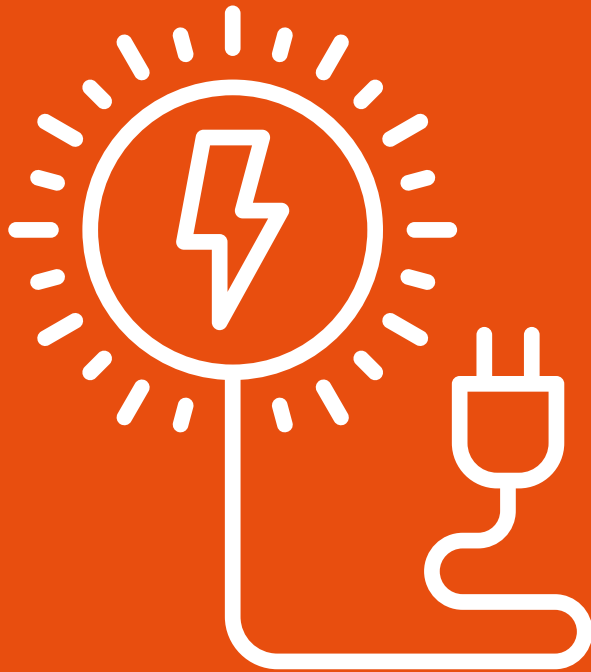


Northpower

Solar Power



Our need to know guide if you are installing or considering solar electricity.

Generating Solar Electricity

Solar panels are becoming a popular option to generate some, or all of your own electricity needs. In this guide, we provide some things you need to know when considering having solar installed at your home or business.

Who are we?

Northpower operates and maintains both the electricity distribution and fibre networks in the Whangārei and Kaipara region with more than 60,000 connected customers.

Northpower is not a retailer, nor are we a provider or installer of solar equipment, so you can trust us to provide you with non-biased, accurate information about your solar generation.

This information is primarily aimed at residential solar users, but some of the technical information could also apply to commercial properties. If you have any further questions, call Northpower on 0800 667 847 or visit www.northpower.com

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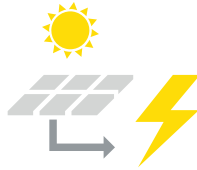
1 What is Solar Power?

Solar PV Systems

How does Solar PV work?

A solar photovoltaic (PV) panel is made up of a number of connected solar cells. These panels absorb sunlight and the silicon and conductors in the panel convert this light into DC (Direct Current) electricity. From there, the electricity flows into an inverter, which converts the DC electricity into AC (alternating current) electricity for use in your home.

The electricity from the solar panels is only generated during sunlight hours and needs to be used immediately unless there is a battery to store the energy.



Grid-connected and off-the-grid systems

Solar PV systems can be installed 'grid-connected', which means they will still have a connection to the local electricity network. Connection to the Northpower network will let you use power supplied through Northpower's network and your electricity retailer when your system is not operating or producing enough energy for your electricity needs (the load).

If a solar system does not have battery storage, it will likely need a network connection. Network connected systems allow excess generation to be sold ('exported') back to the national grid.

Off-grid systems are stand-alone and generally require battery storage so that power can be used when the solar panels are not generating (for example at night).

Battery Storage

Battery storage can be used in grid-connected systems. While this does add to the cost, it means you can store the energy generated during sunlight hours for use when the solar panels are not generating, while still having the network connection as a back-up option.



Exporting solar power to the grid

Excess power generated by a solar PV system can be sold back or 'exported' to an electricity retailer. To do this, you will need to connect to the Northpower network. This power is sold back to your power retailer for a per kilowatt price that is generally less than what it costs to "import" or buy electricity. You might want to shop around to see what rates different retailers can offer you.

Import/Export Meter

The New Zealand Electricity Industry requires all grid-connected solar systems have an import/export meter installed. This records electricity imported from the grid and electricity exported back to the grid. Your electricity retailer owns this meter and will arrange the installation, so check with your retailer for the cost of this.

Solar Generation

A number of factors can influence the amount of electricity produced by a solar PV system. These include their capacity, panel positioning and tilt, seasonal variation or weather factors, any shading over the panels and the surrounding air temperature.

2 Before You Invest



Do your research!

Is my property suitable?

Phasing

All residential houses in the Whangārei and Kaipara Districts have either a single phase, two phase or three phase supply. This means the electricity capacity allowed from the network for your home is either 60 Amp one phase, 30 Amp two phases or 20 Amp three phases (every home is allocated 60 Amps). Most urban areas are on single phase, while rural areas are on two or three phases.

The number of phases in your home affects how your home is wired, and will affect how the solar powers different parts of your home. It might also have an impact on the type or number of inverters you use. Single phase homes are the simplest and homes on two or three phase supply are a bit more complicated. We recommend you speak to your electrician about the options.



To find out how many phases supply your property, check your household switchboard, talk to your electrician, or contact Northpower.

Your Roof

Some roofs are easier to install solar panels on than others. It is best to have an in depth discussion with your installer about your roof type, shape, size and direction to best understand what will work for you. Some things to consider are;

Roof Cladding

It is the easiest to install solar panels on iron, steel or aluminium roofs. Tile roofs are slightly more complicated but possible, while flat membrane roofs are the most difficult and expensive.

Roof age and condition

It is a good idea to check the condition of your roof and make any repairs prior to installing solar panels. Solar panels are designed to last at least 25 years and once they are in place you want them to stay there for as long as possible.

You should also check that the roof structure is strong enough to support the weight of the panels. We would recommend having a licenced builder do this.

Roof direction

The ideal situation is lining your solar panels up to face the sun directly. This will help maximise their generation.

North facing roofs are the best for this. The further away from the sun the panels face, the less efficient they become.

East or west facing panels will generate significantly less power than north facing ones and will generate their power at different times of the day; east is best in the morning and west is best in the afternoon.



Roof size

The typical size of one residential solar panel is roughly 1.65m x 1m.

You will need around 7m² of available roof space for every 1.0 - 1.3kW of your solar PV system.



Roof pitch (or angle)

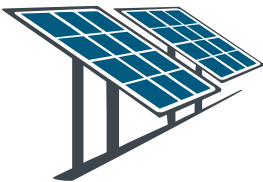
While electricity can be generated from a panel on any pitch, the best roof pitch to maximise generation depends on your location and the season. For example, Whangārei's optimum tilt angle is 26° in summer and 51° in winter. Solar panels can be mounted on tilts to raise them to the best position.

Shading

Any shade on your solar panels can have a huge impact on what they generate, depending on the type of inverters you use. Before you install solar panels, it pays to make sure hills, trees, buildings or even a chimney won't shade them now or into the future. You also should consider how the angles of shading may change from summer to winter, and optimise your set up for the winter months when you may use more power.

Ground Mounted Panels

In some instances, it may be possible to have ground mounted solar PV panels installed. These are more suitable in rural areas as they do take up a fair amount of ground space. Ground mounted panels can be easier to clean and maintain.



Specialist Advice

We strongly recommend consulting an engineer, builder or solar install specialist to check if your roof is strong enough to hold not only the weight but also any uplift caused by wind flowing under the panels. You should also check whether you need local council consent for any changes.

Going 'Off-Grid'

Installing a solar system to power your home or business and going completely off-grid means you will not have a connection to the local power network. It may be a good option for people where the cost to connect to the local network is excessive or if you simply do not want a connection to the network.

This option can be more costly because you will require a battery system so the power generated by the solar panels during the day can be stored and then used when the sun is not shining. The battery should have significant excess generation capacity in case there are long periods without enough sunlight (ie. long periods of cloudy weather). You may also have a back-up generator.

You may consider other energy sources, like gas, for cooking or water heating. It is a good idea to factor in the cost of these when considering your options.



An off-grid solar system should be bespoke and unique to your home or business. It needs to be designed specifically for your needs, now and into the future.

Using Solar Power

It is important to consider how you will be able to capitalise on your solar generation. If you don't intend to invest in a battery system to store power, then it makes sense to try and use as much of the electricity generated during the day when it is sunny, rather than export all this back to the grid and have to import electricity when the solar isn't generating. The cost of buying/importing electricity from a retailer is much higher than what you will be paid for any energy that you export/sell.

Most household power is consumed in the morning and evening, and we generally use more in winter for things like heating. However, the best solar generation is between 11am and 3pm, with higher generation in summer. This means you may have to change your electricity usage habits, like having your most power hungry appliances on during the day.

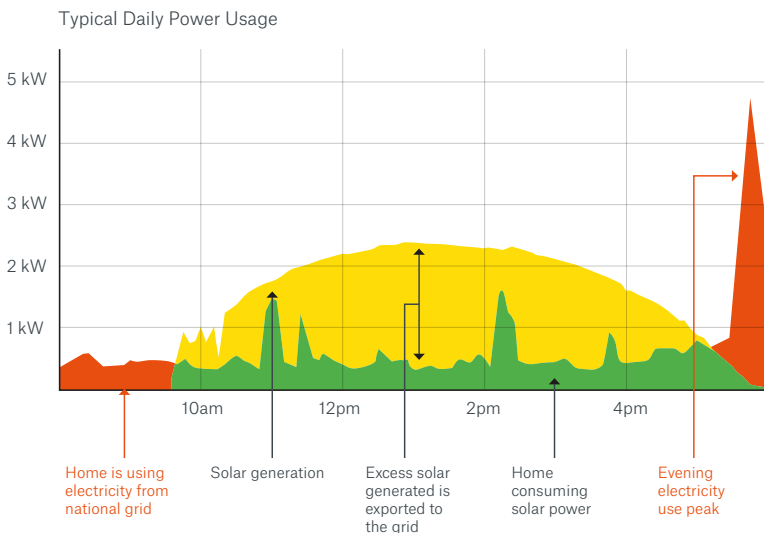
Solar PV systems are ideal for homes with heating or other appliances that have high electricity use during the day, and when someone is home during the day.

What can you do?

By changing the times of day that you use power, you can capitalise on the solar power generated during the sunlight hours.

Things such as smart load control devices, solar hot water diverters (or timers) or delayed start functions on dishwashers, washing machines and dryers mean you can set appliances to use electricity while it is being generated.

It is also a good idea to invest a bit extra in a monitoring device which can provide real time feedback on the solar generation and consumption, so you know exactly how much is being generated and used, or sold back to the grid.



What is the right system for my household?

Size

The most important thing when looking to have solar installed is the size of the solar PV system that you choose. To be the most cost efficient, it needs to supply your daily needs without exporting too much power back to the network. Choose a reputable installer that will help you calculate the best size to fit your needs.

Panel types

The main types of solar panels are monocrystalline silicon (mono-Si) and polycrystalline silicon (poly-Si). Both are very similar when it comes to performance but mono-Si panels are slightly more efficient, producing higher power outputs per panel area than poly-Si, so they take up less space. However, they are more expensive, so poly-Si solar panels can be a more economic option. The main factor when deciding will probably be the roof space available.

Inverters

There are two types of inverters; micro-inverters and string inverters. Micro-inverters allow the maximum output from each individual panel while the string inverter only allows as much output as the weakest panel (ie. one that might be affected by shade or dirt, or have a fault). Micro-inverters make it easier to find faults but are generally more expensive and harder to access for any maintenance because they are located on the roof, whereas string inverters can be at ground level.

Solar Installers

There are many solar salespeople and installers out there, so it is important to do your research before committing to anything. It is a good idea to get a range of quotes, compare prices, check workmanship and references and make sure they will be able to provide any follow up services you may need.

When comparing prices, keep in mind that there is a wide range of technology and configurations available, as well as differences in product quality. Make sure the quotes are for a system that is the right size for you and will meet your needs, as well as what might be required to maintain them in future. Also, check for any exclusions that could unexpectedly push up the price.



3 Before You Begin

Arranging the Details

If you intend to connect to the grid, you need to let Northpower know. Our network was originally designed to have electricity flow one way – to the homes. It can have electricity flow from the home, but this reverse power flow means there is the possibility of higher than expected voltage flowing through the lines, which could cause damage.

Northpower also have to consider things like electrical safety and compliance, our network capacity to handle excess electricity coming into it, along with any adverse effects from a new connection that could interrupt the electricity supply.

Connecting your generated power to the grid is known as Distributed Generation. Northpower looks at new distributed generation connections on a case-by-case basis to make sure there is enough capacity in your area. Currently we are not aware of any specific locations on the Northpower network that have export congestion for small-scale generation.

However, it is highly likely that export congestion will occur as more distributed generation connects to the network and it is vital that people considering installing new or additional small-scale generation follow the processes in clauses 4.3 and 6 of Northpower's Technical Requirements for Small Scale Distributed Generation before committing to the purchase of new generation.

Connection of large-scale generation (1MW or above) will always be engineered on a case-by-case basis.

Submit an Application

Once you have your design outlining electricity capacity, energy production and electrical system specifications, and you have contacted your energy retailer to discuss your proposal and complete any commercial arrangements they require, we advise completing the Northpower's application form as soon as possible. This is often done by the PV provider as it requires details of the technical information of the system.

There are two versions of the application form depending on the size of your system (over 10kW or under 10kW). Find them at www.northpower.com/get-connected.

Once Northpower receive the application, we will check that our network has capacity and that there will be no adverse effects for our users. We will advise if it needs any changes (including additional support) and once this is done, we will approve your application.

Once a small-scale distributed generation application is approved, the system owner will need to arrange installation, inspection and livening. Your installer and retailer will need a copy of our approval form. Once the system is connected, the installer/electrician will need to complete the CoC (Certificate of Certification), the inspector will need to complete the RoI (Record of Inspection) and a both will need to complete the Livening Form. The Livening Form and RoI must be returned to Northpower within 5 days of the system being connected to our network in order to comply with the Electricity Industry Participation Code.

Unless a connection contract has been entered into, small scale distributed generation is generally on regulated terms in accordance with Schedule 6.2 of Part 6 of the Code.

4 After Solar is Installed

Be sure to follow your system's user manual and keep your system well maintained to make sure it keeps generating at the best efficiency possible.

This includes washing the panels, usually once a year, and regularly checking the system's energy production, which will give you an indication of any faults.

Please be aware that solar PV systems that are grid-connected include a safety setting on the inverter that will switch off the power if there is a power outage on the network.

This is so there is no electricity flowing back to the grid when the power is out to keep anyone working on the lines safe.

5 Frequently Asked Questions

Your Bill

Will solar panels lower my energy bill?

How much you save on your electricity bill will depend on the size of the solar system installed, how you use your power while it is being generated, and whether you have batteries installed.

Solar is a good option if you are at home during the day, or if you have items such as pool pumps or air-conditioning that use a lot of energy during the day. If you don't have battery storage, you will still need to buy power during the times the solar panels are not generating (ie. at night).

How much do I get for selling power back to the grid?

The export price per kWh varies per retailer. We suggest shopping around retailers to get the best price. The export price is generally less than the import price.

Will I still get a power bill?

If you connect to the grid, you will still get a power bill from your power retailer. It will include a standard daily lines charge, and charges based on the amount of power you draw from the grid.

Will I need a smart meter?

Yes. Anyone on a grid-connected solar system will need an import/export meter installed, as this is a requirement of the NZ Electricity Industry Code. This records electricity imported from the grid and electricity exported back to the grid. Your power retailer owns the meter.

Can I run my home completely off the grid?

Yes, but you will need battery storage. To have a home run completely by solar and off the grid, you will need to make sure you have the right sized system to meet your energy usage needs, and a battery to store the power to use when the solar panels are not generating, including long periods of cloudy weather.

Frequently Asked Questions

The System

How long do solar panels last?

Solar panels last approximately 25 years. It is important to understand that because solar panels degrade over time, they will produce slightly less energy each year. Under a 25-year warranty, most manufacturers will expect their solar panels to generate at 80% of their original capacity at the 25-year mark. High-quality panels tend to degrade at a far slower rate, while cheaper solar panels degrade faster.

The inverters connected to the solar panels have different lifespans depending on the type. String inverters generally have a life expectancy of around 12-15 years, while micro-inverters and DC optimisers have an expected life of 20-25 years.

Three things influence the batteries life expectancy: how much it is used, the type of battery and its operating environment. Battery storage capacity becomes less efficient over time. Most current lithium-ion batteries will come with a 10-year performance warranty.

What happens to the old panels?

Solar panels can currently be recycled, through either re-use, mechanical recycling, or chemical recycling.

How much sun do solar panels need?

Ideally, you want your panels to be generating every time it is sunny, especially if you are using the power as it is generating. Solar panels work best with direct sunlight. For battery storage, the best-case scenario is four to five hours of direct sunlight per day to generate enough to charge the battery. Solar panels will still generate electricity when it is cloudy but not as efficiently.

Is solar reliable?

Solar energy has proven to be a reliable energy source. It offers consistent energy production, and systems can last 25-30 years, but it is always good to check the warranties that solar installers offer.

Do solar panels overheat?

Solar panels use light particles as the main source of energy, which converts into electricity. The heat does not generate the electricity. Solar panels can become hot and this will decrease their efficiency, but with normal use of a solar panel they will not overheat.

In Northland

Is Northland good for generating solar power?

Solar panels only need sunlight, rather than warmth to generate power. While Northland has a wet and tropical climate, meaning a reasonable level of rain and cloud, we also have a fair amount of sunlight hours, so solar generation in Northland is a good option.

Where do I get trustworthy information?

Northpower can help you answer some questions about solar generation in your home or business. If you want connection to the grid, it is best to talk to us before committing to any solar installation. Northpower is not a retailer, nor are we a provider or installer of solar equipment, so you can trust us to provide you with non-biased, accurate information. You can also check out the independent Consumer website at **consumer.org.nz**.

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