safety feature is known as anti-islanding and is important to keep the grid and your home appliances safe.

Some electricity access during load-shedding:

The exception to above is if you have a battery backup system, and are "grid-tied" (this is known as a grid-tied hybrid system). In this case, a suitably interlocked changeover switch on your electricity board can be activated to shift the house electricity demand from the grid to your batteries. You will then have electricity access to some of your home appliances, during load-shedding. The appliances with electricity access will depend on what is safely connected and the size of your hybrid system.

Note: It is important to have a suitably interlocked changeover switch installed, so request one because they are not ordinarily provided.

Are the solar panels fragile?

The modules are made of tempered glass and are very strong. They pass severe wind and hail tests, and are regularly installed in areas prone to hurricanes as well as Arctic and Antarctic conditions.

Key terms and definitions

What is an inverter?

A power device that converts direct current (DC) to alternating current (AC) at a certain voltage and frequency. This device allows battery stored or solar PV generated power to be converted into usable (the required voltage and frequency) AC power that can supply your home. It is important to distinguish between battery, solar and hybrid inverters when considering a solar PV, battery backup or hybrid system.

What is a solar charge controller?

A solar charge controller or regulator regulates voltage and current generated by the PV panels to keep batteries from overcharging

What is direct current (DC)?

The flow of electrical current in one constant direction. Direct current is typically converted to alternating current for practical purposes, as most modern uses of electricity require alternating current. Solar PV panels generate direct current.

What is alternating current (AC)?

The flow of electrical energy that follows a sine wave and changes direction at a fixed frequency (i.e. it alternates). Most residential and commercial/industrial users of electricity require alternating current.

What is a power utility?

A power utility is responsible for the electricity grid infrastructure. Homes, businesses and other users connect to this grid to get electricity. In Cape Town both the City of Cape Town and Eskom are responsible for portions of the electricity distribution network within the City of Cape Town's formal metropolitan boundaries.

What is a bi-directional meter?

A meter that measures the active energy (kWh) flow in both directions (import and export) and either displays the balance of the imported and exported energy in a single register meter (net metering) or displays both imported and exported energy in separate registers.

What is anti-islanding?

The ability of a small-scale embedded generation (SSEG) installation to instantly and automatically disconnect the generator from the distribution network whenever there is a power outage, thus preventing the export of electricity to the distribution network from the SSEG. This is done primarily to protect the distributor's workers who may be working on the distribution network and who may be unaware that the network is still being energised by the generator.

What does 'grid-tied' mean?

SSEG that is connected in parallel to the distribution network either directly or through a customer's internal wiring is said to be grid-tied. SSEG that is connected to the grid through a reverse power flow blocking relay is also considered to be grid-tied.

What is 'generating capacity'?

Generation/Generating Capacity – refers to the total output capacity of the generator. For PV systems in particular, this refers to the maximum output of the solar PV inverter.

What is 'solar installed capacity'?

This is how the maximum DC power of solar PV system is measured. Assuming the same type of panel is used, the Solar Installed Capacity can be found by multiplying the solar panel Wp rating with the amount of solar panels installed.

Connecting to the electricity grid

Do I need permission to connect my PV system to the electricity grid?

Yes, all solar PV systems within the City of Cape Town's electricity supply area must be approved by the City. This is to ensure that all systems connected to the grid are installed safely and are operating correctly, and comply with the most recent regulations. Note that all new solar PV and/or battery systems are treated as grid-tied and must use [City-approved inverters](#), have professional sign-off, and be authorised before switching on.

For more information on how to apply for authorisation to install an SSEG visit www.capetown.gov.za/ApplyForSSEG. See our useful guideline documents below:

- [Requirements for Small-scale Embedded Generation](#)
- [Guidelines for Safe and Legal PV installation in Cape Town](#)
- SSEG FAQs
- Registration is legally required in terms of the [City of Cape Town Electricity Supply By-Law, 2010](#) and ensures the safety of anyone who comes into contact with the PV system or the grid itself.

What next, once I've connected to the grid?

If you have a system that generates more electricity than you use, then the excess can be sent back into the City of Cape Town's power grid. Your new tariff agreement with the City will refund you for any excess electricity you generate. Visit www.capetown.gov.za/CashForPower to find out more.

Can I have a PV system and still be connected to municipal power?

Yes. In fact, many PV systems are designed as on-grid systems, meaning they are designed to interconnect with utility power and not use battery storage. As most people at this stage can only generate some of their electricity needs from solar, they still need to be connected to the grid. (E.g. because battery storage is expensive, electricity would still be needed during the day when the home needs more power than the solar PV can provide, and at night).

What application forms do I need for connecting to the City of Cape Town's grid?

If you are planning to connect your solar PV system to the municipal grid, you will need to apply for approval. Connecting without approval is illegal and dangerous. The approval process for a small-scale embedded generation (SSEG) installation in the City of Cape Town's electricity area varies depending on the size of the system and consumer category. Visit www.capetown.gov.za/ApplyForSSEG for more information on the requirements for SSEG.

Net consumer requirements relating to Small Scale Embedded Generation (SSEG) applications

The City of Cape Town has allowed customers to feed excess generation back into the City's grid since 2014 through the SSEG Feed-in Tariff. There was previously a requirement for all SSEG customers to remain net generators (i.e. buy more electricity

from the network than they fed in), however this restriction was recently lifted and the City is able to procure excess generation through its Cash for Power programme. Excess generation from a customer's SSEG installation fed into the City's grid will be credited at the SSEG Feed-in Tariff rate, and can be used to offset their entire Municipal account (previously it was only the Electricity portion), which is a huge win for customers. If there is remaining credit after the account is offset, the City will pay out the customer in cash, once the amount accrues to R1000 or over. Visit www.capetown.gov.za/CashForPower

Professional sign-off for grid-tied systems

All SSEG systems in the City of Cape Town electricity supply area are considered grid-tied and therefore must use a [City-approved inverter](#), have professional sign-off and be authorised before switching on.

City-approved Inverters List

The City of Cape Town maintains a list of NRS 097-2-1 type test approved inverters in an attempt to protect our customers from purchasing and installing equipment that does not meet the requirements for grid interconnection. The City's requirements for grid-tied inverters (GTI's) and ancillary equipment (e.g. network and system grid protection voltage and frequency relay) type test certification are explained in **Appendix 3** in the [requirements for small scale embedded generation document](#). For more information and how to submit an inverter for approval, please email Inverter.Approval@capetown.gov.za

PV System Use and Performance

How much power does a PV system produce?

The power generated by a PV system is determined by the number and type of PV modules used. The size of system needed is determined by evaluating the amount of electricity needed to run the appliances and equipment in a home or building, taking into account the amount of roof or ground area available. Typical home systems generate between 2 kWp and 10 kWp, which is usually enough to provide 40% to 100% of a household's electricity needs.

Will my system work at night?

A PV system will not generate electricity at night. Sunlight must be present for solar PV to produce power. At night, electricity is typically drawn from the utility's grid. If a PV system has batteries, electricity can be drawn from those at night.

Will my system work on cloudy days?

Yes, though PV modules will produce less electricity. Under a light overcast sky, panels will typically produce about half as much as under full sun. During the design of a PV system for a household a solar analysis conducted on the installation site takes into consideration the average amount of the sun's radiation reaching your system and accounts for cloudy, rainy and foggy days. This information is based on

weather data collected over a 15-year period by Solar GIS and by SASRAD (for example): An hourly-time step solar radiation database site throughout our region.

What's the effect of rain?

A steady rain is great for cleaning your solar modules. However, it will decrease your electricity production while it is raining and overcast.

What do I do if my solar panels get damaged or broken?

Solar panels were banned from landfill in 2021 and are therefore illegal to be placed in landfill. With the Extended Producer Responsibility (EPR) regulations, it is the producer's responsibility to ensure that solar panels are recycled at a licensed facility. You can contact [GreenCape](#), our industry partners, for more information.

Costs and Insurance

Are government incentives available to reduce the cost of installing PV?

For the 2023/2024 tax year, the South African Revenue Services (SARS) introduced the SARS solar tax benefit, where Individuals who install rooftop solar panel(s) can claim a rebate of 25% of the cost of the panels, up to a maximum of R15 000 per taxpayer. This is available for one year between 1 March 2023 and 29 February 2024. Visit the SARS website for further information.

What is the payback period?

The payback period will depend on the nature and cost of the PV system, your consumption patterns, how you are financing it (e.g. from savings, your existing bond/ homeloan facility or a higher interest-bearing bank loan) and future electricity tariff increases.

How long will my PV system last?

Most PV modules come with a 25 year power output guarantee from their manufacturer (and are typically expected to last at least twice that long). This means that after 25 years, the solar panels are guaranteed to still produce at least 80% of their original power output. Battery life span varies between 5-10 years, and depends on the type and quality of the batteries, as well as how often they are charged and discharged ('cycled').

What if I sell my house?

When you sell your house the solar PV system usually remains on the house.

It is important to pass on all the system information, guarantees, etc. to the new owners who must sign a new Supplemental Contract for Embedded Generation with the City or decommission and remove the system.

Is my PV system covered by my homeowners' insurance policy?

PV systems can be covered by your homeowners' insurance as a dwelling extension. Be sure to check with your insurance company to make sure that your system is covered and that you have enough coverage to repair or replace the system if needed. You will need to specify the system on your policy.

Installation and Ownership

How do I know if a residential PV system would work on my home?

Solar PV power works for most homes. Systems are engineered to work with most roofing materials, in most locations where direct sunlight is available, in almost every region of South Africa. A PV system needs a sunny roof space. Any shading from trees or other obstructions can be a problem, so needs to be carefully noted and managed. A north-facing roof area is best, but PV panels can be mounted on north-west- or north-east-facing roofs and still produce adequate power as long as they do not deviate more than 45 degrees either direction from true north. It's best to ask a PV professional to come and check out your home and give the best possible advice.

Your PV installer professional will also be able to give you advice on whether or not your roof structure can withstand the weight of the system, although this is not usually a problem.

Will a system produce enough energy to cover all my electricity needs?

A solar PV system does not need to provide all the electricity you need to be of great value. A small system that simply reduces the amount of grid electricity used can still significantly lower your electricity costs. A system with a battery backup can deliver uninterrupted power to critical loads during load-shedding or other outages, in some cases for days. While many people plan to get a system that supplies 100 percent of their energy needs, installing a smaller system may be more affordable and still make a big difference.

What maintenance does the system require?

Solar PV systems typically operate virtually maintenance-free for years without problems. The batteries in a residential system may need replacement every 5 to 10 years, depending on the batteries and how they are used during their lifetime. It is recommended that the installer check the system annually, just to make sure everything is performing as it should. If it is convenient and your installer suggests it, you can clean off the PV modules with water one or two times a year to remove dust or dirt, and salt build-up in coastal areas. PV modules have a typical life span of 20-25 years.

How much roof space is needed to power my house?

A good rule of thumb is to allow 9.5 square meters for every kilowatt (kW) of electricity production needed. A typical residential solar PV system of 3 kW will

require approximately 30 square meters. Note that these are figures for north-facing roofs without shading or obstruction.

The following factors will affect the roof space required, and need to be accounted for in the design of any system:

Shade-free roof area:

Shadows affect PV in two ways: lower efficiency due to blocking of the sun's rays and shorter life span of the panels because commonly shaded modules burn out faster. The burnout is due to the shaded portion of the panel turning into a resistor instead of its normal function as a conductor when in the sun. This heats it up and over time burns it out, requiring replacement of the entire panel (the cost of which will not be covered by warranty).

Panel efficiency:

Less efficient PV panels need more panels – and therefore more rooftop space – to generate the same amount of electricity as more efficient panels.

Weight of the system:

PV panels are fairly heavy (about 20-40 kg/m²). They typically do not pose a problem for concrete roofs, but roofs made from other materials may require a professional design engineer to check out risks from point loads and wind loads, and make recommendations for any modifications to the roof.

Angle of roof:

The farther off of true north and the ideal angle to the sun a PV panel is, the less efficiently it operates. This means more PV panels needed – and therefore more rooftop space – to generate the same amount of electricity as the same panels at the ideal angle

Some homeowners' associations have rules regarding the installation of anything on your roof or grounds. If you belong to a homeowners' association, consult them for details before you install a PV system.

Do PV panels stand up to heavy winds?

Rooftop solar PV panel mountings need to withstand wind pressure that builds up under the panels during heavy winds. This is an important consideration if you are located in a part of Cape Town prone to high winds. Discuss the kind of mounting required for your location and type of roof with the installer.

How are PV systems attached to a roof?

Mounting systems on the market today are made entirely of anodised aluminium and stainless steel to ensure long life without rusting. A racking system on a typical residential roof attaches through the shingles to the rafters using stainless steel screws. The attachment areas are then sealed with a high-quality polymer sealant for water tightness. Other types of roofs have different mounting systems, which are best discussed with the installer.

Do I need to install a new roof before the solar panels are installed?

Not typically. However, PV panels are designed to last more than 25 years and if the roof is going to need replacement within the next 8-10 years, it would probably be replaced first. If the existing roof has plenty of life still in it, the installed solar panels will reduce wear on the roof by blocking ultraviolet rays, keeping most rain and dust off the roof, and preventing anything from hitting the roof. It is illegal to install solar PV panels on asbestos roofing.

What other options do I have if the system cannot be mounted on my roof?

There are options for ground-mounted PV installations. Speak to the installer for details on this.

Do the PV modules need to face north?

The greatest efficiency comes from modules facing due north and at the ideal tilt angle. North is best, but modules installed facing northeast or northwest still generate a very high percentage of possible power. The rule is not to deviate more than 45 degrees from true north. Ask the installer to perform a comprehensive site evaluation to determine the efficiency of the system, taking into account shading from trees or other sections of the roof.